Poster Week 16/2021

ABSTRACT BOOK

Escola Superior de Tecnologia da Saúde

Politécnico de Coimbra

December 13th – 17th 2021

estesc
Politécnico de Coimbra

SCIENTIFIC COMITEE

Coordination:

Célia Margarida Alcobia Gomes

Ana Catarina Almeida Pestana Lança
Ana Lúcia Baltazar Santos
António Jorge Dias Balteiro
Cristiano Filipe Romão Matos
Cristina Sofia dos Reis Santos
Diana Raquel Fernandes Martins
Fernando José Figueiredo Agostinho d' Abreu Mendes
Hélder José da Silva Simões
João Pedro Marques Lima
Joaquim Alberto Pereira
Paulo Nuno Centeio Matafome
Raquel Mafra Oliveira
Rui Santos Cruz
Sónia Alexandra da Silva Pimentão Fialho
Susana Mónica Marinho Paixão

EMAIL

posterweek@estescoimbra.pt

Calendário

Poster Week 16/2021

	2ªf		3ªf		4ªf		5ªf			6ªf	
	13/dez		14/dez		15/dez		16/dez			17/dez	
8-9h											
9-10h	Cristiano Matos: 9P Curso: Farmácia 1º UC: **Introdução à Farmácia**				Célia Gomes: 10P Curso: DN 3º UC: **Genética**						
10-11h							Cristina Santos: 9P Curso: SA 3º UC: **Qualidade e Segurança Alimentar**	Sónia Fialho: 9P Curso: DN 2º UC: **Composição Nutricional dos Alimentos**	Rui Cruz: 5P Curso: Farmácia 3º UC: **Organização, Gestão e Qualidade em**		
11-12h	Hélder Simões + Ana C. Lança: 7P Curso: SA 1º UC: **Introdução à SA**				Ana Baltazar + Raquel Oliveira: 9P Curso: Farmácia 3º UC: **Nutrição**	Fernando Mendes: 8P Curso: CBL 3º UC: **Imunohemoterapia Clínico-Laboratorial II**					
12-13h											
13-14h											
14-15h				Cristina Santos: 8P Curso: SA 2º UC: **Gestão da Qualidade da Água I**	Diana Martins: 10P Curso: CBL 3º UC: **Morfologia e Histotecnologia**		Hélder Simões: 7P Curso: SA 2º UC: **Saúde Ocupacional**			João Lima: 12P Curso: DN 2º UC: **Nutrição e Saúde Pública**	
15-16h			Rui Cruz: 5P Curso: Farmácia 3º UC: **Organização, Gestão e Qualidade em Farmácia**			Jorge Balteiro: 10P Curso: Farmácia 2º UC: **Tecnologia e Farmácia Galénica I**					
16-17h										Paulo Matafome: 9P Curso: Fisioterapia 1º UC: **Fisiologia I**	Joaquim Pereira: 1P **Mestrado Fisioterapia**
17-18h											Joaquim Pereira: 4P Curso: FC 4º UC: **Investigação Aplicada 2**
18-19h			Ana C. Lança: 8P Curso: SA 1º UC: **Epidemiologia**		Ana C. Lança + Susana Paixão: 4P Curso: SA 2º UC: **Gestão do Habitat**						
19-20h	João Lima + Raquel Oliveira: 5P Curso: DN 1º UC: **Sociologia da Alimentação**	Fernando Mendes + Diana Martins: 9P Curso: CBL 4º UC: **Oncobiologia**					João Lima + Raquel Oliveira: 5P Curso: DN 1º UC: **Sociologia da Alimentação**				
20-21h											

INDEX

ABSTRACTS

ACCIDENTAL DOPING

Alexandre Pinho, Bárbara Gomes, Bernardo Santos, César Pinho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: Doping is the use of drugs or specific methods that aim to increase an athlete's capabilities and performance during competition and can often be done accidentally.
Methods: An analysis of several articles was carried out between November 1st and November 29th in Pubmed ® and Google Scholar®, using keywords such as doping, sports, pharmaceutical, accidental, unintended and a period of 10 years. First, an analysis of the titles and their abstracts was made, and 15 articles were chosen. Afterwards, a complete analysis of the articles was carried out, which led us to the final 12 articles.
Results: Doping have impacts not only on the human body but also on sports and it has increasingly been used by athletes at both professional and amateur levels despite being often done accidentally/unconsciously due to taking common or necessary drugs for the treatment of an injury, which contain doping substances. Some examples of the substances used for doping are cocaine (Stimulator), GH-Growth Hormone (Hormone), testosterone (Anabolic).
Conclusion: Greater awareness, study and prevention about doping remains careful pharmacological choice by practitioners to obtain better treatment and performance from athletes, not making the mistake of prescribing drugs with substances that can be considered doping.

Keywords: doping, sports, pharmaceutical, unintended, accidental

Discipline: Introduction to Pharmacy

Professor: Cristiano Matos, Rui Cruz

Degree: Pharmacy

A 2

Edition 16/21

EPILEPSY

Inês Sousa, Joana Martins, Lara Ramos, Sara Urbano e Vasco Bettencourt

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Epilepsy is a neurological disease which involves the nervous system. We talk about epilepsy when, at least, two episodes of convulsion occur not related with alcoholic abstinence, hypoglycemic, and other causes. The convulsion results from the activity electrical in the brain, being able to be the cause of a trauma or have an unknown cause. Most of the time, this activity is unpredictable in start, being short in duration and where remains the normal operation of the brain between crises. This has a tendency to repeat, being the frequency of repetitions variable from sick to sick.

With this work we intend to understand and make known epilepsy, its causes and effects, as well as treatment and its distribution in populations.

Epilepsy affects various mental and physical functions, being a fairly common condition and affecting about 65 million people worldwide. It has a higher risk of incidence in younger or older people, but may occur at any age.

The manifestation of this disease does not occur in the same way in all patients and crises can be simpler or more complex. In addition, they depend on the location of the foci of energy discharge in the brain that can affect various activities of the human organism.

Treatment of this disease varies from patient to patient, as many of the antiepileptic medicinal products have relevant side effects that should be taken into account. In some cases, the prescription of a type of drug is sufficient, for some patients, a combination of various medicines is required. The goal of prescription drugs is not to cure epilepsy, but to control the frequency of seizures, and initially a small dosage is administered, which is subsequently adjusted.

There are several elements that, when controlled, can help prevent epileptic seizures, including: stress, anxiety, excessive alcohol consumption, tobacco, changes in sleep rhythm, changes in ongoing medication, among others.

Keywords: epidemiology , epilepsy , incidence , prevalence , prognosis

Discipline: Introduction to Pharmacy

Professor: Cristiano Matos, Rui Cruz

Degree: Pharmacy

A 3

Edition 16/21

BENZODIAZEPINES AND SELECTIVE SEROTONIN REUPTAKE INHIBITORS IN THE CONTROL OF ANXIETY AND STRESS

Ana Portela, Gabriela Carvalho, Gabriela Vieira, Maria Coimbra

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Benzodiazepines and selective serotonin reuptake inhibitors (SSRIs) exert anxiolytic and antidepressant effects and may interfere with the neuroendocrine axis of stress. Benzodiazepines are drugs that act as depressants of the Central Nervous System, as diazepam or alprazolam. SSRIs include Fluoxetine and Mirtazapine, among others, despite of similar mechanism of action, there are differences in their clinical properties that make their selection important. Depending on the cellular receptor they stimulate, they can cause anxiety, insomnia and sexual dysfunction (5HT-2 receptor), or nausea and headache (5HT-3 receptor). Some patients tend to be drowsy at the start of treatment.

The aim of this study was to compare drugs for anxiety and depression, and which is the most suitable for each clinical condition.

The information was collected based on articles from Google Schoolar ® and Infarmed page the keywords we used were “Benzodiazepine” and “SSRIs”.

Regarding SSRIs, if the treatment is interrupted, episodes of irritability, anxiety and nausea may occur; however, these effects are less likely with Fluoxetine. SSRIs are used for depression, increasing the levels of serotonin which regulates mood, sleep and appetite. Mirtazapine, a tetracyclic antidepressant, which acts on two neurotransmitters (serotonin and norepinephrine) and has fewer side effects, it also has a faster effect on the body compared to Fluoxetine.

Concerning benzodiazepines, the period of treatment should be short, however, tolerance and dependence often appear. Regarding treatments for anxiety, diazepam and alprazolam produce a calming and sedative effect, however Diazepam is often used in emergency and alprazolam for a prolonged effect.

Keywords: Benzodiazepine, Selective Serotonin Reuptake Inhibitors, Anxiety, Stress, Antidepressants

Discipline: Introduction to Pharmacy

Professor: Cristiano Matos, Rui Cruz

Degree: Pharmacy

A 4

Edition 16/21

PHARMACOVIGILANCE, RISKS AND ADVERSE EFFECTS OF SELF-MEDICATION

Ângela Oliveira, Carolina Oliveira, Catarina Castro, Catarina Frederico

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Self-medication is defined as the selection and use of medications by individuals to treat self-recognized or self-diagnosed conditions and symptoms. This practice is often seen as harmless but can pose risks to patients' health.

According to INFARMED, “Pharmacovigilance aims to improve the safety of medicines in defense of users and public health, through the detection, evaluation and prevention of adverse drug reactions”.

The goal of the study is to analyze the risks of self-medication, stressing the importance of pharmacovigilance and proposing measures to address these issues.

For this purpose, 3 scientific articles were collected from Google Scholar and Pubmed and analyzed in order to select relevant information according to the theme addressed.

In order to prove the above data, the articles we used to help us in this research used as a study method the influx of self-medication in pregnant women, the comparison of self-medication values according to age and gender and also by recording sales of nonprescriptionmedicines in Europe.

We conclude that self-medication may be beneficial in that it promotes the sale of non-prescription drugs, which is an added value for the pharmaceutical industry (at the economic level and not only). However, the risks of this practice outweigh these advantages. Since self-medication implies a self-diagnosis and this may be wrong, leading to serious consequences on the individual's health.

Keywords: Pharmacovigilance, medicines and self-medication.

Discipline: Introduction to Pharmacy

Professor: Cristiano Matos, Rui Cruz

Degree: Pharmacy

A 5

Edition 16/21

DIABETES: PHARMACOTHERAPEUTIC MONITORING

Andreia Carvalho; Andreia Ferreira; João Simões; Lucas Rocha; Sara Ribeiro

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Diabetes mellitus (DM) is a chronic disease characterized by increased levels of glucose in the blood called hyperglycaemia. This disease affecting both sexes although its prevalence increases with age.

This review aims to explain what diabetes is and analyze the role of pharmacotherapy in this disease. Bibliographic research was made out in different articles in “PubMed” and a Portuguese Diabetes journal.

Diabetes drugs use has been significantly increasing over the last decade across Europe regarding the daily dose/1,000 inhabitants/day. There drugs allow the change of the glucose metabolism in the human organism, leading to increase in insulin resistance. DM1 is identified by hyperglycemia and insulin deficiency as a consequence of autoimmune destruction of pancreatic B cells and this can be controlled with insulin treatment. DM2 is a chronic progressive disease that is described by years of insulin resistance.

Metformin is a first option treatment for DM2, used in patients without contraindications. It lowers blood glucose levels and inhibits hepatic gluconeogenesis thereby lowering circulating insulin levels. Alternatively, sulfonylureas are among the oldest and most used drugs for DM2. Incretin-based therapies are a class of more recent drugs for the treatment of DM2 including: Glucagon-Like peptide-1 (GLP-1) analogues and dipeptidyl peptidase-4 (DPP-4) inhibitors. Other groups of drugs used include SGL T2 inhibitors like dapagliflozin, thiazolidinediones (TSDs) like pioglitazone, and others less used like acarbose.

In conclusion, as there is no definitive evidence of antidiabetic therapies, frequent screening for diabetes and pre-diabetes is recommended in order to prevent disease progression.

Keywords: Diabetes, Diabetes Pharmacotherapy, Metformin

Discipline: Introduction to Pharmacy

Professor: Cristiano Matos, Rui Cruz

Degree: Pharmacy

A 6

Edition 16/21

HEPATOTOXICITY OF PARACETAMOL AND RELATED FATALITIES

Ana Capela, Ana Nogueira, Catarina Morais, Elsa Oliveira, Gonçalo Lameiras

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: Paracetamol (acetaminophen) is an antipyretic and analgesic used to treat fever and relieve pain. However, its hepatotoxicity wasn't recognized until 1980, when there was a large consumption of high doses.

Objective: To investigate the main factors that induce acetaminophen hepatotoxicity and its mechanism, analyzing various scientific articles.

Methodology: We analyzed 3 articles that fall within the period of 2012-2019, taken from Google Scholar and Pubmed.

Results: In terms of pharmacokinetics, paracetamol has good oral availability and acts within 30 to 60 minutes. Its metabolism is divided into three phases: glucuronidation, sulphation and oxidation, in which the liver is the main organ involved.

Regarding pharmacodynamics, it's considered hepatotoxic depending on the dosage. The recommended dose for an adult is 650-1000mg every 4 hours and for a child 10-15mg/kg every 4-6 hours. Overdose occurs when ingesting more than 10g in adults and up to 150mg/kg in children. When toxic doses are administered, the pathways involved in drug biotransformation saturate, leading to hepatic necrosis.

Discussion: Some authors argue that paracetamol hepatotoxicity is a serious problem that still affects a lot of population, due to its easy access and low cost. In 2011, the FDA established that all medications containing acetaminophen shouldn't exceed 325mg of acetaminophen per pill, making it safer for patients.

Conclusion: Paracetamol is considered effective and safe when administered in therapeutic doses, but when consumed in doses higher than recommended, it becomes hepatotoxic. This medicine is one of the most consumed by the population.

Keywords: Paracetamol, toxicity, risk factors.

Discipline: Introduction to Pharmacy

Professor: Cristiano Matos, Rui Cruz

Degree: Pharmacy

A 7

Edition 16/21

ACETYLSALICYLIC ACID AND DIABETES MELLITUS

Francisco Mano, Dinis Silva, João Gírio, Ricardo Inocêncio

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

The Acetylsalicylic acid, known as aspirin, is an analgesic and anti-inflammatory drug and a reference for clinical trials, and it´s used as a way of preventing cardiovascular complications of the population at risk.

Assess the role of aspirin to reduce the cardiovascular risk of events on patients with diabetes mellitus.

The researched articles were based on the electronic database like “PubMed”. The research was conducted with the keywords: “acetylsalicylic acid”; "diabetes" "aspirin", “cardiovascular”, “rivaroxaban” and “clopidogrel” between 1998-2020 we selected 6 articles.

Serious vascular events occurred in a significantly lower percentage of participants in the aspirin group than in the placebo group. Major bleeding events occurred in participants in the aspirin group, as compared with the placebo group. Clopidogrel can be used in patients who are allergic to aspirin. The aspirin plus clopidogrel combination is not recommended for long-term use because bleeding risk increases. There is a numeric increase in the incidence of severe bleeding among patients treated with rivaroxaban and aspirin compared with aspirin alone. This results in a favourable clinical benefit of rivaroxaban and aspirin, which is especially apparent in higher-risk patient, and increases as the duration of treatment with rivaroxaban and aspirin increases.

Aspirin is used to prevent serious vascular events in person who had diabetes, but it also caused major bleeding events. Clopidogrel is considered to be as safe as aspirin with fewer bleeding episodes. The risk of severe bleeding is low, and the clinical benefit remains favourable for most patients treated with rivaroxaban and aspirin.

Keywords: “Acetylsalicylic acid”; “diabetes mellitus”; ”cardiovascular diseases”; “rivaroxaban”; “Clopidogrel”

PANCREATIC CANCER

Alexandra Marques, Bárbara Lima, Beatriz Paulo, Diogo Correia, Mariana Gama

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Pancreatic cancer is one of the types of cancer of the digestive system, considered one of the hepatobiliopancreatic tumors. It is considered a rare cancer, but with high lethality. This disease has several risk facts associated, among which tobacco use stands out as the main factors. One of the most common symptoms is weight loss.

The objective of this is to explore aims to outline the most up-to-date knowledge of pancreatic adenocarcinoma risk, diagnostics, treatment and outcomes, while identifying gaps that aim to stimulate further research in this understudied malignancy. Better understanding of the risk factors and symptoms associated with this disease is essential to preventive and/or early detection measures

The research was conducted on the electronic databases of “Google Scholar” and “PubMed”. The keywords used were: “Pancreatic cancer”, “Pancreatic adenocarcinoma”, “Pancreatic cancer risk factors”, “Pancreatic cancer treatment”; articles were selected between 2018-2021 of which were selected two articles.

In short, this study allowed to delineate the most up-to-date knowledge of the risk of pancreatic adenocarcinoma, diagnosis, treatment and outcomes, while identifying gaps that aim to stimulate further research in this malignancy. Overall, considerable progress is needed, and in this sense there have been recent and renewed efforts to fund research on this cancer.

Keywords: Pancreatic cancer, Pancreatic adenocarcinoma, Pancreatic cancer risk factors, Pancreatic cancer treatment

CLINICAL PHARMACOKINETICS OF SERTRALINE

Cristina Martins; Inês Rodrigues; Francisca Rodrigues; Simone Martins

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Sertraline is an antidepressant proven to be effective and widely prescribed marketed as Zoloft®, Serenata®, or Assert®. It belongs to selective serotonin reuptake inhibitors (SSRIs). It can be used in depression, social anxiety disorder, posttraumatic stress disorder (PTSD), panic disorder, and obsessive-compulsive disorder (OCD).

Our research aims to provide an overview of clinical pharmacokinetics of sertraline, use and pharmacological effect. We researched in different databases including “Google Scholar” and “PubMed” using keywords such as “Sertralina”, “Farmacocinética”, “Antidepressivos”, including articles since 2011.

Sertraline has excellent pharmacokinetics, which means it’s rapidly absorbed and distributed to tissues when administered orally. It can be metabolized by the liver, reaching the Central Nervous System (CNS). Excretion is through the renal and faecal routes.

The effects of sertraline begin to be noticed 2-4 weeks after the start of its use. After this period, it will have an antioxidant and anti-inflammatory profile.

Sertraline dosage will depend on demand, but it’s usually prescribed as a single dose (50-100mg), given every 24 hours with or without food in the stomach.

Most patients do not have adverse reactions. However, common side effects include headache, dizziness, fatigue, insomnia or drowsiness, increased or reduced appetite, dry mouth, nausea, diarrhea, and decreased libido.

In conclusion, sertraline has good pharmacokinetics and it can treat a lot of diseases, that is why so many doctors prescribe it.

Keywords: Sertraline; Clinical Pharmacokinetics; antidepressant

Discipline: Introduction to Environmental Health

Professor: Hélder Simões, Ana Catarina Lança

Degree: Environmental Health

A 10

Edition 16/21

BIODIVERSITY LOSS AND HUMAN HEALTH

Beatriz Beleza, Beatriz Nazaré, Carolina Corgas, Francisca Medeiros, Rafaela Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

This work, entitled Loss of Biodiversity and Human Health, was requested under the curricular unit of Introduction to Environmental Health, in the Degree of Environmental Health, of the Coimbra Health School. The planet's biodiversity is threatened and the main culprit is the one who, contradictorily, depends most on it: the human being! Some causes of biodiversity loss are: Climate change; habitat destruction; Invasive alien species; Excessive explanation of the natural environment; Agriculture, urban sprawl and pollution. And the consequences are: Species extinction; Human threats; Pest proliferation; Increased CO2 emissions.

Biodiversity is the basis of the planets health and has a direct impact on the lives of all of us, that is, the reduction of biodiversity translates into a future in which food resources will become scarcer. What for humans is worrisome, given that it is a resource on which communities and families depend.

Its preservation is necessary, since it has a direct relationship with causes of infectious diseases. According to scientific studies, deforestation and habitat loss are associated with the appearance of infectious diseases that come from animals. These diseases are also the main causes of biodiversity loss, as it keep wildlife away from the natural environment, which results in the frequency of outbreaks of contagious diseases, such as Ebola, Zika and more recently Covid-19. Biodiversity ensures health and food security as it underlies global nutrition and helps fight disease.

Increased biodiversity rates have been associated with an increase in human health.

After completing the present work, using scientific studies, it is possible to reinforce the idea that we, human beings, lean on biodiversity, since we have direct contact with it, needing its resources. As such, it is right for everyone that we must preserve it so that we can continue to enjoy its benefits.

Keywords: biodiversity, environmental health, human being; contagious diseases;

DEFORESTATION: A PROBLEM OF (FOR) ENVIRONMENTAL HEALTH

Gonçalo Pires, Maria Macedo, Maria Silva, Miguel Pires, Tomás Ladeiras

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The deforestation is one of the most serious environmental problems we are all familiar with and happens due to the need to use products that can be made from a tree such as wood, and the need for spaces for agricultural plantations and for civil construction.
Deforestation is the disappearance of entire forests, a consequence of cutting them down without planting new vegetation, although it is not only characterized by the devastation of forests and natural resources but also by the imbalance that can be caused to the planet, in its various elements, including ecosystems, the economy and society itself. But why does this become a problem for environmental health? Our objective will be to identify how deforestation can and is affecting the human being and the ecosystems around him, helping to increasingly accentuate climate change and ways to calm these effects and reduce deforestation in general. The methodology we used were scientific articles related to the topic and we analyzed graphics in order to relate deforestation to the human being and environmental health.
Thus, we can conclude that a large part of the existing deforestation was, and continues to be caused by us, mainly due to monetary purposes and it affects us seriously, so it is necessary to act on this problem, allowing for a sustainable exploration of this resource.

Keywords: Deforestation, vegetation, sustainable exploration, resource

IMPACT OF GLOBAL WARMING ON HEALTH

Ana Cardoso, Ana Rolo, Beatriz Mesquita, Daniela Alves, Mara Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The theme of climate change is very present in the twenty-first century. It is the biggest threat to global health and to the environment, with enormous profound consequences that encompass many areas of society such as economic areas.

Climate change has always been present throughout earth's history, but not as fast and intense as we see today, nowadays it´s faster and more devastating, the great part being man's fault.

Our study aims to address the impact of climate change on global health, as permafrost melting phenomena occurs with the increasing of the temperature, where bacteria and viruses are sheltered, which pose a threat to global health.

After reviewing different databases, we chose to use some articles from "National Geographic", based on a study of the journal "Nature Communications", where it is verified that the increase in temperature on a global scale is causing the melting of permafrost.

To obtain the results, more than 120 drill holes were distributed around the Arctic and Antarctica, as well as in mountains and high plains around the world.

In brief, climate change, rising temperatures and melting of the permafrost pose a major threat to human life, as the release of these bacteria, viruses and gases has endangered the health and well-being of populations.

Keywords: global warming, permafrost, virus, environment, health

Discipline: Introduction to Environmental Health

Professor: Hélder Simões, Ana Catarina Lança

Degree: Environmental Health

A 13

Edition 16/21

ENVIRONMENTAL HEALTH IN THE AGING POPULATION

Joana Santos, Guilherme Macide, Simão Silva, Pedro Dias, Rodrigo Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

An environment favorable to growing old involves the adaptation of factors like accessibility, security, orientation, privacy and control as much as the environmental functions of support, stimulation and maintenance relatively to the elderly's capacities. That way, environmental stimulation may help prevent or reduce the risk of functional and cognitive decline.

Several factors may contribute to the quality of an elderly person's life, many of which are related to the surrounding environment. According to the UN's projections, in 2050 almost 25% of the global population will be 55 or even older; that implies both the population's aging and environmental changes, two of the main challenges needing approach to insure a safer and sustainable future for all.

Among the environmental factors were examined the ones that directly impacted life quality: housing (comfort, size, global satisfaction with the space), installations, neighborhood (interaction with the neighbors and their behavior), coexistence problems (vandalism, criminality, lack of safety), noise and traffic.

This project was made for the subject of Introduction to Environmental Health with the purpose of explaining more about the relation of environmental health and the older population.

Keywords: Environment, Population, health

Discipline: Introduction to Environmental Health

Professor: Hélder Simões, Ana Catarina Lança

Degree: Environmental Health

A 14

Edition 16/21

CLIMATE CHANGES AND RESPIRATORY DISEASES

Inês Buco, Mariana Regala, Mariana Couto, Laura Moreira, Leonardo Soares

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

INTRODUCTION: Our planet has always been subject to climate change (CAs) in a balanced way. However, the strong industrialization during the industrial revolution, as well as the unsustainable consumption of energy sources led to increased emission of greenhouse gases into the atmosphere, which contributed to global warming, leading to the occurrence of extreme weather events, and promoting the increase in the development of respiratory diseases in populations.

OBJECTIVES: understand the impact that climate change has on populations and its consequences; infer possible strategies that can decrease the vulnerability of populations through the implementation of prevention measures and adaptations to climate change.

METHODOLOGY: In this work, we used articles from the Faculty of Medicine of the University of Coimbra, the news, the article "Evaluation of the relationship between climatic variables and hospitalizations for cardiorespiratory diseases in Juiz de Fora".

RESULTS: The increase in heat wave periods, like, on the other hand, exposure to low temperatures, promotes an increase in the incidence of allergies, asthma, and respiratory infections, and is associated with the increased concentration of atmospheric pollutants and allergens, as well as with the anticipation of pollen phases.

CONCLUSION: In conclusion, and considering our research, climate change has been increasing and is very harmful to the health of the population, essentially, in view of respiratory diseases.

Keywords: Climate change, respiratory diseases, vulnerability

Discipline: Introduction to Environmental Health

Professor: Hélder Simões, Ana Catarina Lança

Degree: Environmental Health

A 15

Edition 16/21

SUSTAINABLE MOBILITY - RESOURCE MANAGEMENT AND POLLUTION

André Rodrigues, Alexandre Carvalho, Diogo Craveiro, Ricardo Anjos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The objective of this work is to mention the problems of population transport in our daily lives and the consequences they may have in the future, as well as the measures that enable sustainable mobility.

Nowadays due to the gradual concentration of population in large cities, there is no doubt that one of the biggest problems is chaotic transit that leads to emissions of carbon dioxide and polluting gases into the atmosphere. Therefore, it is necessary to implement a more effective, less polluting and more functional system in order to provide sustainable mobility.

Sustainable mobility aims to make the most common transport change today, which is largely based on the use of individual transport constantly, which implies high emissions of polluting gases and greater exploitation of natural resources such as oil and other fossil fuels, to less polluting, more economical and more efficient transport, in order to provide a better quality of life for the population and the environment. Some of the measures that fall into this concept are, for example, the call for the use of electric transport as well as the creation of stations for charging them and the call for the use of public transport and non-motor vehicles.

In conclusion, one of the biggest problems for the environment today is emissions of polluting gases, largely caused by urban transport. To try to mitigate this threat to the environment, we must encourage and bet on sustainable mobility, even with small actions of our daily lives such as giving or carpooling, in order to avoid the use of more private transport.

Keywords: Population, Sustainable Mobility, Environment

Discipline: Introduction to Environmental Health

Professor: Hélder Simões, Ana Catarina Lança

Degree: Environmental Health

A 16

Edition 16/21

THE AGING OF WORKERS AND OCCUPATIONAL ACCIDENTS

Ana Rita Rosa, Gustavo Enxuga, Maria Mano, Mariana Duarte

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

In today's Western society, the growth in the number of older workers is increasingly notorious among the working population. This growth stems from increased life expectancy as well as the extension of the retirement age. However, the decline in age affects, in particular, physical skills and, for this reason, these workers will be more susceptible to work accidents. The collection of information on work accidents is important for the study of occupational accidents. Occupational accident is understood to be the accounting of the occurrence of work accidents, thus its study is vital for a better understanding of what allows the adoption of prevention and precautionary measures, as well as providing a periodic control of the results obtained, promoting an improvement in the conditions of safety and health at work.

Objectives: The intention is to illustrate the current context of the theme to be discussed, in this perspective we will address the consequences of the aging of the active population, the importance of its study and its prevention.

Methodology: To show the above objectives we will use data graphs, citations and images related to the theme so that a better understanding of the theme exposed is possible. A literature review was carried out on the subject.

Keywords: Occupational safety and health; occupational accidents; work accidents; ageing of the population

Discipline: Food Sociology

Professor: João Lima, Raquel Oliveira

Degree: Dietetics and Nutrition

A 17

Edition 16/21

HOUSEHOLD ZERO WASTE

Ana Pegado; Andreia Louro; Diana Ferreira; Joana Dias; Rosário Pinheiro; Sofia Carvalho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Food waste at the household level comprises a major component of all the food waste: 1300 million tons/year, around the globe. With a society more consumerism, waste are increasingly pressing issues. Food waste is massive and widespread, and incompatible with the prediction that in 2050 earth will have more than 9 billion inhabitants.

Purpose/Objective: This study's main objectives is to raise awareness and educate society about food waste in the household, to demonstrate effective ways to reduce, or eliminate waste, and to create an understanding of how nutritionists can play a relevant role. The study also aims to investigate about what actions are taking place, regarding the reduction of food waste.

Methodology: A literature review was conducted through a selection of scientific articles researched on several platforms, such as Pubmed, SciELO and Science Direct under the key-words: household food waste, nutritionist paper, Sustainability. The articles were selected by the titles, followed by an analysis of the abstract and, 11 out of 28 articles were chosen.

Conclusions: A sustainable food system can bring benefits to the environment and health sustainability. The use of the hole ingredient, including the parts considered less noble or less attractive, will provide access to the all the nutritional value contained in it. The nutritionists with their training can promote a rapprochement between popular and scientific knowledge, providing changes in the population's eating habits, particularly in consumption behavior, influence the attitude towards domestic food waste.

Keywords: Household food waste; Sustainability; Nutritionist; Challenges; Environmental health

3D FOOD PRINTER: NEW APPROACH FOR FOOD AND NUTRITIONAL INTAKE IN THE FUTURE?

Ana Matilde Cruz; Lara Araújo; Maria Helena Bogas; Vitória João

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The eating habits of the world population have been changing according to the increase of the population, the times lived and with the scarcity of resources in the future. Currently, there is the possibility to customize our food according to our needs and tastes. 3D food printing is a pioneering technology that could enable the manufacture of customized foods through the deposition of nutrients or soft materials obtained by mixing.
Objectives: To analyze the contribution of 3d food printers in the future of food.
Methods: Analysis of articles found in PubMed and Scopus databases using the expressions "feeding in the future"; "3D food printer". We are based on 5 articles to carry out the work, with a time interval of 10 years.
Results: Printing can be used as a treatment for those suffering from nutrition-related problems, improving the nutritional profile of the meal. Thus, this is a technology currently used and will have a much larger range in the future with economic and environmental benefits.
Conclusion: Regardless of what the future awaits us, food in 2050 will always depend on genetic and food engineering. However, the choice of food ingested depends solely on the consumer. This technology is recent, so optimizing print parameters are key factors for successfully creating advanced 3D frameworks in the future.

Keywords: "food in the future"; "3D food printer"

THE ENVIRONMENTAL IMPACT OF MEAT AND THE ROLE OF SOY-MEAL AS A SUSTAINABLE AND HEALTHY ALTERNATIVE

Ana Santos, Beatriz Poças, Guilherme Lúcio, Hugo Pereira, Inês Anselmo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The world population is expected to reach 9.7 billion in 2050, it will be necessary to produce 70% more food. This projection highlights the importance of the environmental impacts of meat production. The Portuguese consume more animal than plant-based foods. The transformation of diets by 2050 will require substantial dietary shifts, global consumption of red meat will have to be reduced by more than 50%.

Objectives: Relate meat consumption to climate change and analyze the environmental performance of soy-meal as a meat substitute.

Methods: Literature review was conducted through Science Diret and SpringerLink databases, using the expressions “Meat environmental impact”, “Meat substitute”, “Population growth”, “Soy meal”. It was obtained nineteen eighty six articles from the last six years. After reading the titles and the abstract, nine articles were selected. Of these, six articles were selected for full reading and analysis.

Results: The livestock sector, which alone accounts for about 18% of total global Greenhouse gas emissions (GHG), presents the food sector's largest GHG impact contribution. Comparing the different meat substitutes, soy-meal is the most sustainable alternative because it has been shown to have the lowest impact on human health, resources and ecosystems.

Conclusion: A diet rich in plant-based foods and with fewer animal source foods confers both improved health and environmental benefits. As an alternative to meat, soy-meal is a more sustainable and healthy option.

Keywords: Meat substitute, meat environmental impact, population growth, soy-meal

THE MEDITERRANEAN DIET FROM THE PRESENT TO THE FUTURE

Mariana Cruz; Mariana Martins; Melânia Vilar; Teresa Alves

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: It is estimated that until 2050 there is going to be an exponential population growth. This will lead to a bigger food production, at least 60%, that in order to be sustainable will implicate a change in eating habits. The current Mediterranean diet already meets some of the needs, but given the adverse conditions of the future, it will have to undergo further changes in order to continue to be considered a healthy and sustainable diet.

Objectives: Analayze how to change the Mediterranean diet based on the current one, taking into account climate conditions and population growth over the next 30 years.

Methods: Literature review was conducted through PubMed and ScienceDirect databases using the expressions “Mediterranean diet” ”sustainable diets”. It was obtained thirteen articles from the last five years. Of these, four articles were selected.

Results: According to the United Nations Sustainable Development Goals, the Mediterranean diet complies with at least 11 out of 17 goals.

The adapted MD has animal-based, sugar-rich foods at the top of the pyramid, which should be eaten less frequently, weekly instead of daily.

A preference for local, seasonal, fresh, minimally processed foods and lower consumption of red meat and bovine is shown, supporting biodiversity and environmentally friendly and traditional foods.

Conclusion: If we don't change our habits, it will be a big risk for us and for the environment. In this way, the countries that have previously adopted this diet should preserve it with the necessary changes, and the remaining countries should also adopt it, but adapting it to their own country-specific contexts and cuisines.

Keywords: “Mediterranean diet” ”sustainable diets”

Discipline: Food Sociology

Professor: João Lima, Raquel Oliveira

Degree: Dietetics and Nutrition

A 21

Edition 16/21

WILL SCIENCE FEED FUTURE POPULATIONS?

Alexandre Agostinho; Ana Beatriz Marques; André Alves; Clara Filipe; Clara Marques

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The population increase predicted up to 2050 has been a worrying factor in terms of food production, sustainability and health.

The evolution of science and technology has enabled humans to create genetically modified foods. Is this the solution to the above problem?

Objectives: To understand if the use/production of genetically modified foods is a healthy solution to address hunger and malnutrition in a sustainable way.

Methods: A literature review was carried out using the RCAAP, DOAJ and Free Medical Journals databases. Twenty-one articles were obtained, in the last ten years, of which eight were selected for full reading and three for concrete use.

Results: Throughout the research and analysis carried out, it was possible to observe the controversy surrounding genetically modified foods.

These are advantageous as they have reduced production costs, require less pesticides and are more resistant. In nutritional terms there is the possibility of improving the quality of food by removing allergens or changing the nutritional profile.

Although the production of genetically modified foods is the target of several studies, and the implementation of several biosafety protocols is mandatory, these negatively affect biodiversity it is not possible to establish a standard regarding the negative effects on the organism.

Conclusions: Genetically modified foods are a possible solution to secure the food needs of the future world population in terms of production; with regard to sustainability, it has a positive and a negative aspect, while in health there is no concrete data.

Keywords: Genetically modified foods; sustainability; health; production.

THE POWER OF INSECTS: POSSIBLE SOLUTION FOR PROPERLY NUTRITION IN THE FUTURE?

Rita Ferreira, Bruna Matos, Guilherme Magalhães, Rafael Mateus

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The modern diet has several issues and it's necessary to make changes so that it's possible to feed all of humanity properly in 2050. Including insects in our diet can help us solve this problem

Objectives: Our goal is to compare a diet where insects are introduced to our food chain, with our present diets, their nutritional values, their advantages and disadvantages.

Methods: Literature review was conducted on PubMed and ScienceDirect, where we searched throughout for the words - insects, diet and nutritional. When we finally came by several articles, we selected seven of them, which are from the last five years.

Results: The introduction of insects in our diet has many advantages. Not only does it have benefits for our health, because insects are rich in micro and macronutrients, which are very important for us, it benefits the environment too, as the production of insects has a minor environmental impact in comparison to other food industries and the economy will also improve. The main challenges to this reality is food security and acceptance of the consumer.

Conclusions: Insects are an excellent nutritional alternative, but there's a great deal of factors that influences the perception of consumers and their acceptance of insects as food. We should try to overcome all stereotypes that people have concerning this diet and educate people about all of its benefits.

Keywords: Insects, sustainability, food, nutritional, diet

AGRICULTURAL BIOTECHNOLOGY NECESSARY APPROACH FOR FOOD TOMORROW?

Afonso Santos; Carlota Almeida; Filipa Rocha; Francisco Panão; Inês Príncipe; Pedro Leandro

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The expectation of reaching 9 billion people in 2050, in addition to the issues of sustainability and global warming, challenge us to increase the food supply. Biotechnologyallow the development ofnew plant varieties, improving the quality of various foods.
Objective: To analyse the contribution of agriculture biotechnology in the development of food production in 2050.
Methods: Literature review was conducted through google scholar databases, using the expression “Agricultural Biotechnology”. Analysis of scientific articles published in the last 5 years that address the topic of biotechnology in agriculture.
Results: Genetic manipulation of food seems to be part of the solution to avoid hunger scenarios across the globe, as transgenic foods may be more nutritious, more resistant to pests and more adaptable to nutrient-poor terrains than conventional ones. While advantages, agriculture biotechnology seems contribute to the increased production per hectare (which lowers energy and water costs); pest control and disease elimination; Another reason for consumers to opt for genetically modified foods is that they have a longer shelf life and, therefore, increase their durability for consumption. However, they could contribute to ecological imbalance; and emergence of new pests with bigger resistance.
Conclusion: Yes, after the analysis carried out we think that agricultural technology canbe na advantage for food production in 2050. This assingment had the objective of analyzing the spread of genetically modified crops in agriculture, which is related to cost reduction, increased productivity and increased efficiency in the administration of pest control.

Keywords: Biotechnology; Agriculture; Food

FOOD SUSTAINABILITY IN SPORTS NUTRITION

António Duarte; Jorge Oliveira; Kevin Lukas; Rui Pinto

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction : Human food has a huge environmental impact, and that is why some food alternatives have been created to reduce this impact. Athletes' diet, which despite having different energy and nutritional needs, also have to be adapted to a sustainable level.
Objectives : Analyse changes to be made in the athletes' diet for 2050, in order to make it sustainable; the implications, advantages and disadvantages that these changes will have;
Methods : Literature review was conducted through B-on and SciELO databases, using the expressions "food sustainability" and "sports nutrition". It was obtained two hundred and five articles between 2016 and 2021. After reading titles and abstracts, fifteen articles were selected. Of these, 4 were selected for full reading.
Results : To make athletes' diets more sustainable, a big step will be to reduce their consumption of red meat and dairy products. Relative to the rest of the population, athletes consume these products excessively, which is extremely harmful to the environment, since their production releases large amounts of methane gas and carbon dioxide into the atmosphere. To mitigate its environmental impact, athletes can opt for other more sustainable protein sources such as poultry meat or vegetable proteins (peas, lentils,...). This change alone would make the athlete's diet more sustainable, without harming their sporting performance.
Conclusion : Despite depending on several changes, in 2050 it will be possible to reconcile the athlete's diet with the sustainability of the planet.

Keywords: sports nutrition; food sustainability

3V, 3 DECADES TO 2050: WAY TO A SUSTAINABLE LIFE

Carolina Lopes; Joana Carvalho; Leonor Afonso; Maria Figueiredo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: With the evolution of society, sustainability of the planet is being compromised and food production is one of the main factors. It's important addressing food and sustainability based on seasonality and locality.
The 3V diet, a french approach links not only nutritional needs, but also environmental concerns: Végétal (plant), Vrai (real) and Varié (varied, if possible organic, local and seasonal).
Objective: The main goal is understand how the adoption of this diet contributes to safeguarding the future of food.
Methodology: Literature review was conducted on PubMed using expressions "food", "seasonality", "sustentainability" with from the last 10 years and 16.182 articles were obtained. Firstly they were selected by the titles and then an abstract analysis was made, only 6 articles being chosen. Lastly, after reading all the articles 3 were selected.
Results: The 3V diet shows that it´s compatible the protection of human health and the sustainability of the food system.
Discussion: With this diet is possible to combine regional, healthy and sustainable diets and adapt 3V diet to traditional specifities, climate, agronomic and socio-economic. Could be applied to 2050 as a healthy and sustainable solution to feed a larger population of different countries, without compromising future generations, as well as their traditional habits. On the other hand, as this diet is based on French standards/studies, there may not be a population's adhesion.
Conclusion: The "3V rule" will allow for greater control over certain diseases, increase years of sustainable life and preserve the sustainability of the food system. Since this diet is so adaptive, it will allow society to preserve its cultural traditions.

Keywords: 3V rule, seasonality, sustentainability, healthy and locality

Discipline: Food Sociology

Professor: João Lima, Raquel Oliveira

Degree: Dietetics and Nutrition

A 26

Edition 16/21

FOOD WASTE

Isabelly Rojas; Maria Leonor Caires; Maria Leonor Pereira; Maria Ribeiro; Marta Marques

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: In 2050,there will be around ten billion people to feed, however, that will be a problem since much of the food that is produced, nowadays, is poorly distributed and about one third of it is wasted. In order to guarantee enough resources to the future generation, we should adopt a sustainable lifestyle and think in better ways to decrease food waste.

Objective: To analyse the impact of food waste, its consequences and the importance of changing our habits until 2050.

Methods: Basing our research on sites like “Pub-Med and B-on”, using keywords like “ food waste statistics” and “ food waste in 2050” we were able to reach such results. We found thirteen pertinent articles about the past five years and selected them based on their title. From these thirteen, five were chosen because of their relevance.

Results: Food waste comes from three main behaviours: over preparation, excessive purchase, and inappropriate conservation. By wasting food, we waste all the resources used in the production and transport of food (such as land, water and fuel) threatening future generation’s survival. Therefore, there must be a change in both consumers and retailers’ habits, especially in the five principal food supply’s phases: production, post-harvest, processing, retail and consumption stages.

Conclusion: Even though there’s enough food to feed everyone in the world, a huge amount of it is poorly wasted. If we don’t take any measures now, in 2050, there won’t be enough resources to assure everyone’s needs.

Keywords: Food waste; food waste statistics; food waste in 2050; sustainability

Discipline: Oncobiology

Professor: Fernando Mendes, Diana Martins

Degree: Biomedical Laboratory Sciences

A 27

Edition 16/21

PANCREATIC CANCER

Monteiro Ana Raquel, Santos Ana Rita, Silva Ana Rita, Louçano Beatriz

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Pancreatic cancer is one of the deadliest malignant neoplasms in the world. In 2020, 466,003 deaths were registered worldwide, with the estimated 5-year survival rate being around 5%. The highest incidence was registered in East Asia. Its high mortality is explained by its pathophysiology and difficulty in early diagnosis.Environmental risk factors include smoking, diabetes mellitus, obesity, processed meats, and chronic pancreatitis.

There are many subtypes of pancreatic cancer, however pancreatic ductal invasive carcinoma (PDAC) comprises 85,8% of cases while other subtypes comprise only 14,2%. Given this fact its tumorigenesis it's well described, especially its progression from a microscopic precursor lesion to invasive carcinoma.

The genetic basis of pancreatic cancer is complex and heterogeneous. This type of cancer might result from acquired somatic mutations in key genes like: oncogenes, tumor suppressor genes, cell cycle genes, DNA maintenance genes and apoptosis; they can also be the result of inherited germline defects. It is believed that in a lot of cases there is a strong genetic predisposition.

There are several techniques that might help establish an early diagnosis, for instance: computed tomography, magnetic resonance imaging, endoscopic ultrasound, endoscopic retrograde cholangiopancreatography.

Treatment options are still very scarce and dependent on the stage of the cancer. In early stages, surgical resection might be a possibility. However advanced stages are oftentimes inoperable and only treated with chemotherapy and sometimes radiotherapy. The use of PARP-1 inhibitors has been showing promising results in individuals with germline mutations in BRCA1/BRCA2, mutations seen in hereditary pancreatic cancer.

Keywords: Pancreatic cancer, PDAC, mortality rate, incidence, computed tomography, subtypes, precursor lesion, mutations

KIDNEY CANCER

Lígia Melo; Luana Martinho; Mafalda Maniés; Magda Chantre

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Renal cell carcinoma (RCC) represents approximately 80% of kidney tumours. The most common subtypes are clear cell (ccRCC), papillary RCC (PRC) and chromophobe RCC with the highest incidence in the Czech Republic.

The kidney cancer diagnosis involves clinical exams of blood and urine, for more accurate staging there's ultrasound and contrast-enhanced chest, abdominal and pelvic computerized tomography scan and renal tumour core biopsy that allows histopathological diagnosis, tumour type identification and staging.

Genetically, RCC can be caused by different dysregulated pathways, giving origin to different tumour subtypes, each one with different histological characteristics. Mutations in the Von Hippel-Lindau (VHL) tumour suppressor gene increase the risk of ccRCC and are directly connected with the loss of the VHL/HIF oxygen-sensing pathway, stimulating hypoxia responses. A higher stimulation of the PI3K/AKT/mTOR pathway can also be associated with hereditary (HPRC) due to activating mutations of MET oncogene that leads to the stimulation of pathways related to cell proliferation and survival. Anomalies in Krebs cycle metabolism caused by loss of fumarate hydratase can also conduct dysregulations in gene expression and affect stress oxidative sensing pathways. Studying and understanding these and other mutations is advantageous because it allows them to eventually become therapeutic targets. For example, mTOR pathways inhibitors such as everolimus or temsirolimus target the tyrosine kinase domain of MET. Other treatments include checkpoints inhibitors such as Programme Death-1 and cytotoxic T-lymphocyte-associated protein 4.

Keywords: Kidney cancer; RCC; VHL/HIF oxygen-sensing pathway; CT scan; MET mutations.

MELANOMA

Gonçalo Alves, Inês Pina, Josiane Andrade, Juliana Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Melanoma is the most aggressive and skin tumour that derives from melanocytes alteration. Is one of the most frequent cancers in light-skinned populations, accounting for 75% of deaths associated with skin cancer. Its diagnosis at an early stage is essential, as it can be treated by surgical excision increasing survival.

Several risk factors may lead to the development of melanoma, including gender, UV exposure, age, number of melanocytic nevi, and family history. So, it is important to appeal for its prevention, through awareness campaigns for the use of sunscreen and avoiding exposure to UV lights.

Dermoscopy has increased the accuracy of its detection since it allows visualization of the first signs of the disease, which are visible in pigmented lesions long before clinical changes. However, immunohistochemistry has become an increasingly important tool in its diagnosis. It uses two main types of biomarkers: melanocyte markers (Melan-A, S100, HMB-45) and proliferation markers (Ki-67).

Genetically, this cancer is highly heterogeneous. There are several molecular pathways involved in tumour proliferation and invasion. The BRAF gene is the most frequently mutated, however, there may be other significant genetic alterations, such as mutations in the biomarkers NRAS, C-KIT, and NF1. These mutations lead to abnormal activation of two main signalling pathways: mitogenactivated protein kinase (MAPK) and phosphoinositol-3-kinase (PI3K/AKT). The constitutive activation of these pathways leads to uncontrolled cell proliferation.

Currently, the most effective treatment options involve the use of targeted therapies such as vemurafenib, dabrafenib, and encorafenib and the use of immunotherapies.

Keywords: Melanoma, MAPK, PI3K/AKT, *BRAF* Gene, Treatment

LYNCH SYNDROME

Daniela Pereira, Diogo Carregã, Filipe Fadigas, Francisco Morais

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Lynch Syndrome (LS) is commonly known as hereditary non-polyposis colorectal cancer and consists of an inherited cancer syndrome that predisposes to the development of distinct cancer types. LS prevalence in the general population is up to 0.35% (1:279). In addition, it is known that LS accounts for 3% (1:35) of all colorectal cancer cases and approximately 1.8% (1:56) of endometrial cancer cases. LS's aetiology resides in pathogenic genetic alterations in a DNA mismatch repair (MMR) gene (MLH1, MSH2, MSH6 and PMS2) or the *EPCAM* gene.

Patients with LS typically present with symptoms commonly associated with colorectal and endometrial cancers, such as constipation, weight loss, vaginal bleeding, and abdominal pain. The pathophysiology of this syndrome derives from a mutation in one of the DNA mismatch repair system genes, contributing towards an increased predisposition to genetic mutations within the cell. This system, being impaired, also contributes to lower susceptibility to apoptosis, once DNA damage detection is compromised and so the cell can persist and proliferate, even if it has several accumulated mutations in its DNA.

LS's screening can be done through immunohistochemistry, with the intent of identifying a lacking *MMR* gene protein. The treatment, depending on the tumour, is usually done through surgery, chemotherapy or, as of late, the promising immune check point inhibitors.

Keywords: Lynch Syndrome; Colorectal Cancer; Endometrial Cancer; *MMR* Genes; Mutation.

IMMUNOTHERAPY IN CANCER

Alexandre Pimentel; Ana Beatriz Filipe, Ana Catarina Ferreira, Ana Laura Ramos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Immunotherapy is a treatment that uses the individual's immune system to fight a tumour, utilizing substances that stimulate the organism's defence mechanisms. The immune system plays an important role in the immunological surveillance antitumoral response, but it's also closely linked to initiating and progressing tumours. This process is called cancer immunoediting, consisting of three stages: elimination, equilibrium, and escape.

Different types of immunotherapies have distinctive acting pathways helping the immune system stop or slow the growth of cancer cells. Others destroying cancer cells or stopping cancer from spreading to other parts of the body. Immunotherapy can be used alone or combined with other cancer treatments.

Specific treatments are: immune checkpoint blockades (PD1/PDL1 blocking and CTL A4 inhibition); co-stimulatory receptor agonists; oncolytic virus therapy; T cell therapy (T CAR cells); cancer vaccines (tumour cell lysate, dendritic cells, nucleic acids (such as mRNA) or neo-antigens); cytokines: interferon (IFNα- high-risk melanoma and hairy cell leukemia), interleukins (advanced melanoma and metastatic renal cancer) and granulocyte–macrophage colony-stimulating factor (GM-CSF).

In immunotherapy, we can observe side effects of the immune system's reaction against normal organism cells, like autoimmunity symptoms. These can affect different organs, such as the skin (rash, dryness), intestine (diarrhoea, colitis), liver (through hepatitises), endocrine organs (such as thyroid, causing hyperthyroidism, or hypophysis, causing hypophysitis), among others.

These immunotherapies, specifically immune checkpoint blockades are being used more frequently in Portugal.

Keywords: Immunotherapy; Cancer; Immune System; Autoimmunity symptoms.

ANGIOSARCOMA

Daniela Cerqueira, Renata Castanheira, Sara Figueiredo, Stephanie Fortes

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Angiosarcoma (AS) is a rare, aggressive, malignant tumour, originating from the endothelial cells of blood or lymphatic vessels. Accounting for 2% of all soft-tissue sarcomas (STS), AS can occur at any age, being more common in older individuals, with no gender tendency. It can be divided into primary (cutaneous, parenchymal tissue/visceral and deep soft tissue) and secondary (lymphoedema-associated and post-radiation) angiosarcomas.

There are well-established risk factors linked to the development of AS and the two most common are chronic lymphoedema and radiation exposure.

Angiosarcoma diagnosis involves the imaging and radiological scans observation, followed by pathological and immunohistochemical confirmation. Immunohistochemistry analysis reports the expression of markers typical for vascular endothelium (CD31, CD34, and von Willebrand factor) and lymphatic endothelium (D2-40). No lab abnormality specifically points towards a diagnosis of AS. Sequencing reveals mutations in angiogenesis pathways, particularly in vascular endothelial growth factor (VEGF) and mitogen-activated protein kinase (MAPK) signalling pathways.

Treatment is challenging as the infiltrative nature of AS leads to frequent local and metastatic recurrences. Current options, according to the organ affected, include surgery, radiotherapy and chemotherapy. The outcome varies widely and is affected by tumour type, size, location and resectability. In addition, targeted medicines and immunotherapy have been studied as promising treatments for angiosarcoma.

The management of AS requires a multidisciplinary approach, but its multifocality along with the tendency towards early dissemination makes it difficult or impossible to control.

Keywords: Angiosarcoma, risk factors, oncogenic pathways, treatment

GLIOBLASTOMA

Catarina Santos, Catarina Rosete, Cátia Azevedo e Cláudia Furtado

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Glioblastoma is the most common primary malignant brain tumour and an aggressive diffuse sporadic glioma of astrocytic lineage. Accounts for 54% of brain gliomas with an incidence of 3.19 per 100.000, prevailing around 50 years old caucasian man.

Initial diagnosis includes magnetic resonance imaging scan or computed tomography which determinates the volume of the various tumour sub-regions. The tumour subtype is determined by biopsy or surgical resection to identify molecular markers becoming an important mark to develop specific therapies.

According to 2021 WHO classification, these tumours are divided into 3 main groups, defined by their isocitrate dehydrogenase (IDH) status: Glioblastoma, IDH-wildtype; Astrocytoma, IDH-mutant; Oligodendroglioma, IDH-mutant, and 1p/19q-codeleted.

The Glioblastoma occurs in 90% of cases, characterized by the absence of IDH mutation, TERT promotor mutation, EGFR amplification, the gain of entire chromosome 7 and loss of entire 10q chromosome. Furthermore, Astrocytoma represents the other 10% of cases, where IDH1 or IDH2 mutation emerges as well as TP53, ATRX and CDKN2A/B mutations. In addition, the Oligodendroglioma represents 3% of the cases of all primary central nervous system malignancies, based on IDH1 or IDH2 mutation and 1p/19q codeletion.

Prognosis remains associated with different types of glioblastomas and their genetic expressions and therapies. The determinants to treat this type of tumour depends on the patient's general conditions. Maximal surgical resection followed by radiation combined with an oral alkylating chemotherapy agent – temozolomide, it's the standard treatment in cases of MGMT methylation, a promoter that has strong prognostic factor in the therapy of IDH mutant groups.

Keywords: Glioblastoma, brain tumour, IDH, Astrocytoma, Oligodendroglioma, temozolomide

OESOPHAGUS CANCER

Maria Carolina Faria; Maria Gaspar; Maria Vale; Maria Vieira; Mariana Freire

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Oesophageal cancer ranks seventh in terms of incidence and sixth in mortality. It presents a greater proportion of cancer mortality than incidence since it's rarely diagnosed before it has advanced or metastasized. Most cases occur in men and general rates are higher in developed countries, with the highest incidence rates in Eastern Asia.

The two most common histologic subtypes are oesophageal squamous cell carcinoma (OSCC), more common, and oesophageal adenocarcinoma (OAC). The key risk factors for OAC are excess body weight, gastroesophageal reflux disease and Barret's oesophagus, and for OSCC the major risk factors are heavy drinking and smoking, in high-income countries, and dietary components such as nutritional deficiencies in lower-income countries.

OSCC and OAC should be considered as different disease entities, because the genomic, transcriptomic, and epigenetic changes identified in each cancer reflect divergent aetiologies and tissues of origin.

Screening methods involve cell collection devices, such as cytosponge, quantification of circulating molecular markers and volatiles detected in breath. Concerning diagnosis, the golden standard is conventional endoscopy biopsy.

There are several approaches for oesophageal cancer treatment based on staging, such as preoperative and postoperative chemotherapy (CHT)/chemoradiotherapy, surgical and endoscopic resection and palliative CHT. Target therapy has been undergoing clinical trials with trastuzumab and ramucirumab already being used in patients that overexpress Human Epidermal growth factor Receptor 2 and vascular endothelial growth factor Receptor, respectively.

Keywords: Oesophageal cancer; Oesophageal squamous cell carcinoma; Oesophageal adenocarcinoma; Barret's oesophagus; Trastuzumab

Discipline: Oncobiology

Professor: Fernando Mendes, Diana Martins

Degree: Biomedical Laboratory Sciences

A 35

Edition 16/21

LIVER CANCER

Mariana Pires; Martim Ferreira; Matilde Cadima; Micaela Dias

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Liver cancer comprises a heterogeneous group of malignant tumours with distinct histological features and an unfavourable prognosis. It is the second deadliest and sixth most common cancer. The most relevant primary liver cancers include hepatocellular carcinoma (HCC), approximately 75%, and intrahepatic cholangiocarcinoma (iCCA), approximately 6%.

Risk factors for HCC include chronic hepatitis B and hepatitis C, metabolic liver disease, alcohol addiction and exposure to dietary toxins. The development of HCC is the result of long-term accumulation of gene mutations. Molecular anomalies in the *TERT* promoter, *TP53, ARID1A, CDKN2A, CTNNB1, AXIN1* and *CCND1* genes are the most common. PTEN loss at the protein level is also frequent.

Later studies have shown that hepatic progenitor cells, their intermediate states, or dedifferentiated hepatocytes can originate HCC and iCCA with progenitor-like features or even mixed HCC-iCCA such as cholangiolocellular carcinomas (CLC), which is a very rare case of both HCC and iCCA features in one single tumour. Mature hepatocytes can also be transdifferentiated into biliary epithelial-like cells and take part in iCCA development.

Sorafenib is the first targeted therapy for advanced HCC treatment in cases of relatively preserved liver function. The interactions between PD-1 and its ligands, PD-L1 and PD-L2, are a major pathway of immune suppression within the tumour microenvironment. PD-L1 overexpression has been associated with tumour aggressiveness and postoperative recurrence in HCC patients.

Recently, exosomes have been regarded as potential targets of HCC. These extracellular vesicles are responsible for the secretion and activation of some molecular markers.

Keywords: Liver cancer; HCC; iCCA; exosomes; treatment

THE WATER FOOTPRINT AND THE GREEN, GRAY AND BLUE WATER CONCEPT

Fernando Sousa; Gonçalo Martins; Hélder Pereira; Mariana Machado; Renato Palricas

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Water is fundamental to the planet. The first forms of life appeared in it, and from these, terrestrial forms originated, which only managed to survive to the extent that they were able to develop physiological mechanisms that allowed them to take water from the environment and retain it. The evolution of living beings has always depended on water; however, its pollution and contamination has risen substantially, compromising present and future generations and all micro-organisms on the planet.

With this work, we intend to understand the behaviour of the population in order to reduce the water footprint, and mainly, the knowledge they have about the concept of green, grey and blue water. For this purpose, a questionnaire was carried out to the general population with the participation of 147 people and a bibliographical research.

Of the population studied, 91% assume not to have knowledge about the blue, green and grey water footprint. As such, 67.3% does not know how to define blue water footprint, 69.4% admits not knowing the concept of grey water footprint and 68.7% does not master the meaning of green water footprint. Of the 147 respondents 19.7% correctly defined grey water footprint, 21.1% blue water footprint and 15.6% green water footprint. Concerning the association of words with the respective type of footprint colour, on average 68% answered 'Don't know', with a small proportion, about 20%, relating it correctly.

We conclude that there is a clear lack of knowledge of the population about the green, blue and grey water footprint. Thus, we report the need for awareness-raising actions to demonstrate and explain to society the definition and implications of the three water footprints in our health, in order to encourage the entire population to change and improve their daily lives, reinforcing the importance of saving and preserving water, a truly essential asset to all.

Keywords: Water Footprint, Grey Water Footprint, Blue Water Footprint, Green Water Footprint, Health

POLLUTION AND WATER CONTAMINATION

João Daniel; Ricardo Marques; Tiago Barbosa

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Water is an essential commodity for life and must be used properly to ensure that future generations have access to it and with good quality. Water pollution is the introduction by man, directly or indirectly, of substances or energy into the marine environment, resulting in negative effects such as damage to living resources, hazards to human health, and obstacles to marine activities.

With this work we intend to evaluate the level of knowledge of the surveyed population about water pollution and contamination, and to raise awareness about the importance of preserving water.

To carry out this study, we resorted to a bibliographic research on the theme and to the application of a survey to the Portuguese population.

From the results obtained from the evaluation of the population's level of knowledge about "Water Pollution and Contamination", where 112 answers were obtained, we concluded that most respondents have good practices regarding the non-pollution of water (83.9%) and that all respondents agree that water pollution and contamination are a harmful factor for public health. Interestingly, only 34.8% of the respondents know the role of an Environmental Health Technician (EHT) in preventing water pollution and contamination.

In summary, we see that there is a need to raise awareness among the population in order to improve their attitudes towards preserving water quality. Given the importance of water for all beings on this planet, there are attitudes that can/should be improved, such as recycling oil, not throwing garbage on the ground or directly into the water, not pouring chemicals into the

Keywords: Contamination, Pollution, Public Health, Water, Preservation

RADIOACTIVE WATERS

Beatriz Fonseca; Bernardo Fontinha; Daniela Leitão; Mafalda Póvoa

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Water is essential for the planet. It is a natural resource, exhaustible and indispensable to life, which has been used in an excessive and consumerist way.
In this radioactive water, the radionuclides present in high concentrations are those of the uranium and thorium family. Deep aquifers come into contact with high concentrations of uranium, radium and radon (radioactive elements), which are presente in rocks and ground.
This work aims to expose and analyze the Annual Report accomplished by the Regulatory Authority for Water and Waste Services, in Portugal, and to analyze the presence of radionuclides in water, in Fukushima, in relation to radioactive water for human consumption, based on a literature review.
In relation to radioactivity, the achievement of percentages of compliance with the parametric values of the indicative dose of 99% stands out positively, although radon presents a compliance with the parametric values of 96,59%. It appears that Portugal has excelente levels of water quality for human consumption.
In Fukushima, after implementing contaminated water management measures, the amount of contaminated water generated in 2020 decreased to around 140 m3/dia and we can see that Tritium exceeded the target of 1 500 Bq/L and didn't meet the maximum values accepted by the World Health Organization of 10 000 Bq/L.
Through this study, we conclude that despite changes in the analyzed parameters and radioactive elements that the water that reaches our taps continues to be of good quality.

Keywords: Safe Water, Radioactivity, Radionuclides, Parameters, Radioactive waters

WASTE OF WATER CASE STUDY OF AN AUTARCHY OF THE CENTRAL ZONE OF PORTUGAL

Ana Cruz; Carolina Tavares; Íris Milheiro; Joana Teixeira; Mariana Santos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Definitely, water is vital to any activity, so its availability is a human right, which must be guaranteed for the use of the entire population. It is important to mention the wide range of international treaties related to the right to water, as well as their regulations and laws governing it.

This work aimed to evaluate the measures implemented by a local authority in the central area to combat water waste. Therefore, an interview was conducted with a person responsible for the water area. Several issues related to the measures implemented by the municipality on the subject and what kind of awareness is made to the population were addressed.

Although the municipality implements measures to combat this theme and raise awareness among the population, this does not seem to be sensitised because there is disinterest on the part of citizens. The lack of data on the waste of water by the municipality (hydrographic registration), is a reason that leads to this cause.

Keywords: Water, Waste, Autarchy, Awareness, Prevention

WATER USE IN NUCLEAR POWER PLANTS AND ITS CONSEQUENCES

Bianca Fontes

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The use of water by human society aims to meet its various needs. One of the sectors that takes advantage of the characteristics of water is nuclear energy. Water is fundamental for the production of electrical energy, as are radioactive materials. The purpose of this paper is to expose the use of water resources in the production of energy in nuclear power plants.
Through a bibliographic review, information was gathered in order to highlight some of the processes that it goes through, its treatment, and the industry's risk activities.
A nuclear power plant is an industrial facility built with the purpose of applying the principle of nuclear fission in materials with radioactive characteristics in order to produce electricity. Although the electrical energy produced in the plants has the least environmental impact, its production also generates the so-called "nuclear waste". The most common way of managing this "waste" is storage in tanks, but there are some cases such as Lake Karachay that prove to be a danger to the environment. Also inserted in the subject of water contamination by radioactive products, we have the 2011 accident at the Fukushima plant, responsible for the contamination of water in much of the Asian coast. As the industry grew, Offshore Nuclear Power Plants emerged as safer alternatives for producing energy through radioactivity.
Nuclear energy is not one of the most polluting forms of energy production, but it is a risk factor for water safety.

Keywords: Water, Nuclear Plant, Energy, Contamination, Safety

WATER FOOTPRINT

Jéssica Oliveira; João Maurício; Rute Costa; Tatiana Dias; Vanessa Cardoso

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Water is a natural resource, essential to life. Although it's a renewable resource, water, as we need, is a limited and increasingly scarce good. In 2002, the concept of water footprint emerged as a relative indicator of water consumption, aiming to account the amount of water used in goods and services consumed by individuals.

This work aims to calculate the water footprint of each individual, assess whether there's a good water management and where the population wastes more water. The preparation of this work included the review of literature on the subject and the application of a questionnaire, prepared by the Portuguese Water Resources Association.

It was found that of the 97 responses obtained, about 62% of respondents wash the dishes under running water. Washing the dishes by hand with the tap running results in a consumption of 150 liters and with the tap closed 30 liters are spent, however, when using an efficient dishwasher (full load) only 12 liters are spent, representing a great saving of water.

To manufacture a single cotton t-shirt represents 2700 liters of water. Since 52% buy up to 5 T-shirts per year we are in the presence of a water use of more than 13,000 liters.

The results show that good practices are not instilled in the population and that saving water isn't something automatic and effective, since 87% of people have a high Water Footprint. There's an urgent need to automate small gestures, which can make a difference! There is no Planet B!

Keywords: Water Footprint; Water; Consumption; Sustainability; Water Scarcity

WATER FROM THE PUBLIC SUPPLY SYSTEM - THE LEVEL OF CONSUMER CONFIDENCE

Ana Gomes; Ana Vitorino, Diogo Doutor; Paula Bagrin

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Water is essential to life, so it must be accessible to the community, and present conditions of potability such as being wholesome, clean and free of any danger to public health. About 70% of the surface of the planet Earth is covered by water, but of this only 1% is available for human use. According to the World Health Organization, in 2015 about 663 million people do not have access to safe drinking water on a sustainable basis and 2.4 billion do not have integrated sanitation systems. With this work, we intend to determine the level of confidence that consumers have regarding the water that comes to them for consumption from the public supply system, as well as to identify situations of risk that may exist. A bibliographic research on the subject was done and a questionnaire was applied to the Portuguese population. It was found that 63.8% of respondents consider that the water that comes from the supply is of good quality, but 68.6% know where it comes from. Of the respondents 77.1% do not know that they can become contaminated when consuming tap water, thus representing more than half of the surveyed population. Of the 22.9% who know that water can be contaminated, all gave examples of pathologies: cholera, typhoid, legionella, diarrhea, hepatitis, and gastroenteritis. We thus conclude that the water coming from the country's public supply system is of good quality despite people's lack of information about its treatment and potability.

Keywords: Human Consumption, Essential Good, Life, Drinking Water

Discipline: Water Quality Management I

Professor: Cristina Santos

Degree: Environmental Health

A 43

Edition 16/21

HIDRAULIC ORIGIN DISEASES

Elisa Cordones; Felipe Macedo; Lara Sofia

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Water has a direct influence on health, quality of life, and the development of human beings; these conditions can be summarized in three key words: quality, quantity, continuity.

This work focuses on the presentation of the main water-borne diseases and an analysis of their incidence globally, and specifically in Brazil. For its realization, a bibliographic research of several articles and reliable websites was carried out, allusive to these diseases.

The diseases that are most associated with the lack of basic sanitation (cause of poor water quality) are typhoid fever, cholera, and malaria. Polluted water is water that has modifications in its physical and chemical characteristics. Once contaminated, the water requires specialized treatment so that consumers can enjoy it without being exposed to the risk of contracting any of the diseases presented.

The epidemiological data presented for Brazil have a positive evolution, because the Brazilian Ministry of Health has created a set of actions that provided the knowledge and detection of any change in the determining and conditioning factors of the environment that interfere with human health, which has the purpose of adopting prevention and control measures of the risk factors for these diseases.

Through analysis, we can see that on underdeveloped continents, with greater population density, there is a greater deficit in terms of water treatment, since the necessary care is not taken to ensure that it is properly treated and then consumed.

Keywords: Water, Health, Quality, Waterborne Diseases, Treatment

Discipline: Organization, Management and Quality in Pharmacy

Professor: Rui Cruz

Degree: Pharmacy

A 44

Edition 16/21

ECONOMIC MANAGEMENT OF DRUGS STOCKS AT HOSPITAL PHARMACY: QUALITY INDICATORS

Ana Rita Oliveira, Joana Julião, Nuno Vidal, Rosa Ferreira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Hospitals under financial pressure may have difficulties in maintaining the quality and safety of users, as well as having worse results compared to well-funded hospitals. One third of medication errors that cause negative consequences for hospitalized patients occur in the drug preparation phase. These medication errors are common, serious and costly. As such, the medication preparation process is vulnerable and conducive to error. In order to monitor, evaluate and improve the quality and safety of this process, quality indicators can be used.

To analyze the quality indicators related to the structure, process and result for a safe hospital preparation.

We conducted a research in PubMed database to selected articles from 2004 to 2019.

It is important to make use of reliable and valid quality indicators based on clear definitions, since these are used for quality assessment, to ensure internal and external transparency. Its existence allows quantifying productivity, referring to structure, process and results.

Regarding the structure, the management of safety and introductory principles and the availability of medications that may cause suffering to the patient were evaluated.

With regard to the process, the verification of prescriptions was evaluated; the selection, search, and distribution of drugs; production and preparation procedures; chemotherapy protocols and relevant medication documentation relates to clinical information.

Concerning the results, reference is made to adverse events such as medication-related incidents and deaths associated with them; pharmaceutical clinical services and ensuring patient quality and safety; education and participation in clinical trials.

Defining these quality indicators is the first step to evaluate the performance and quality of hospital pharmacy. Future developments of these indicators should focus more on aspects such as specific quality indicators in the critical phase of drug preparation and administration.

Keywords: quality indicators, hospital pharmacy, management

PARENTERAL NUTRITION IN GERIATRICS AGE

Beatriz Arede, Ecaterina Fuior, Fátima Granja, João Monteiro

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Parenteral nutrition offers the possibility to increase or guarantee nutrient ingestion in patients when normal food intake is inadequate and enteral nutrition is not feasible. According to data from 2015/2016, the prevalence of malnutrition in the elderly is 16.1%.

The indication of this type of nutrition can also be done for the short term (Partial parenteral nutrition), when it is done for up to 1 month, or for the long term (Total Parenteral Nutrition), depending about the situation of each person: multiple surgery, pancreatitis or severe inflammatory bowel disease, severe Crohn's disease, bone marrow, transplant blood diseases, cancer, removal of a large part of the small intestine, kidney or liver failure affecting the intestine

The main objective is to understand the needs and prevalence of parenteral nutrition in the geriatric area.

This review used the scientific databases Google Scholar, Pubmed, and other health ites. We used 4 documents between 2015 - 2021, with the keywords: “parenteral nutrition”, “geriatrics”, “pathology”.

We found several clinical aspects of parenteral nutrition in geriatric patients, like the calculation of recommended nutritional values starts from the calculation of the total fluid required in 24 hours (30 to 40 ml/kg/day). This caloric calculation is set out in 4 main ways. Carbohydrates: should correspond to 30 to 70% of the recommended daily value. Proteins: must correspond to 15 to 20% of the recommended daily value. Lipids: must correspond to 20 to 50% of the recommended daily value. Electrolytes and micronutrients: They can be administered in solution or individually.

The geriatric patients must receive a set of nutrients to ensure that their physiological needs are met, regardless of whether they have a disease or are just malnutritioned to contribute for the reduction of chronic diseases and, consequently, promote healthy and active aging.

Keywords: Parenteral nutrition, geriatrics, pathology

SAFETY AND AUTOMATION CONTROL IN HOSPITAL PHARMACY

Catarina Almeida, Isabel Calai, Jéssica Neves

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Background: The automation of the Hospital Pharmacy was a turning point in terms of safety and control of the medication circuit. Automation allows the reduction of human error, by assisting the management and optimisation of processes from prescription, through dispensing to the administration of medication.

Objectives: The purpose is to address the safety and control of automation and robotic systems used in Hospital Pharmacy with the aim of reducing errors and assisting in the dispensing of medicines.

Materials & Methods: We conducted a library research of articles and in databases such as PubMed and Google Scholar. We use the keywords: "automation", "hospital pharmacy", "safety" and "technologies" to selected articles from the year 2014 to the present.

Results: In order to guarantee the safety and control of the medication circuit, it is necessary to have a balance between health professionals and information systems and automatic control of medicines. With the growing number and variety of medicines used in hospitals, it has become unthinkable to manage them manually and distribute them, so new automation technologies have been implemented. Some examples of automation in pharmacy are: Pharmacy Bar Coding, Inventory Management Carousel (Kardex), Automated Dispensing Cabinets (Pyxis) and Fast Distribution System (FDS).1;3

Conclusion: We conclude that automation in the Hospital Pharmacy is an asset for better stock management, shorter waiting times, fewer errors in the medication circuit and increased safety, as long as it is used by properly qualified health professionals, never forgetting the possibility of possible technological errors, with constant checking and vigilance being required. 3

Keywords: Automation, Hospital Pharmacy, Safety, Technologies

PHARMACY QUALITY SERVICES

Catarina Sequeira, Mariana Maia, Patrícia Manso

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Quality services can cover several areas of pharmacy, such as hospital pharmacy, community pharmacy, industrial, research, among others. We will address quality services in community pharmacy, since in this area we can talk about the various topics of the topic under study, and this is the only one that directly relates to the user. The ultimate goal is for the community pharmacy to be properly recognized as a provider not only of products but also of professional pharmacy services. Identify quality services in community pharmacy.

We conducted a research in databases such as PubMed and Google Scholar. We use the keywords: "Quality Services"; "Community Pharmacy"; "Health Professionals"; "Management", to selected 5 articles from 2009 to 2015.

In the community pharmacy the quality is related to 3 main factors: Health Professionals, Management and Equipment. Regarding professionals, they must have good qualifications so that the pharmaceutical services provided are of quality. As this area is constantly being updated, professionals will have to be able to keep up with this evolution, so that they are qualified to carry out their role.

In management area, it is necessary to effectively plan organizational processes and implement quality programs aimed at productivity. Its purpose is to guarantee the quality of care provided to the user, through the safe and rational use of medicines and health products, with regard to individual and collective health. A factor that also influences the quality of pharmaceutical services is the equipment used and available in a pharmacy. There are more up-to-date establishments, with robotic services that facilitate and reduce the time spent in the service process.

Critically evaluating our performance and continually looking for ways to improve the quality of care will not only help us to be better healthcare professionals, but will also benefit our clients and society.

Keywords: "Quality Services"; "Community Pharmacy"; "Health Professionals"; "Management"

COST OF DRUGS USED IN CANCER TREATMENT IN PORTUGAL

Ana Almeida, Ana Mota, Catarina Afonso, Renata Rodrigues

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Background: Currently, cancer is the second leading cause of death in Portugal, with breast cancer being one of the most prevalent.
In 2006 it was found that 565 000 000€ were spent on cancer treatment in Portugal, representing 3.91% of total health expenditures. In that year, on average, for cancer in general 53 000 000€ per person was spent, while breast cancer was found to be spent on average 6 600 000€ per year.
Objectives: The main objective of this study is to estimate the cost of cancer in Portugal, more specifically breast cancer, as well as the cost of medicines used in the treatment.
Materials & Methods: We conducted a library research of articles and in databases such as PubMed and Google Scholar. We use the keywords: "treatment"; "cancer"; "Trastuzumab" to selected articles from the year 2006 to the present.
Results: The estimated costs, taking into account the different stages, were 26417€ in stage I, 34948€ in stage II, 51394€ in stage III and 55199€ in stage IV.
When we divide total drug expenditures by therapeutic area, cancer medicines account for about 5.6% and accounted for 32% of the total expenditures related to it.
As an example of a medicine used to treat breast cancer we highlight Trastuzumab, with a total cost of 81598€.
Conclusion: It is concluded that the cost of cancer treatment depends on several factors, such as the type of cancer, its stage and the presence of metastases. Although it is a disease that carries high costs it is essential to resort to drugs, since there is a significant increase of years and life quality.

Keywords: treatment; breast cancer; Trastuzumab

MEDICATION ERRORS

Diogo Castro, Nuno Vasconcelos, Rafael Macedo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: Medication errors (ME) are preventable events with the possibility of causing harm to the patient. These might be reversible or not. ME in pediatrics consists in avoiding all the events capable of harming the patient when under the responsibility of health professionals and that may occur during the medicine circuit. It is in pediatric patients that exist an higher incidence of their physiological and behavioral characteristics.

Objetive: Understand how to avoid and fight back ME and comprehend the evolution throughout several countries, including Portugal.

Results: In 2012 a study was carried out in which measures were introduced in order to reduce the number of ME in hospitals.

Regarding the USA, which is the country with more medical prescriptions in pediatrics and, consequently, more ME, a study was also carried out to reduce those same errors. A system was implemented in which all drugs, with a short therapeutic action window, were replaced by less specific drugs, but with a broader therapeutic window. Finally, since 2016 in Portugal, electronic medical prescription became mandatory. With the goal to reduce prescription errors, at every level. This also reduced the number of drug thefts by around 80%, thus ensuring: greater authentication security, greater ease in issuing prescriptions, lower number of issued receipts, greater autonomy, mobility and convenience for the user and greater rigor in fighting fraud.

Conclusion:Compared to the USA, Portugal has significantly lower ME due to electronic prescription. Which indicates that i tis an essential and necessary tool for a significant reduction of ME in pediatrics. However, we must emphasize the importance of the complementarity of other support systems at the level of the Hospital Pharmacy.

The participation of health professionals working in the Pharmacy and the promotion of communication between health professionals are two complementary measures that allow us to maximize this tool.

Keywords: Medication Errors; Pediatrics; USA; Portugal; Australia.

POTENTIAL RISKS IN PHARMACY COMPOUNDING

Carolina Branco, Erika Daniel, Juliana Sousa, Mafalda Maia

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: Compounding drugs is any manufactory product made with a mandatory prescription, tailored to each patient, according to the needs of that patient. The manipulated drugs are a therapeutic alternative to when the drug that best suits the patient isn´t available on the market, either in the desired composition, or in the necessary dosage or appropriate pharmaceutical form. To create a high standard quality of manipulated drugs prepared in a pharmacy or at the hospital pharmaceutical services, the good manufacturing practices should be observed in the preparation of manipulated drugs.

Objective: Identify the risks associated with drug handling and preparation.

Methods: A search was done in PubMed, Google Scholar and official websites, with key words: "Coumponding drugs", "Hospital pharmacy", "risks" in the 2013-2020 period. We selected 3 articles.

Results: To ensure safety and good manufacturing practices the professional must secure proper indication of the prescription and dosage. The quantities of the ingredients should be calculated meticulously and the quality of the source of those ingredients should be guaranteed. Handling facilities and equipment must be cleaned and monitored continuously. The team should practice frequently and be evaluated for competence in appropriate hygiene measures.

Most common errors are microbiological contamination, incorrect ingredients or incorrect amounts of ingredients, sub-dosage and above-dosage can be considered as the only category of concentration errors. Sterile compounds are potentially more dangerous for patients. The introduction of contaminated compound medicinal products into different areas of the body may cause infection, serious injury or even death.

Conclusion: Pharmaceutical manipulation provides an important therapeutic option to individualized treatment. To avoid error it´s indispensable that its activity be framed by a quality management system, based on continuous improvement and customer focus.

Keywords: Compounding drugs, safety, risks, hospital pharmacy

ORGANIZATION OF A HOSPITAL PHARMACY

Carla Figueiredo, Diana Pereira, Joana Graça

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: The Hospital Pharmacy are the service responsible to delivery drug therapy for patients, the quality, efficacy and safety of drugs, integration with healthcare teams and promote scientific research and teaching actions.

Objective: This work aims to make known how the management of stocks influences the management of a hospital pharmacy.

Methods: We used articles from the following information sources “PubMed”, “Science Direct” and thesis “Stock management in hospital pharmacy and the application of the Lean theory”.

Results: One of the most important functions of the hospital pharmacy is stock management control. For the purchase of medicines, they are subject to a budget, so any change in this budget generates a reinforced impact on the pharmacy. This management is not always easy as a hospital may face several unusual/rare hypotheses for which the necessary stock is not always available or may have very high security stocks and thus be tying up capital.

The stock in the hospital pharmacy is made according to a set of criteria and that should generate a financial return greater than that invested in it. The constitution and constant monitoring of stock makes it possible to overcome variations in supply and demand, obtain economic advantages in the acquisition of greater quantities and reduce ordering and transport costs.

Conclusion: In short, the logistics of managing the stock of a hospital pharmacy is a distributed and transversal process in order to satisfy the requirements of the patients.

Keywords: “hospital pharmacy”, “organization”, “stock of medicines”

Discipline: Organization, Management and Quality in Pharmacy

Professor: Rui Cruz

Degree: Pharmacy

A 52

Edition 16/21

HOSPITAL DRUGS DISTRIBUTION SYSTEMS

Oriana Betancourt, Rui Duarte

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Background: Hospitals have complex drug distribution systems that allow drug delivery for patient administration. Distribution processes play a broad role at the hospital level. Errors in those systems can lead to the incorrect use of medication, with consequences for the patient.

Objectives: The aims to clarify the concept of the drug distribution system in a hospital environment and the description of the most used distribution systems at the European level.

Materials & Methods: We conducted library research of articles and in databases such as PubMed, B-ON, and Google Scholar. We use the keywords: "Drug distribution systems" and "Hospital pharmacy". Information from the Ministry of Health's Hospital Pharmacy Manual was also used.

Results: From the documents analyzed on the functioning of the most common drug distribution systems, some special distribution systems and a small approach regarding the necessary changes in distribution systems, after the SARS-COV2 pandemic, aimed at the safety of professionals and users. Therefore, there are several Drug Distribution Systems in the Hospital Pharmacy, with some advantages and disadvantages concerning the others. It should be noted that the needs and requirements of each system are different, for example, in terms of the physical space occupied, especially when the systems present technology and demand for health professionals. The importance of adapting to atypical circumstances, for example, pandemics, is also highlighted.

Conclusion: In conclusion, drugs distribution systems are a fundamental part of hospitals and require careful attention. Its selection must consider the needs of the environment and the possibilities that exist financially.

Keywords: Hospital Drugs Distribution Systems, hospital pharmacy

THE HOSPITAL PHARMACY TRENDS

Ana Frias, Ângela Oliveira, Bárbara Medeiros, Rawan Nasser

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: Pharmacy represents a self-regulated healthcare profession, responsible for serving and protecting the public. Drug and disease monitoring, disease detection, and pharmacogenetics are active themes in community pharmacies, with pharmacy professionals being challenged by recent trends to provide safe, effective, comprehensive, accessible, and equitable care for all.
Objective: Make known the current trends of pharmacy and the future perspectives.
Material and Methods: We did searches in Google Scholar and Pubmed, selecting articles from 2018 to 2021, using "pharmacy trends" and "hospital pharmacy trends".
Results: Current trends and policies in health care lead to changes to effectively and safely serve society, implying organizational changes and better external relationships that the pharmacy professionals should and can assume in the coming years.
In terms of health financing and provision, there is growing interest in drugs pricing reforms to improve the accessibility of prescription drugs. In 2020, special, biological, and diabetes medicines were the ones with the highest cost at the hospital level.
One of the change strategies include the use of technology for interprofessional teamwork and better work management. At the beginning of the COVID-19 pandemic, a pharmacy panel was created to help in the management of workload and in the prescription and dispensing of medication, updated in semi-real time at the hospital level.
Conclusion: Changes at different levels in health are needed, however, there are gaps in the most effective way to address current challenges in terms of drug management, health care resources, and drug use.

Keywords: Pharmacy, Hospital, Trends, Pharmacist and Drugs.

NUTRIGENOMICS AND CANCER: ASSOCIATION, PREVENTION AND FUTURE PERSPECTIVES

Ana Brito, Francisca Costa, Mariana Pereira, Matilde Martins

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Cancer is considered a global health problem and the number of cases increases every year, being currently considered the second leading cause of death worldwide

Factors such as smoking, alcoholism, sedentary lifestyle, pollution, microorganisms, sun exposure, genetics, and poor diet, make the population more susceptible to the onset of cancer and other chronic diseases. Particularly in the case of diet, studies reveal that the correlation between nutrients and the genome modifies one or more processes related to cancer, whether these are beneficial or not.

Nutrigenomics attempts to understand how dietary components may affect gene expression. Nutrigenomics is based on two areas:1) the effect of nutrients on gene expression and 2) the metabolism of nutrients that may differ between different individual genotypes, thus affecting people's health differently.

Current evidence demonstrates that genetics play an important role in determining an individual's risk of developing a particular disease. Individuals respond differently to the same diet, as it depends on age, genetics and their physical status, so there is variation in tumor risk among people with identical food preferences. Through Nutrigenomics, it will be possible to recommend an ‘’tailored dietary treatment’’ for each individual, considering their response to the different nutrients, which is why it could be a successful strategy in terms of health outcomes in general, and for the cancer patient in particular.

This work aims to demonstrate the importance of the study of nutrigenomics as a complement in the treatment and prevention of cancer.

Keywords: nutrigenomics, cancer, cancer prevention

Discipline: Genetics

Professor: Célia A. Gomes

Degree: Dietetics and Nutrition

A 55

Edition 16/21

NUTRITIONAL THERAPY IN FAMILIAL HYPERCHOLESTEROLEMIA

Ana Duarte, Ana Fernandes, Cláudia Maia, Maria Ferreira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Familial Hypercholesterolemia (FH) is a genetic disease of autosomal dominant transmission, as it is transmitted from generation to generation, where the siblings and children of a person suffering from this condicione have a 50% risk of inheriting it. Several mutations are reported in genes that encode key proteins involved in the endocytic and recycling pathways of LDL receptors.

From the research carried out, it was possible to verify that heterozygous Familial Hypercholesterolemia has a high prevalence (1/500) while homozygous Hypercholesterolemia has a much lower incidence (1/1,000,000). It was also verified that the main genetic mutations responsible for FH are in the genes of: LDL receptor (LDLR), apolipoprotein B and the proprotein convertase subtilisin/Kexin type 9. The most frequent mutations are in the *LDLR* gene.

The main objective of nutritional therapy for Hypercholesterolemia is to avoid being overweight and reduce the amount of foods and beverages with high cholesterol, saturated fat and trans-fat content. Regular exercise should be implemented. A complete record of eating habits and individual recommendations for healthy eating should be obtained.

It is important to adhere to therapy not only with pharmacological help but also by adopting a healthy lifestyle that includes a healthy diet and physical activity, since incorrect diet, excess weight, a sedentary lifestyle and smoking habits contribute to the worsening of the pathology.

Objective: With this work we intend to understand Familial Hypercholesterolemia and as nutritionists, we can contribute to the treatment of this pathology.

Keywords: Familial Hypercholesterolemia; Hypercholesterolemia, nutrition therapy

CREATINE DEFICIENCY SYNDROMES

Ana Marta Felício, Diana Santos, Inês Ferreira, Joana Oliveira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Creatine metabolism deficits are errors of metabolism that compromise normal creatine synthesis and transport. Patients with this deficiency have mental and global developmental retardation, speech difficulties, seizures, and autism spectrum disorders.

The creatine/phosphocreatine/creatine kinase system plays an essential role in maintaining the high energy levels needed for brain and muscle development and function. Creatine can be acquired through food or synthesized through two enzymatic reactions: a) from arginine and glycine, the arginine enzyme: glycine amidinotransferase (AGAT) forms guanidinoacetic acid (GAA); b) methylation of GAA to creatine by the enzyme S-adenosyl-L-methionine: guanidinoacetate methyltransferase (GAMT). The main organs where creatine synthesis takes place are the liver, pancreas and kidneys. Deficits in GAMT and AGAT are autosomal recessive transmission diseases, whose genes are located on chromosome 19p13.3 and 15q15.3, respectively. Deficit of the transmembrane creatine transporter (SLC6A8) has an X-linked inheritance (Xq28). Curing patients with SLC6A8 deficiency remains a real challenge. However, in creatine deficits in GAMT and AGAT are subject to supplementation in which creatine occupies a central place.

The aim of this work is to understand the origin of the different forms of deficiencies in creatine metabolism and their correlation with genetics.

Keywords: Creatine; AGAT; GAMT; *SLC6A8*; Syndrome

Discipline: Genetics

Professor: Célia A. Gomes

Degree: Dietetics and Nutrition

A 57

Edition 16/21

GENETICS OF ARGININOSUCCINIC ACIDURIA

Carolina Baptista, Carolina Dias, Saide Lileza

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Argininosuccinic aciduria results from a mutation in the gene encoding the enzyme argininosuccinate lyase (ASL), which leads to inadequate ureogenesis, accumulation of argininosuccinic acid, and deficient production of endogenous arginine, contributing to health problems. ASL deficiency is inherited in an autosomal recessive manner. In a family with a child who has the severe form of the disorder, subsequent children are susceptible to develop a severe neonatal onset form. The phenotype of late onset forms is variable. Heterozygous carriers are asymptomatic, with no risk of developing the disorder. Unless an ASL-deficient individual has children with an affected or carrier individual, the offspring will be heterozygous carriers of a pathogenic variant of ASL.

Treatment requires coordinated efforts by a multidisciplinary team. In the long term, dietary restrictions are recommended with alternative methods consisting of the use of drugs stimulating the conversion and removal of nitrogen from the body. During acute episodes of hyperammonemia, oral protein should be avoided for 24 to 48 hours to prevent the development of excess ammonia, however, affected children should take in enough protein for adequate growth. In the case of infants, a low-protein, high-calorie diet supplemented with essential amino acids is recommended.

It is therefore important to perform genetic testing in at-risk newborns with known familial cases and to carry out carrier testing of at-risk family members and prenatal testing, for timely diagnosis and treatment in affected individuals.

The aim of this work is to study the genetics of argininosuccinic aciduria.

Keywords: Argininossuccinato lyase, argininossuccinic aciduria, argininossuccinato lyase deficiency

Discipline: Genetics

Professor: Célia A. Gomes

Degree: Dietetics and Nutrition

A 58

Edition 16/21

PHENYLKETONURIA: GENETIC FACTORS AND DIETETIC INTERVENTION

Margarida Lopes, Maria Aleixo, Maria Geraldes, Neuza Aguiar, Paula Almécija

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Phenylketonuria (PKU) is an autosomal recessive genetic disease caused by a deficiency in the hepatic enzyme phenylalanine hydroxylase (PAH) which means that the essential amino acid phenylalanine is not hydroxylated to tyrosine, resulting in its accumulation in the blood and other body fluids. This may lead to toxicity to the body and cause symptoms such as intellectual disability and seizures.

Phenylketonuria can be classified as classic and mild being the first one the most dangerous type. This metabolic disease results from mutations in the PAH gene located on chromosome 12 (12q23.2) where 567 mutations were detected, predominantly the missense type, although these vary according to ethnic groups and regions.

Both prenatal and neonatal diagnosis are important to make an early intervention based on a low protein diet and consequently low phenylalanine. It is recommended that all children treated for PKU receive a phenylalanine-free protein substitute that provides non phenylalanine protein and tyrosine requirements. Many contain added vitamins, minerals, essential fatty acids and docosahexaenoic acid (DHA).

In adults, in addition to diet, enzyme replacement therapy to decrease plasma phenylalanine levels is also an option.

With this work we intend to deepen the knowledge of the genetic cause of this metabolic disease as its consequences and possible dietetic intervention.

Keywords: Phenylketonuria, genetics, mutation, screening, genes

Discipline: Genetics

Professor: Célia A. Gomes

Degree: Dietetics and Nutrition

A 59

Edition 16/21

FABRY DISEASE: AN HERDITARY METABOLIC DISORDER

Francisca Rosa, Inês Soares, Sofia Matias, Tiago Rodrigues

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Fabry disease is an hereditary X-linked metabolic disorder that results from deficient activity of the enzyme α-galactosidase A, caused by mutations in the *GLA* gene located on the long arm of the X chromosome at the Xq22 position. These mutations lead to progressive accumulation of glycosphingolipids, mainly globotriaosylceramide (Gb3), in lysosomes. The spectrum of disease severity ranges from asymptomatic to a classic (severe) phenotype, with several variants between these two extremes, depending on mutations and which is the X-chromosome inactivation. The prevalence of Fabry disease is higher in men than in women, with the incidence being approximately 1 in 117,000 live births in men.

The diagnosis is made by identifying low enzyme activity, by measuring Gb3 in urine and blood, and is confirmed by genetic analysis. The main symptoms are caused by changes in heart, kidney and brain function. Enzyme replacement therapy is the gold standard of treatment, however, there are being studied new therapeutic approaches, such as pharmacological therapy (with Migalastate), substrate reduction therapy and gene therapy. In addition, sodium rich diets contribute to decreased symptomatology Therefore, efforts are needed to ensure more effective, safe and advantageous therapeutic strategies for patients with Fabry disease.

The aim of this work is to provide knowledge about Fabry disease, the variations in the manifestation of the disease particularly in heterozygous (X chromosome inactivation) women, as well as the effectiveness of its treatments.

Keywords: Fabry disease, metabolic disorder, X chromosome inactivation

THE ROLE OF NUTRIGENOMICS IN ATHLETIC PERFORMANCE

Ana Melo, Soraia Fonseca, Susana Teixeira Dias, Tatiana André

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Sports performance is remarkably influenced by nutrition, yet individuals respond differently to the same foods/nutrients/supplements consumed. Nutrigenomics centers the individual sensitivity to nutrients regarding the influence on gene/protein expression and, eventually, metabolite production. Thus, it provides useful information on diet effects and ensures food intervention strategies to improve athletic performance.

Data shows the importance of genetic influence in the physiological changes happening in the body, how different genes may be determinant in different functions and how knowing this information is crucial to enhance athletic performance. For example, some genes such as *CYP1A2* are associated with caffeine metabolism, sensitivity and response while others are related to the intake of macronutrients and the consequent changes in body composition, which is the case of the *FTO* gene. Another important application of nutrigenomics in sports is related to the diet of vegetarian/vegan athletes because, if not fully adequate and controlled, the diet can lead to vitamin B12 deficiency if intakes are low. It is proved that the *FUT2* gene can alter its absorption, aggravating vitamin B12 deficiency, so is fundamental understanding this aspect to minimize the risk of this occurrence.

Thus, applying genetic information to personalize a nutritional regime can maximize athletic performance which is really relevant. However, the data is still scarce on the role of genetic polymorphisms, on nutrient's absorption, distribution, metabolism and excretion (ADME) and their impact in athletic performance so more studies are needed.

With this study we aimed to understand the importance of diet/genetics in sports performance.

Keywords: nutrigenomics; sports nutrition; nutritional genomics.

NIEMANN-PICK DISEASE – A LYSOSOMAL LIPID OVERLOAD DISORDER

Catarina Busca, Inês Santos, Mariana Fernandes, Vanessa Laborinha

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Niemann-Pick disease is a lysosomal lipid overload disorder (DLSs), that is characterized by the accumulation of lipids due to genetic defects in an enzyme and in the transport of molecules involved in lysosomal activity. This is an autosomal recessive inherited disease and can be classified into several types, being the most common type A, B and C. Niemann-Pick A and B disease is caused by mutations in the *SMPD1* gene, which is located on human chromosome 11. The *SMPD1* gene encodes the acidic sphingomyelinase enzyme that catalyzes the hydrolysis of sphingomyelin to ceramide and phosphocholine and leads to the accumulation of sphingomyelin in tissues, and in turn, to the onset of symptoms. Niemann-Pick type C disease is a pathology caused by the mutation of the *NPC1* gene, the most common, which is located on chromosome 18 and/or *NPC2* which is located on chromosome 14 and is characterized by the body's inability to transport cholesterol and other lipid substances leading to an abnormal accumulation of these substances in various tissues of the body. The most common symptoms of Niemann Pick disease type A are hepatosplenomegaly, motor and neurological development delay, in type B the pathological changes are in the lungs and finally in type C the most common symptoms are cerebellar ataxia, cataplexy and dysphagia. The objective of this work is to understand how nutritional intervention and the treatment of Niemann-Pick disease, directed to each symptom, aims to improve the quality of life of patients.

Keywords: Niemann Pick; type a; type b; type c; disease; genetics

Discipline: Genetics

Professor: Célia A. Gomes

Degree: Dietetics and Nutrition

A 62

Edition 16/21

FISH ODOR SYNDROME

Daniela Castro, Filipa Lopes, Lara Carrilho, Renata Pereira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Trimethylamineinuria, also known as Fish Malodour syndrome, is a rare condition whose main characteristic is a body odor that resembles spoiled fish due to excessive excretion of trimethylamine (TMA) in urine, sweat and other body secretions. Diagnosis can be difficult because the disease is often unknown to the physicians.

A diet restricted in TMA precursors, especially choline-rich foods (egg, liver, peas, beans, broccoli), lecithin and trimethylamine-N-oxide (TMAO) (marine fish), has been most effective in mild to moderate conditions. Since, in normal situations, dietary precursors are transformed into TMA by intestinal bacteria, where TMA is transported to the liver, to be oxidized by flavin monooxygenase 3 (FMO3) for odorless TMAO, which is excreted through bodily fluids. Therapy consists mainly of dietary restriction and hygiene measures, in which the use of low pH soap and frequent washing of clothes are useful to eliminate the bad odor.

Trimethylaminuria results from dysfunction of the FMO3 enzyme by genetic, hormonal factors and/or because of excessive substrate (diet precursors of excessive TMA or changes in the intestinal microflora). In humans, the *FMO3* gene is in the chromosome 1q23-25, being highly polymorphic. Combinations of polymorphisms can be responsible for moderate and mild forms, causing a decrease in the enzymatic oxidation capacity, especially when there is an overload of TMA dietary precursors. Primary trimethylaminuria is caused by a functional defect in FMO3 that is inherited in an autosomal recessive manner.

Affected individuals can develop psychological problems that result in anxiety, social isolation, depression and in some cases suicide. Therefore, it is important to implement food and hygiene strategies to improve the quality of life and minimize the consequences.

With this work we intend to study the genetic component of fish odor syndrome.

Keywords: Fish Malodour Syndrome and Body odor

Discipline: Genetics

Professor: Célia A. Gomes

Degree: Dietetics and Nutrition

A 63

Edition 16/21

HEREDITARY FRUCTOSE INTOLERANCE

Joana Gameiro, Mariana Santos, Matilde Cabral

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Fructose is almost exclusively derived from the diet and is found in honey, fruits and vegetables, and is associated with glucose in sucrose in numerous foods. Sorbitol, present in fruits and vegetables, is converted to fructose in the liver. Glucose transporter proteins are responsible for the absorption of fructose which is metabolized by the enzymes fructokinase, aldolase B and triokinase. Three inborn errors in the fructose metabolism pathway are known, hereditary fructose intolerance (HFI) being one of them.

HFI usually manifests itself during weaning from breast milk in infants when they are beginning the intake of foods containing fructose, sucrose and sorbitol. After its dietary exposure, when HFI is left untreated, it's characterized by nausea, vomiting, diarrhea, abdominal discomfort and metabolic disturbances. These manifestations are caused by the toxicity of undegraded fructose-1-phosphate, due to a deficiency of aldolase B.

HFI is a rare autosomal recessive disease caused by homozygous or compound heterozygous mutation in the aldolase B gene on chromosome 9q31. Over 50 mutations are known to cause HFI with c.448G>C being the most common worldwide.

Through a detailed nutritional history and clinical picture, HFI is suspected, but the diagnosis is only confirmed by molecular analysis of the *ALDOB* gene. However, if no mutation is found in this gene, a lower aldolase activity in a liver sample will confirm the diagnosis.

Treatment of HFI involves dietary restriction of fructose, sucrose and sorbitol, and therefore follow-up with a nutritionist is necessary.

The aim of this work is to learn about the disease, its metabolism and its genetic basis.

Keywords: Hereditary Fructose Intolerance, fructose, metabolism, genetics

THE RELEVANCE OF *ANAPLASMA PHAGOCYTOPHILUM* IN TRANSFUSION SCIENCES

Susana Oliveira, Tatiana Silva, Télvia Bungo, Vanda Falorca

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Anaplasma phagocytophilum is a gram-negative bacterium, the outer membrane is often thick with irregular periplasmic spaces and its multiplication occurs in mature and immature hematopoietic cells, peripheral blood and tissues of hematopoietic organs. *A. phagocytophilum* is an agent causing infections in large hosts that usually transmit infectious disease to man, and some of the main vectors are several species of ticks of the genus Ixodes. In 1986, this agent became the target of an investigation after the first human infection, human granulocytic anaplasmosis (HGA). Risk factors for HGA include activities in forest areas or agricultural fields, immunosuppressed individuals, and patients after blood transfusion.

Antibiotic prophylaxis is not effective and there is no universal vaccine available for *A. phagocytophilum* due to the existence of different variants and lack of studies. Treatment options for this infection include tetracycline. Rifampin and chloramphenicol can be given in pregnant women and patients with intolerance or allergy to tetracycline.

Symptomatology occurs between 5 to 21 days after infection and initially includes fever, headache, malaise, and myalgia and may be accompanied by thrombocytopenia, leukopenia, and increased levels of hepatic transaminase.

The most common serological technique is indirect immunofluorescent antibody testing (IFA), ELISA and PCR techniques directed to 16S rRNA, msp4, groEL, ankA and p44 genes can also be used. Given that the prevalence rate of HGA in Europe ranges from 1 to 20%, therefore is not necessary to screening donors, since its cost is high.

Keywords: Anaplasma phagocytophilum, HGA, ELISA, PCR, transfusion

THE RELEVANCE OF MALARIA IN TRANSFUSION SCIENCES

Adriana Mira, Alexandra Pinheiro, Alexandre Guerreiro, Ana Beatriz Matos, Gabriela Marques

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Malaria is one of the most common protozoan parasitic infections. Being transmitted by infected female Anopheles mosquitoes, thus becoming an intermediate host for the Plasmodium parasite, which can also be transmitted by blood transfusions, organ transplants, and needle stick injuries. Although there are numerous species of Plasmodium, only the following can cause disease in humans*: P. ovale, P. knowlesi, P. falciparum, P. vivax* and *P. malariae*. The latter three are most associated with the transmission of malaria by transfusion (TTM).

The prevalence of TTM in non-endemic areas is one case per four million and in endemic areas, more than fifty cases per million units of blood transfused, with P.falciparum being the most frequently detected.

Once the first case of TTM was identified in 1911, it was essential to screen donors for malaria. Diagnosis can be made using microscopy, rapid diagnostic tests (antigen and antibody), molecular techniques (PCR) and immunochromatographic tests (RDTs).

Infected individuals can present severe complications, such as cerebral malaria, hypoglycaemia, adult respiratory distress syndrome (ARDS), and pronounced haemolytic anaemia, which can lead to death in patients with a weakened immune system.

As a treatment for malaria, chloroquine is the most used drug, but *P. falciparum* is resistant, other drugs can be mefloquine and doxycycline.

Keywords: Malaria; mosquitoes; transfusion; parasitic infections*; P.falciparum*; blood; donors

Discipline: Immunohemotherapy Clinical and Laboratory II

Professor: Fernando Mendes

Degree: Biomedical Laboratory Sciences

A 66

Edition 16/21

THE RELEVANCE OF SARS-COV-2 IN TRANSFUSION SCIENCES

Maria Martins, Maria Pereira, Mariana Teixeira, Marta Santos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

SARS-CoV-2 is the infectious agent responsible for the COVID-19 infection, which manifests as Severe Acute Respiratory Syndrome. This is an RNA-type beta-coronavirus that has a genome of approximately 30kb single-stranded positive sense. It was first identified in Wuhan, China, in December 2019, deriving from reported pneumonia-like cases of unknown aetiology.

SARS-CoV-2 spreading occurs either when aerosols or respiratory droplets containing the virus are inhaled or through permucosal exposure, either air-borne or through the touching of these areas with unwashed hands after touching a contaminated surface.

Transmission is quick, both because the incubation period is relatively short (2-14 days) and because of the recombination capacity of the S protein in the receptor-binding protein region. The clinical spectrum can range from mild to severe and symptoms include cough, fever, anosmia and difficulty breathing or shortness of breath.

Diagnosis relies mainly on Real-Time Polymerase Chain Reaction (PCR), rapid antigen or antibody tests and immunoenzymatic serological tests. In some cases, CT scanning can also be useful, as lung opacities compatible with atypical pneumonia may be visible in infected patients.

Current evidence suggests that, in addition to the extremely low prevalence of viral RNA in the plasma of recovered patients, RNA detection in the blood does not equal infectiousness. As such, it is not correct to state that potentially found RNA in blood samples would be able to cause infection should it be used in a transfusion.

Keywords: SARS-CoV-2; Virus; Polymerase chain reaction; transfusion

THE RELEVANCE OF *BABESIA* IN TRANSFUSION SCIENCE

Ana Cristina, Ana Cardoso, Bárbara Barata, Beatriz Sousa, Carolina Bastos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

The bite of a tick, infected with the parasite *Babesia*, causes a rare disease, occasionally severe, named Babesiosis. The species with the highest number of cases reported Worldwide is *B. microti*.

Babesia enters red blood cells (RBC), mature, and then divide asexually. Infected RBC eventually ruptures and release organisms that invade other RBC. Patients exhibit anaemia with fever and jaundice. The diagnosis is based on these symptoms, which are always supported by laboratory tests, such as immunofluorescent assays, EIA enzyme assay, ELISA, RT-PCR and microarrays. Most people cure the infection without the need for antibacterial treatment, however symptomatic patients with detectable parasitemia require treatment. In the case of hyperparasitemia, blood transfusions rapidly reduce parasitism and anaemia and should be considered as a treatment option.

The disease affects mostly people who have had their spleen removed, weakened immune systems and the elderly. Adding to this, Babesia can be transmitted by blood, vertical transmission and possibly by organ transplantation.

The first case of Babesiosis due to blood transfusion was reported in the USA in 1979, and its incidence has increased in recent years. Most donors are asymptomatic increasing the risk of infecting other patients. Screening for donated blood is essential to reduce the risk of transmission. For this reason, blood collection centres in the highest risk areas have been testing since 2010. Delayed diagnosis of Babesiosis carries the risk of increased patient morbidity and mortality, demonstrating the need for better preventive strategies, including more sensitive and specific screening tests for blood donors.

Keywords: *Babesia*, Babesiosis, fever, jaundice, blood transfusion

THE RELEVANCE OF DENGUE IN TRANSFUSION SCIENCE

Marta Barros, Marta Gaspar, Martim Ferreira, Mónica Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Dengue infection is caused by a single-stranded, enveloped, RNA arbovirus of the Flaviviridae family, Flavivirus genus. This virus has four serotypes, DENV-1, DENV-2, DENV-3, and DENV-4, having no cross-immunity between them. Each year there are approximately 50 to 100 million new DENV infections and 20 000 estimated DENV-related deaths. Globalization, increased air travel, and unplanned urbanization have led to an increase in the infection rate and helped dengue expand its geographic and demographic distribution.

DENV can be transmitted via human transmission cycle, where the Aedes aegypti mosquito is the responsible vector through its bite. However, the most relevant when it comes to transfusion science, are non-vector transmission routes which include blood transfusion, bone marrow transplant, and intrapartum and perinatal transmission. The incubation period of this vírus oscillates between 3 to 14 days.

The clinical course of this infection can be divided into three phases: febrile, critical, and recovery phase. Laboratory diagnosis can be made by NS1 antigen and antibody detection, reverse transcriptase PCR (RT-PCR), and real-time RT-PCR.

Ideally, to prevent Dengue infections, all populations of DENV-bearing mosquitoes should be destroyed, as well as their habitats. Regarding blood transfusion, all donors in endemic areas should be screened for this virus. If infected, there is no directed treatment, only symptom attenuation measures such as rest and hydration in milder or moderate cases and intravenous fluids administration and blood transfusion for more severe ones.

Keywords: Dengue, DENV, mosquito, blood transfusion, arbovirus, immunity

THE RELEVANCE OF *BARTONELLA* IN TRANSFUSION SCIENCES

Filipa Morgado; Francisco Morais; Helena Marques; Ibrahim Da Gama

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Bartonella is a fastidious gram-negative bacillus whose growth requires an enriched culture medium as well as an environment with a high CO_2 level. This bacterium is capable of causing asymptomatic long-lasting infection and has been demonstrated that it can remain viable in red blood cell units after 35 days at 4ºC. Bartonella can cause several human diseases including Peruvian bartonellosis, trench fever, cat-scratch disease, and endocarditis and angiomatosis.
Transmission is through traumatic contact with infected animals or by blood-sucking arthropods. Transmission through blood transfusions and solid organ transplants has been documented.
According to recent studies, the incidence of cat-scratch disease was reported to be 6.4 cases per 100 ,000 population in adults and 9.4 cases per 100 ,000 population in children aged 5 to 9 years globally.
The diagnostic modalities commonly used in the diagnosis of *Bartonella* infection include serological testing, culture, histopathology, and polymerase chain reaction. However, it must be emphasized that *Bartonella* often can't be detected because they can evade the immune system causing intraerithroid bacteremia.
Although screening of blood supplies for this pathogen is not routinely performed, due to the low number of reported cases of Infection by *Bartonella*, it has been reported subclinical bloodstream infection in humans which enlightens the potential risk in blood transfusions.

Keywords: *Bartonella* ; Blood Transfusion; angiomatosis; cat-scratch disease

IMPORTANCE OF Q FEVER IN SCIENCE TRASFUSION

Joana Sousa; Joana Duarte, Mara Santos, Marcelo Vilas Boas

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Q fever is a bacterial infection caused by *Coxiela burnetti*, a Gram-negative coccobacillus from the gammaproteobacteria group and coxiellaceae family. The first reference of this disease came from Australia in 1935 and more cases were reported across the world except in New Zealand. Animals are the primary host of this disease, and the transmission pathways vary from urine, faeces, milk and fluids from animal births. In humans, the infection rate is higher among people who work in dusty rural environments. Infection via blood transfusion might be possible and vertical transmission are reported in some situations. Males are often more susceptible to this disease.

This illness has an acute phase with an incubation period of 2-3 weeks, usually asymptomatic. However, it can induce a feverish state, atypical pneumonia and hepatitis. 5-15% of acute-phase cases become chronic and may cause primarily endocarditis which can be mortal, but also splenomegaly and hepatomegaly. *C.burnetti* is an intracellular bacteria that is incorporated in macrophages phagolysosomes resisting their harsh conditions. It produces two antigens responsible for the serologic diagnosis, the phase I and II antigens. Serology diagnosis is the first-line diagnostic technique. The immune response induces the production of antibodies against the phase I and II antigens that are detected in indirect immunofluorescence assay. Other tests such as PCR, Western blot and ELISA can also be used. To prevent this disease, there are vaccines available in endemic zones, people shouldn't

consume unpasteurized or raw animal products and should avoid contact with infected animals.

Keywords: Keywords: Q fever, *Coxiela burnetti*, Acute phase, Chronic phase, Immunofluorescence assay

THE RELEVANCE OF ZIKA IN TRANSFUSION SCIENCES

Nadine Ribeiro; Neyda Lima; Nicole Lopes; Polina Ponedilok; Rita Melo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Zika virus (ZIKV) was isolated in 1947, from a Rhesus monkey's serum sample that was a test subject for Yellow-Fever monitoring, in Zika forest, Uganda. It is a single-stranded positive-sense RNA virus, that belongs to the family Flaviviridae and genus Flavivirus.

In comparison to other known viruses of this family, it has a lipidic envelope, which surrounds the nucleocapsid, and the viral genome consists of three structural proteins and seven nonstructural proteins. Based on nonstructural protein differences two lineages were identified, Asian and African. This arbovirus is transmitted by mosquitoes of genus *Aedes*, vertically, through sexual contact and hemotransfusion, therefore, having significant relevance in science transfusion.

Infected individuals exhibit symptoms such as fever, rash, headaches, conjunctivitis, and myalgia shared with other viral infections namely Dengue and Chikungunya, thus it is crucial to make differential diagnoses between them. The major complications include Guillain-Barré Syndrome, and microcephaly or other neurological problems in newborns due to vertical transmission. During the disease's evolution, IgA and IgM antibodies are detected on the fifth day after the onset of symptoms, and two to three days later, IgG antibodies can also be detected. The structural similarity between Flaviviruses can cause cross-reaction, detected using NS1 antigen, specific for ZIKV.

Serological ZIKV's antibodies detection, using techniques such as ELISA and Indirect Immunofluorescence, and reverse transcriptase-polymerase chain reaction (RT-PCR) are the main procedures to make the diagnosis. There are no vaccines, and the treatment is directed to the symptoms.

Keywords: Zika Virus; Arboviruses; *Aedes*; Flaviviridae Infections; Transfusion;

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 72

Edition 16/21

BENEFITS OF BIOACTIVE COMPOUNDS OF STRAWBERRY AND BLUEBERRY

Ana Oliveira, Joana Julião, Nuno Vidal Rosa Soares

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Background: Strawberry and Blueberry are, in general, characterized by highly nutritious compounds, including minerals, vitamins, fatty acids and bioactive compounds, such as phenolic compounds and flavonoids. These are associated with the prevention of cardiovascular diseases, inflammatory diseases and the reduction of oxidative stress.

Objective: This research aims to understand the advantages associated with the intake of blueberries and strawberries in various pathologies.

Methods: This scientific work was realized with resources from scientific databases, websites, and articles from 2010 until 2021.

Results/Discussion: Blueberries are a rich source of micronutrients and phytochemical compounds, organic acids, sugars, vitamins, fibers and phenolic compounds (anthocyanin), with nutritional and functional properties that justify the interest in these berries, mainly at a pharmacologic level.

Strawberries are a fruit rich in anthocyanins, such as glycosidic derivatives of pelargonidin and cyanidin.

The intake of this fruit attenuates the postprandial inflammation in adults with excessive weight.

Additionally, it reduces vascular adhesion molecules in people with cardiovascular risks.

Conclusion: These fruits present cardiovascular protection, and they can prevent CVDs or facilitate the repair of morphological functions of the heart and vessels after an injury. The evolved mechanisms include the protection of vascular endothelial function,blood pressure modulation inhibiting plaquettes, reduction of oxidative stress, and relief of inflammation.

The shortage of information was notorious once most of the articles supported the same conclusions.

Keywords: Strawberries, Blueberries, Anthocyanin, Flavonoids, Cardiovascular Disease, Inflammation, Oxidative Stress

INTERACTION WARFARIN – VITAMIN K

Carolina Branco, Erika Daniel, Juliana Sousa, Mafalda Carvalho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Introduction: Warfarin is the essential therapeutic anticoagulant and was initially approved for the prevention of thromboembolism. Warfarin is ranked among the top ten drugs with severe adverse effects due to its narrow therapeutic window and individual dosage needs.

Objective: Identify possible interactions between warfarin and vitamin K.

Methods: A search was done in PubMed, Google Scholar and Science Direct with keywords “warfarin”, “Vitamin K” and “interaction” in the 2009-2021 period. We selected only 20 articles.

Discussion: Vitamin K is essential to produce active clotting factors II, VII, IX, and X. There´s less vitamin K in the body because the liver metabolizes it, in the absence of a dietary source the vitamin K reserve is therefore rapidly depleted.

Vitamin K epoxide reductase (VKOR) is a protein of the endoplasmic reticulum membrane that supports blood clotting through the vitamin K cycle. Inhibition of vitamin K activity by warfarin hinders the production of functional clotting factor.

The mechanism of action of warfarin will inhibit the effect of vitamin K in the liver, which is necessary for the reduced form of the carboxylation of glutamate residues that are in the terminal part of inactive proenzymes and two inhibitors necessary for its fixation, causing biologically inactive clotting proteins due to a reduced number of carboxyglutamates.

The solid binding mechanism between VKOR and warfarin may partly explain the warfarin´s narrow therapeutic window. Whenever the warfarin concentration exceeds the level of VKOR expression in the liver, all VKOR molecules are inhibited, and warfarin cannot be released.

This way, the level of VKOR protein in the bloodstream becomes helpful to predict the warfarin dose required in the treatment.

Conclusion: To ensure the stability of oral anticoagulation treatment its required a nutrition approach of vitamin K use. Avoiding foods are spinach, watercress, broccoli, cabbage, lettuce, chicory, blackberries and nuts.

Keywords: Warfarin, Vitamin K, VKOR, diet

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 74

Edition 16/21

USE OF FLAXSEED AS A WAY TO PREVENT CARDIOVASCULAR DISEASE

Beatriz Arede , Carla Figueiredo, Diana Pereira, Aya kassah

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Flaxseed is an oil seed produced by flax. This seed is found by bioactive components that, through an isolated or synergistic combination, have beneficial effects related to several pathologies, as is the case of cardiovascular pathologies. These compounds provide bioactivity for health through their anti-inflammatory action, antioxidant capacity, lipid-modulating properties and contribute to the reduction of risk factors for cardiovascular disease.

The main risk factors for cardiovascular diseases are behavioral, such as inadequate diet, sedentary lifestyle, tobacco use and harmful use of alcohol. The effects of behavioral risk factors may manifest themselves in those associated with increased blood pressure, blood glucose, hyperlipidemia and obesity.

Many scientific studies assure a preventive capacity of flaxseed against atherosclerosis, since it has anti-arrhythmic, anti-atherogenic, anti-hypertensive and cholesterol-lowering actions.

The objective of this work is to demonstrate how the components of flaxseed act in the treatment of cardiovascular diseases.

Studies in humans have shown that flaxseed reduces as well as reduced lipoprotein and low-density cholesterol totals, reduces glucose absorption, some markers of inflammation, and increases levels of omega-3 fatty acids, ALA and eicosapentaenoic acid (EPA).

Despite these studies, some antioxidant and hypotensive effects of flaxseed are still inconclusive.

Keywords: “linseed” ,"flax seeds"and “cardiovascular diseases”.

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 75

Edition 16/21

PASSAGE OF LITHIUM INTO BREAST MILK

Fátima Granja, João Monteiro, Oriana Betancourt

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Breast milk is considered the ideal nutrition for newborns. It features a wide range of bioactive compounds and essential nutrients, such as hormones and compounds related to the immune system, contributing to healthy development.

This work will approach the drug-breastfeeding interaction, with lithium as the protagonist. Explaining the benefits of breastfeeding for the newborn, how, in general, the transfer of drugs to breast milk occurs, and using lithium as an example.

The literature review used the scientific databases, Google Scholar, Pubmed, and other health sites. In total, we used 20 articles between the years 2015 and 2021, using the keywords: breastfeeding, drug-breastfeeding interaction, and lithium.

Lithium is the first treatment for bipolar disorder. When used by pregnant women, postpartum or breastfeeding, it is considered a drug that reduces pathology crises. Despite this character, the drug is likely to be transferred to the fetus, during pregnancy, and to breast milk.

Few studies analyze the transfer of lithium into milk as a topic of concern regarding its continued use in these cases. Some of the side effects are feeling sick or nauseous, mild stomach pains, and mild muscle weakness. The occurrence and severity of adverse reactions are directly related to plasma lithium concentrations and individual patient response.

In conclusion, lithium is transported from milk to a child with minor plasma concentrations. Depending on the concentration found after a week of breastfeeding, it may not be justified to stop taking lithium by the mother. It's essential to monitor the child's growth and development.

Keywords: Lithium; Breastfeeding; Drugs; Interaction

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 76

Edition 16/21

INTERACTION BETWEEN GRAPEFRUIT JUICE AND STATINS

Catarina Almeida; Isabel Calai; Jéssica Neves

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

The information about drug-drug interaction is usually given to patients, but this doesn't happen with drug-food interactions. The last interaction consists of a chemical, physical, physiological and/or pathophysiological interaction between both components. The food causes a change in the Absorption, Distribution, Metabolism and Excretion system of the drug.

The aim is to address the phenomenon of drug-food interaction, more specifically, the interaction between grapefruit juice and statins.

Information was collected from articles published between 2016-2021, PubMed, and websites related to the topic.

The adoption of a healthy lifestyle is increasing in people's lives. With this, an increase in the consumption of fruit juices has happened since they have biologically active compounds such as flavonoids. Therefore, combined with certain medicines, they can cause significant drug-food interactions, resulting in a direct effect on the therapeutic outcome or severe adverse reactions.

Thanks to several studies on the subject, it was possible to determine different compounds present in citrus juices that can promote the inhibition or induction of human metabolism through its action in the cytochrome P450, thus changing the bioavailability of drugs. Many drugs interact with grapefruit juice, and about half of these interactions can cause serious adverse events. Intestinal enzymes metabolize statins; with the consumption of grapefruit juice, their action is inhibited, increasing the drug's bioavailability.

In conclusion, statins cannot be administered with grapefruit juice, either before, at the same time or after the drug, as this juice has long-lasting effects. Even a single dose can cause severe side effects.

Keywords: Drug-Food interaction; Fruit Juices; Statins; Grapefruit Juice; CYP3A4

INTERACTION BETWEEN VITAMIN B12 AND METFORMIN

Ana Margarida Almeida, Ana Rita Mota, Catarina Afonso, Renata Rodrigues

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Metformin is an oral anti-hyperglycemic agent prescribed in patients with Type 1 and Type 2 Diabetes Mellitus, who do insulin therapy and in patients with polycystic ovary syndrome. It acts in the inhibition of hepatic gluconeogenesis, induces decreased glucose absorption in the digestive tract, increasing insulin sensitivity in muscle and adipose tissues and indirectly improves the β cell response to glucose.

Vitamin B12 is essential for healthy nervous tissue metabolism as it stimulates hematopoiesis. Vitamin B12 deficiency can cause nerve disorders and brain damage, as well as a form of anemia. It is a coenzyme that acts on the metabolism of fatty acids and carbohydrates, being vital for protein synthesis. The main dietary sources of vitamin B12 are protein foods of animal origin, milk and eggs.

The use of metformin in patients with type 2 diabetes mellitus demonstrated a reduction in vitamin B12 concentration in the body. This is due to changes in the mobility of the small intestine, stimulating the growth of microorganisms, reducing vitamin B12 absorption and modifying intrinsic factor (IF) levels and interaction with the endocytic receiver. Metformin has also been shown to inhibit calcium-dependent absorption of vitamin B12 - IF complex in the gut, reverted through calcium supplementation.

Vitamin B12 deficiency can be reversed by consuming adequate amounts of food and especially supplements that contain folic acid, vitamin B12, vitamin B6 and betaine.

Keywords: metformin, vitamin B12 deficiency, calcium, diabetes mellitus

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 78

Edition 16/21

CHEESE AND ITS EFFECTS ON MAO INHIBITORS

Catarina Sequeira, Ecaterina Fuior, Mariana Maia, Patrícia Manso

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

The interaction between drugs and food can bring benefits but also unwanted effects. One example is the ingestion of foods containing tyramine, such as cheese, that produce hypertensive crises in patients treated with antidepressants of the type MAO inhibitors (Monoamine oxidase).
Make known the interaction between foods rich in tyramine, particularly cheese, and the MAO inhibitors.
This literature review was conducted by analyzing scientific articles, between 1997 and 2020, found in scientific databases such as Google Scholar, PubMed.
The MAO inhibitors belong to a class of drugs that blocks the MAO enzyme. This enzyme is responsible for degrading noradrenaline, tyramine, dopamine and serotonin. By blocking the MAO enzyme, the concentration of these neurotransmitters increases in the brain.
Cheese, as well as other foods, can produce biogenic amines. When the ingestion of foods with a high level of tyramine occurs, a large quantity of this non metabolized amine can reach the blood circulation. This fact leads to the release of noradrenaline by the sympathetic nervous system. There is an increase in blood pressure due to peripheral vasoconstriction and increased cardiac output, which increases arterial pressure.
The MAO inhibitors increase the depressant effects of dopamine and tyramine, but not noradrenaline, on the heart's contractile force. Hypertensive crises can clinically manifest the rise in the activity of innocuous amounts of these amines. In these situations, it's necessary to watch out for the use of MAO inhibitors and the consumption of foods with tyramine, which eventually can lead to secondary effects, known as "cheese reaction".

Keywords: MAO inhibitors, Cheese, Tyramine, Hypertensive crises.

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 79

Edition 16/21

EFFECTS OF CHOLINE-DEPRIVATION ON PARACETAMOL- OR PHENOBARBITAL-INDUCED RAT LIVER METABOLIC RESPONSE

Diogo Castro; Nuno Vasconcelos; Rafael Macedo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Choline, part of the complex B of vitamins, is an essential nutrient.

Although the liver can produce small amounts, is through different foods that the necessary amounts for proper body functioning are obtained.

It is known to be involved in several reactions and metabolic functions in both humans and rats.

This study shows the effect of choline deprivation on biochemical, histological and metabolic levels induced by drug consumption that affect liver function.

This study was carried out considering previous database to administer correct drug doses. Several experimental techniques necessary to carry the study were also used, such as Western Blot statistical and biochemical analysis.

The administration of paracetamol increased the serum levels of aspartate and alanine aminotransferase, regardless of the diet followed. The administration of phenobarbital did not affect the hepatic clinical stage; however, choline deprivation decreased the hepatic glutathione content without affecting the Glutathione-S-transferase activity. The administration of paracetamol decreased the hepatic glutathione content in rats with normal diet and increased in rats with choline deprivation, while it did not affect the activity of glutathione-S-transferase in both groups. Still, hepatic glutathione content was not affected by phenobarbital in either diet, while phenobarbital increased glutathione-S-transferase activity only in rats with choline deprivation.

Choline deprivation can modify the liver metabolic profile, when combined with medication.

In this regard, choline deficiency may alter the effect of acetaminophen on liver detoxification systems, as acetaminophen increases liver glutathione content in the absence of choline. On the other hand, choline deprivation may prevent the up-regulating effect of paracetamol on CYP1A2 and CYP2B isoenzymes that are involved in the metabolism of various drugs and precarcinogens into toxic substances.

Keywords: Choline Deprivation; Acetaminophen; Phenobarbital; Rat; Liver.

Discipline: Nutrition

Professor: Ana Lúcia Baltazar

Degree: Pharmacy

A 80

Edition 16/21

PROTON PUMP INHIBITORS: VITAMIN, MINERAL DEFICIENCY AND HYPOMAGNESEMIA

Ana Frias, Ângela Oliveira, Bárbara Medeiros, Rawan Nasser

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Objective: Relate the use of proton pump inhibitors (PPIs) with vitamin and mineral deficiencies and their relationship with hypomagnesemia.

Methodology: We did searches in Google Scholar and Pubmed, selecting articles from 2007 to 2021, using the words "proton pump inhibitors", "mineral deficiencies", "vitamins" and "hypomagnesemia".

Results and discussion: PPIs are used in anti-secretory therapy to treat upper gastrointestinal disorders. They have been associated with vitamin and mineral deficiencies, such as vitamin B12, vitamin C metabolism, calcium, iron and magnesium. Gastric acid is necessary in the release of vitamin B12 from food. The use of PPIs is mentioned as a cause of this deficiency. Stomach acid and a slightly acidic environment from the proximal duodenum are needed to break down ingested calcium, making it available for absorption. Therapy with PPIs reduces the concentration of vitamin C in the human gastric juice and its amount in the antioxidant active form. PPIs may cause hypomagnesemia, but this idea is not clearly demonstrated in studies. Another example is the association between the use of PPIs and B12 deficiency, which is rare in clinical practice. PPIs may cause deficiency in iron levels, but there is little data to support this possibility.

Conclusion: Clinicians should be aware of this potentially serious electrolyte disturbance associated with the use of PPIs, particularly in at-risk populations such as patients who have chronic kidney disease or use concomitant diuretics.

Keywords: proton pump inhibitors; hypomagnesemia; vitamins; mineral deficiencies.

PIELONEPHRITIS

Ana Gabriela Marques; Beatriz Sousa; Nadine Ribeiro; Polina Ponedilok; Rita Melo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Pyelonephritis is an ascending urinary tract infection that is triggered by the proliferation of gram-negative and gram-positive microorganisms such as Escherichia coli (73-82%) and Klebsiella pneumoniae (2,7-6,2%) that settle in the kidney causing inflammation. This infection can manifest itself as acute (complicated or uncomplicated), chronic, Xanthogranulomatous or Emphysematous.

Generally, untreated urinary tract infections (UTIs) are thought to be the main cause although this type of illness arises more commonly in women as a result of greater proximity of the anus to the urethra, which is shorter in the feminine urinary system.

The diagnosis is routinely clinical but it is also frequent to do biochemical, microbiologic analysis and also imaging tests that are useful for screening anatomical changes or obstructions. Renal biopsy is rarely a method of diagnosis unless malignancy or complications in transplantation are suspected.

Differential diagnosis includes perirenal abscess, cystitis, and malakoplakia. Acute pyelonephritis (APN) is characterized by the presence of patchy suppurative inflammation and focal abscesses, while chronically, tubular thyroidization and an irregular scarred cortical surface is observed. In emphysematous pyelonephritis, cystic spaces formed by gas bubbles are detected in the renal parenchyma which, on the other hand, is replaced by CD68 positive macrophages in Xanthogranulomatous pyelonephritis. Treatment relies essentially on antibiotherapy, intravenous hydration and in cases of exacerbated infection, a nephrectomy might be performed.

Pediatric patients with APN have been described to have decreased mRNA and CXCR1 expression which renders them more susceptible when compared to healthy children, due to gene polymorphisms.

Keywords: Pyelonephritis; Kidney; Urinary tract infections; Infection;

ENDOMETRIOSIS

Alexandre Guerreiro, Catarina Gomes, Cláudia Furtado, Filipa Morgado, Ibrahim Gama

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Endometriosis is a complex, estrogen-dependent inflammatory disease, causing chronic pelvic pain and infertility in women of reproductive age. It is defined by the presence of a tissue similar to uterine endometrium abnormally implanted in extrauterine locations, most commonly in the pelvic cavity. Extrapelvic endometriosis is rare, although several cases have been reported. The ectopic endometrium contains glands and stroma and is functionally capable of responding to the cyclic secretion of estrogen, leading to an inflammatory response and fibrosis. Endometriosis can be expressed with a wide variety of symptoms, depending on the place of endometrial tissue implantation. While there are several theories regarding the origin of endometriosis, the exact pathological mechanisms are still unclear. Diagnostic laparoscopy with biopsy tissue remains the most reliable diagnostic method of this entity, but endometriosis detection is neither easy nor routine. Histologic diagnosis is made upon the identification of endometrial stromal cells, endometrial glandular cells, and evidence of chronic bleeding in or adjacent to endometrium-like tissue, including hemosiderin-containing macrophages.The significant individual and public health concerns associated with endometriosis underscore the importance of understanding its pathophysiology toward prevention. Treatment nowadays is based on painkillers and hormonal treatments, thus none of them are able to cure the disease. Recent studies have been evaluating the role of erastin, a small molecule capable of initiating ferroptotic cell death, as a potential therapeutic treatment of endometriosis.

Keywords: endometriosis, inflammation, fibrosis, histologic diagnosis, treatment

ESOPHAGITIS

Bárbara Barata; Joana Sousa; Maria Martins; Marta Gaspar; Mónica Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Esophagitis is an inflammation of the mucosal lining of the esophagus. The estimated incidence is 0.35 per 100,000 population with a prevalence of 55 per 100,000 population has been associated with food allergies, asthma, and eczema. This is usually more common in men who experience symptoms in their twenties or thirties. However, epidemiology depends on each subgroup.

This inflammation can lead to symptoms such as heartburn, difficult swallowing, chest pain, acid reflux, small bleeding from the esophagus, and others. In more severe cases it can progress to cancer. These can be prevented or attenuated by changes in the lifestyle and diet.

The patient's history and a thorough clinical evaluation, as well as upper digestive endoscopy and pHmetry are the foundation for the diagnosis of this condition. However, the time lag between symptoms and diagnosis results can increase the prevalence of esophagitis, leading to some clinical replications in patients.

Food allergies, prolonged time of contact with drugs, stomach acidity and infections help classify the esophagitis as eosinophilic esophagitis, drug esophagitis, reflux esophagitis and infectious esophagitis, respectively.

This inflammation can be treated based on medical recommendations, usually by taking medications that reduce stomach acidity. Only in more severe cases does it proceed to a surgical intervention.

As there is a large spectrum of inflammatory lesions in the esophagus and there are no reliably sensitive and specific histological features, several studies have been made about this condition.

Keywords: Esophagitis; Inflammation; Stomach Acidity; Esophagus; Acid reflux

LIVER FAILURE

Ana Beatriz Matos, Carolina Bastos, Helena Marques, Lígia Melo, Luana Martinho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Liver failure is defined by abrupt and severe liver abnormalities that can result in mortality in a short period of time. It can be caused by a variety of factors, including pre-existing liver disease, viral hepatitis, alcoholic liver disease, and the use of certain drugs.

Viral infections are the major cause of liver failure in developing countries, while in developed countries drug-induced liver failure is the most common.

There are two types of liver failure, acute and chronic, and three categories where the patterns of injury capable of causing this pathology fall, acute liver failure with massive liver necrosis, chronic liver disease, and liver failure without frank necrosis.

Acute liver failure is a rare complicated multisystemic illness that develops quickly following severe liver damage, resulting in encephalopathy and a high fatality rate. Chronic liver failure affects people with persistent liver disease and is characterized by significant systemic inflammation, organ failure, and a high death rate. It is most typically caused by preexisting cirrhosis and chronic viral hepatitis.

The symptoms of this pathology include yellowing of the skin and eyeballs, nausea, vomiting, pain in the abdomen, disorientation, tremors, among others. For ist diagnosis, we use blood tests, imaging tests, such as ultrasound and imaging analysis and, finally, tissue analysis, through a liver biopsy.

At the histological level, both show panacinar liver necrosis, variable ductular reaction, and variable inflammatory infiltrate.

The most prevalent clinical characteristics are jaundice, coagulopathy, and hepatic encephalopathy, and the sole therapy is liver transplantation.

Keywords: Liver failure; acute liver failure; chronic liver failure; cirrhosis; viral hepatitis; necrosis; liver transplantation

Discipline: Morphology and Histotechnology

Professor: Diana Martins

Degree: Biomedical Laboratory Sciences

A 85

Edition 16/21

IRRITABLE BOWEL SYNDROME (IBS)

Adriana Mira, Ana Cardoso, Mara Santos, Marta Santos, Vanda Falorca

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Irritable Bowel Syndrome (IBS) is a disorder of the gastrointestinal tract that affects mainly the colon, causing disturbances in gut motility. As bowel movement and activities are regulated by the brain, by what's called the gut-brain axis, defined as the "bidirectional communication between the central and the enteric nervous system, linking emotional and cognitive centers of the brain with peripheral intestinal functions", IBS is often referred to as a "brain-gut disorder".

IBS afflicts approximately 10-15% of the population worldwide, being one of the major and most common functional gastrointestinal disorders.

The clinical spectrum can vary from mild, to moderate, to severe, with up to 25% of patients displaying the latter. Symptoms include bloating, disruption of laxation (alternated episodes of diarrhea and constipation), bowel incontinence, excessive flatulence, and mucus in the stool.

Prevention is difficult, as the exact cause of IBS is unknown, however, current evidence suggests that certain factors play a role in the development of this disorder, such as increased gut sensitivity, perturbances in colonic mobility, excessive stress, and a family history of IBS (genetic factor). Also, there seems to be a connection between gastrointestinal infections and the subsequent development of IBS.

As there isn't a specific test that can diagnose IBS, diagnosis is usually done by the process of elimination. IBS isn't detectable through colonoscopy; however, a biopsy may be useful to come to a conclusive diagnostic.

IBS isn't curable, so treatment focuses primarily on relieving symptoms to provide patients as much of a normal life as possible.

Keywords: Gastrointestinal tract; Colon; Bowel; Motility; Constipation

CARDIOMYOPATHIES

Daniela Oliveira, Marco Pinheiro, Margarida Oliveira, Miguel Lourenço, Rui Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Cardiomyopathy is a disease of the myocardium associated with cardiac disfunction, consisting of progressive deterioration of the structure and function of the ventricular muscle walls, making it difficult for the heart to pump blood to the rest of the body. 1 in 500 adults may suffer from this condition, mainly affecting males and black people between the ages of 20 and 60. Its manifestations can vary from alterations in cardiac myocytes to fulminant heart failure, increasing the risk of sudden death when not treated.

There are 3 main types of cardiomyopathies: dilated (the most common), restrictive, and hypertrophic (most common with a genetic origin). They can also be divided into primary (genetic, acquired or mixed) and secondary (systemic or multi organ disorder).

There isn't a specific cause for this disease. However, there are risk factors that may lead to it, such as chronic hormonal diseases, obesity, alcohol and illicit drug consumption, previously damaged heart tissues, long-term high blood pressure and hemochromatosis.

In order to diagnose a cardiomyopathy, the patient is first asked if he or she has a family history of cardiomyopathies. Then, the patient is subjected to a blood test, as well as an echocardiogram, electrocardiogram, chest X-ray, scintigraphy and magnetic resonance imaging of the heart. A tissue sample may also be extracted from the inner wall of the heart by endomyocardial biopsy, for later visualization under a microscope. The treatment administered depends on the type of cardiomyopathy, its cause and the stage of heart failure.

Keywords: Cardiomyopathy, cardiac disfunction, heart failure, risk factors, diagnosis

PANCREATITIS

Ana Cristina, Joana Duarte, Susana Oliveira, Tatiana Silva, Télvia Bungo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Pancreatitis is an inflammatory process that can be acute, with an incidence range from 0.38% to 1.3%, or chronic that range between 0.04% and 5% in the general population. The main risk factors are gallstones and alcohol consumption.

The symptoms are usually characterized by intense and diffuse abdominal pain in the epigastric region, which is later confirmed by measuring pancreatic enzymes such as amylase, lipase, and trypsin and by non-laboratory tests such as abdominal ultrasound, endoscopic or magnetic resonance cholangiopancreatography, and computed tomography. Biopsy is only done if previous tests are inconclusive or in the case of differential diagnosis between tumor and inflammation.

At the macroscopic level, acute pancreatitis presents an edematous and hemorrhagic appearance, which is histologically represented by pancreatic tissue with fat necrosis due to the release of lipase.

Macroscopic chronic pancreatitis presents with atrophy and replacement of normal tissue by fibrotic tissue, these characteristics being visualized through histology.

The treatment of this pathology requires attention to the diet and hydration in the case of acute pancreatitis and in the case of more severe situations supplementation with pancreatic enzymes and taking analgesics. If treatment is not done in time, there is a risk of evolution to pancreatic pseudocysts, necrotizing pancreatitis, pancreas infection, and organ failure, showing that there is a greater risk for patients with chronic pancreatitis of developing pancreatic adenocarcinoma.

Keywords: pancreatitis, macroscopic, histology, symptoms, treatment

Discipline: Morphology and Histotechnology

Professor: Diana Martins

Degree: Biomedical Laboratory Sciences

A 88

Edition 16/21

POLYCYSTIC OVARY SYNDROME

Filipe Fadigas, João Colaço, Marcelo Vilas-Boas, Martim Ferreira, Neyda Lima

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Polycystic Ovary Syndrome (PCOS) or Stein-Leventhal Syndrome is a heterogeneous endocrine disorder that affects 6 to 10% of the female population worldwide. Up to 20% of all infertility problems (including fecundability and early pregnancy loss) are associated with PCOS as it is often called the most common cause of ovulatory infertility in women.

A defect of the androgen production with an increased bioavailability is the main cause of the cysts development leading to the symptoms of PCOS.

The pathophysiology of said disease consists of an excessive secretion of gonadotrophin-releasing hormone (GnRH) which stimulates luteinizing hormone (LH) production that leads to a follicule stimulating hormone (FSH) decrease. This prevents the normal follicular development leading to an irregular menstrual cycle. Hyperinsulinemia and a lack of hypothalamus sensibility to progesterone also plays a major role in the diseases development.

Diagnosis of PCOS in adult women can be made if both hyperandrogenism and ovarian dysfunction are found in the patient. In adolescents, it is made based on the presence of clinical and/or biochemical evidence of hyperandrogenism along with persistent oligomenorrhea.

Differencial diagnosis is based on Hyperprolactinemia, Thyroid Disease and Nonclassic Congenital Adrenal Hyperplasia.

Currently there is no cure for this pathology, however there are some treatments available for certain manifestations.

Keywords: PCOS; diagnosis; hyperandrogenism; cyst development; menstrual cycle

CROHN'S DISEASE

Ávila Andreia; Silva Ana Rita; Rosete Catarina; Barros Marta; Ferrás Marta

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Crohn´s disease (CD) is a chronic inflammatory disease of the intestine, included in the group of inflammatory bowel diseases, with growing worldwide incidence. CD doesn´t have an exact known cause, but it might result from a mix of numerous factors: genetic susceptibility, alterations of the gut, environmental factors that leads to dysregulated and adaptive immune responses.

This disease is characterized by segmental granulomatous inflammation in the intestine, with patients presenting symptoms such as chronic diarrhea, abdominal pain, weight loss and fatigue. Usually, CD is first misdiagnosed as infectious colitis or irritable bowel disease, as all three have many similarities between them.

Crohn´s incidence prevails among the ages of 16 to 40 years, from both sexes in equals proportions. However, some studies indicate that females have a higher prevalence.

Diagnosis is initiated with a colonoscopy where can be performed a biopsy. Later imaging test such as computed tomography (CT), magnetic resonance imaging (MRI) and ultrasonography, can be performed to complement a diagnose. Pathological findings include basal lymphoplasmacytosis, crypt atrophy or distortion of the architecture. In cases of chronicity, Paneth cell metaplasia can be found.

The prognosis can be evaluated by the appraisal of the severity of the disease. This severity is unique to itch patient, and is established by the basis of clinical parameters, systemic manifestations, and the impact of the CD.

There is no cure for this Crohn´s disease, therefore the treatment consists in reducing the inflammation and relieving the symptoms.

Keywords: Crohn´s disease; colon; inflammatory bowel diseases; diagnostic; colonoscopy.

PSORIASIS

Alexandra Pinheiro,Débora Mogadouro, Maria Pereira, Mariana Teixeira, Nicole Lopes

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Ciências Biomédicas Laboratoriais, Coimbra, Portugal

Psoriasis is a chronic, autoimmune, genetically based inflammatory disease affecting skin, joints, and nails. It can occur at any age, with peak incidence between the ages of 20-30 years as well as 50-60 years, affecting men and women equally.

The most common clinical presentation includes demarcated skin lesions, localized or generalized, mostly symmetrical, usually in areas of constant skin trauma such as the elbow, knees, scalp. The disease may present various clinical patterns according to the shape and appearance of lesions: plaque, gout, erythrodermic, pustular, inverse, ungual, arthropathic, and palmoplantar psoriasis.

Conditions commonly associated with psoriasis include psoriatic arthritis, uveitis, metabolic syndromes, pathologies associated with the cardiovascular system, and psychological disorders. There are several trigger factors, such as respiratory infections, stress, skin wounds, medication, obesity, smoking and alcoholism. These factors contribute to the onset and exacerbation of psoriasis and can provide insight into the pathogenesis of the disease as well as help patients better understand their own condition.

The diagnosis of psoriasis is primarily clinical, and a skin biopsy is rarely necessary, except in the less typical pictures where a histopathological examination is required.

On a histopathological level, regular acanthosis, lymphocytic perivascular inflammation, parakeratosis and spongiosiform pustules with neutrophilic, dilated vessels in the papillary dermis, alternating areas of hyper and hypogranulosis and thinning of the suprapapillary plates features are commonly seen.

Although there is no cure, there are three main forms of treatment, based primarily on the severity and clinical pattern of the disease: topical therapy; phototherapy; and systemic therapy.

Keywords: psoriasis, chronic disease, skin, inflammatory, autoimmune

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 91

Edition 16/21

EMULGENTS

Adriana Vieira; Ana Sacramento; Sara Rodrigues

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Emulsions are a colloidal dispersion formed by two immiscible liquids, usually oil and water, with one of the liquids dispersed in the other in the form of drops. The substance that is contained in the drops is called the dispersed/internal phase and the substance that constitutes the surrounding environment is called the continuous/outer phase.

Emulgents thus prevent the adhesion of particles from the two phases and are used to control the size and distribution of water droplets. These fall into 3 classes: surfactants, hydrophilic colloids, finely divided solids. A type of emulgent is selected depending on the intended purpose, the type of emulsion desired and its cost.

The types of emulgents: anionic emulgents, cationic emulgents and non-ionic emulgents.

Anionic emulgents are produced with a carbon chain with 12 to 18 carbons because the solubility of the oily portion is more adequate.

Cationic emulgents have at least one positively charged nitrogen atom. The positive charge will allow the emulgents to adsorb onto the negatively charged substrates, thus acting as antistatic and softening agents as they adhere to the surface.

The most abundant type of non-ionic emulgents are ethoxylates, in which the hydrophilic group is formed by a chain of polymerized ethylene oxide molecules, attached to a non-polar part. Non-ionic emulgents do not dissociate into ions in an aqueous solution and are therefore compatible with any other type of emulgent.

Emulgents are very important for the pharmaceutical, cosmetic and food, for example, in the production of butter.

Keywords: Emulsions; Emulgents; Drops; Phases; Grades.

FUSION GRANULATION

Ana Carolina Barbas; Bruna Silva; Clara Duarte; Dinis Boavista

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Granules can be a final pharmaceutical form after packaged or an intermediate product in the preparation of solid forms. They are highly resistant and can be obtained by melting, dry or moist. It has facilitated administration because they are convenient ways to pack high doses of drugs and have rapid dissolution and absorption.

Fusion granulation consists of heating a mixture of powders that will melt due to crystallization water and heat which can reach temperatures from 90ºC to 105ºC, forming a folder that will have to go through a sieve. This technique is divided into the high shear process with the addition of the binder and in the melting process, and can only be applied to substances with certain characteristics with various advantages.

Pharmaceutical applications range from the immediate release of soluble and insoluble active pharmaceutical ingredients (APIs), flavor masking and sustained release formulation. There are several fusion variables such as fluidity and morphology.

As an example, there is the process of double screw casting granulation from which you get a variety of particle sizes of ibuprofen granules, embedded in a lipid matrix. Ibuprofen products indicate that increasing granule size increases tablet hardness and a potential to mask flavor.

Fusion granulation is currently in disuse due to the high temperature at which it operates, only applicable to some substances, and is therefore replaced by wet granulation.

Keywords: Granulation; Fusion Granulation; Granules.

THE EVOLUTION OF PHARMACEUTICAL TECHNOLOGY

Ana Rita Duarte; Beatriz Vilas Boas; Dulce Fernandes

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

The evolution of pharmaceutical technology pharmaceutical technology is considered an applied science that's the main objective is to obtain drugs preparations. These science covers the technological and scientific knowledge Associated to the different phases that a drug is subjected making it possible to be administered.

It's up to this technology to study the best way to conserve the drugs to make it last for longer.

The pharmaceutical technology is very important for the pharmacist/technician on the day-by-day work and because of that we are presenting a historical evolution of these technology and impact in the society.

For such, bibliographic research was realized on the scientific repositorium of Coimbra university and the Google Scholar. from these research two articles were selected to explore the evolution of the technology in pharmacy.

To show the evolution of pharmaceutical technology, instruments, and drug preparations from prehistory to the present day will be discussed. With this research it was possible to conclude that the pharmaceutical sciences are, nowadays, considered fundamental in society, this due to the progress of technology in pharmacy. It is hoped that the evolution of technology in pharmacy will present an auspicious future of permanent discovery and evolution.

Keywords: Pharmaceutical technology; Pharmaceutical equipment; Evolution of Pharmacy.

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 94

Edition 16/21

IMPORTANCE OF THE LABEL IN PHARMACY

Ana Rita Lopes; Catarina Santos; Mariana Abreu

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

In the 21st century, we value technology and information more than ever. Combined, they allow fast dissemination, which requires a permanent update of the norms and rules that need to be complied. The label is a fundamental aspect of quality in the use of medicines, both by the health professional and the patient. In this work, we propose a critical analysis of the subject based on the legislation currently in use, as well as the selection of documents that are useful in the process of elaborating or evaluating the conformity of drug labeling. Whichever product is on the market, nowadays it must be properly identified and certified. As such, health products and pharmaceuticals must be correctly described, and it is through the labels that we have access to this information. The label must contain some information such as the name of the drug, the pharmaceutical form, the qualitative and quantitative composition of the active substances per administration unit, and it is also important to bear in mind other type of information, such as the validity and batch. The available information is essential for good use by consumers and health professionals, where all pharmaceutical industries must follow the information in DL 176/2006 of 30 August.

Keywords: Labels; Drug; Information; Legislation; Norms.

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 95

Edition 16/21

AIR SUSPENSION DRAGEIFICATION

Joana Duarte; Liliana Gomes; Liliana Rodrigues; Nádia Ferreira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Drageification is a process that consists of coating tablets, which must be small, stiff and convex in shape.

This process is summed up in three phases, the first is divided into an isolated layer whose main function is to make the tablets more resistant, an elastic layer, which gives elasticity, and a smoothing layer, which makes the surface of the dragee plain. The second step consists in adding a simple syrup, colored or not, and in the third phase, polishment is performed in order to obtain the desired brightness.

Drageification by air suspension air is a process to obtain granules by suspension in a current of air, using an equipment created by Wurster. The structure of the device consists of a vertical tube that ends in a wider part (where the granular powders are placed), a compressor system (it launches a rising air stream, preventing the deposit of powders), a heating system (elevates the temperature of the air entering the compressors), a system of adjustable plates (that regulates the air speed) and by atomizers (they throw the granulating solution onto the powders).

At the top of the device there's an extractor hood that clears the excess moisture and allows drying.

The tablets suspended in air, when they reach the highest portion of the device, tend to fall and receive the atomized solution, whose solvent is evaporated by agitation and temperature of the air entering and leaving.

This process is not only very economical, but also very fast.

Keywords: Drageification; Coating; Wurster; Suspension.

FLOCCULATION OF EMULSIONS

Cláudio Oliveira; Diana Rebelo; Filipa Bento

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Emulsions are formed by stirring two immiscible liquids, such as oil and water, in the presence of an emulsifier, and are made up of a dispersed and a continuous phase.

Garret defined a stable emulsion as one that "would maintain the same particle size of the dispersed phase per unit volume weight of the continuous phase. The total interfacial energy must remain invariant over time in order to comply with this definition," knowing that stability is critical to the quality of the final product.

The particles that constitute emulsions are electrically charged either positively or negatively. However, when the particles are totally or partially neutralized their aggregation occurs, resulting in flocculation.

Flocculation is a phenomenon of the formation of dispersed droplets in clusters in the emulsion, with each component of the cluster maintaining its identity as well as maintaining a kinetic equilibrium with its environment.

Flocculation is favored by several phenomena such as increased electrolyte or emulgent concentration and tight packing of the dispersed phase.

Reversibility is a theoretically possible process that is dependent on the strength of the interaction of the particles, the chemical nature of the emulgent, the ratio of the volumes of the phases, the concentration of the dissolved substances, ionic emulgents and especially electrolytes.

To conclude, we can say that flocculation can be divided into primary and secondary depending on the reversibility of the flocculation process and that this phenomenon is undesirable because it promotes coalescence due to the closeness of the droplets.

Keywords: Emulsions; Stability; Flocculation; Reversibility.

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 97

Edition 16/21

TROCHISCATION

Ângela Afonso; Melanie Afonso

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Powders are pharmaceutical preparations composed of solid, free, dry, more or less fine particles, which are used either as a direct form of administration or in the preparation of other galenic forms.

Until reaching the desired state, the powder undergoes several preliminary operations, is pulverized and can also undergo accessory operations, such as trochiscation. This technique or method of operation is to facilitate and speed up the drying of a pulverized product, dividing the agglomerate resulting from humid porphyrization into small fragments, being also used in pasty masses that result from a chemical pulverizing.

When porphyrized, very fine powders are obtained by rubbing the substance with a pestle with a slightly convex end against the porphyry. If the powder is porphyrized by humid way, water is added, since it does not react with a substance or dissolve, the result of this product is brought to trochiscation and then desiccated.

The instrument used in this pharmacological operation is called a trochiscater. This consists of an orifice where fits a funnel. Put the product inside the funnel and beat until the trochiscs drops into a filter paper. The trochiscs are then desiccated and reduced to powder by grinding in a mortar.

So, we can say that the trochiscation method, proves to be quite important in pharmacy, is an accessory operation subsequent to humid porphyrization, promoting the drying process of the pulverized product.

Keywords: Powder; Trochiscation; Porphyrized; Galenic forms; Pulverized.

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 98

Edition 16/21

SPRAYING THROUGH AN INTERMEDIARY

Diogo Silva; Élio Pereira; João Caçola

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Before being reduced to powder, the active ingredient must be subjected to different preliminary operations to make it fit for the process. Spraying should be the process used depending on the nature of the materials and the tenuity of the powder we want to obtain.

Spraying through an intermediary is only used when the active ingredient has physical characteristics that make spraying by mortar ineffective and a foreign substance is then added in order to facilitate the process, which can be permanently mixed with the powder or eliminated later.

This type of spraying can be performed in 3 ways according to the type of intermediate that is used: solid, liquid or gaseous. In solids they are subdivided into soluble and insoluble and examples are sugar, sodium chloride and sodium sulfate. In liquids, the most used is water, but ether, alcohol, olive oil and other oils are also used. And finally gaseous substances, they are applied for spraying volatile substances and at low temperatures solidify into very fine powder.

In short, this is an effective process when it is not possible to spray by the traditional method and can cover a wide range of active ingredients with different physical characteristics.

Keywords: Spraying; Intermediary; Powder; Active ingredient.

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 99

Edition 16/21

PULVERIZATION IN MORTAR

Ana Durão; Ana Rodrigues; Pedro Coelho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

Pulverization in mortar is a technique used in pharmaceutical laboratories that consists in reducing small quantities of material to powder.

There are two types of pulverization in mortar, one by contusion and the other one by trituration.

The pulverization in mortar by contusion consists in vertical movements of the pestle and it's applied in small quantities with the purpose of not making a very thick layer in the bottom of mortar, which would make the operation longer.

This method is commonly used in vegetable drugs, animal drugs and chemical products in the form of large crystals.

The other method, pulverization by trituration, is made by spiral movements from the center to the walls of the mortar and back to the center again.

Therefore, is a methodology typically applied in drugs that agglomerates by pressure, drugs that soften by the heat of the pestle shocks (in contusion technique) and in explosive substances (potassium chlorate).

It is possible to conclude that this technique is essential in pharmaceuticals labs because it allows to perform fundamental functions in the manipulation of meds, as so the preparation of powders and simple or composed pharmaceutical formulas.

Keywords: Pulverization; Drugs; Mortar; Pharmaceutical.

Discipline: Galenic Technology and Pharmacy I

Professor: Jorge Balteiro

Degree: Pharmacy

A 100

Edition 16/21

PRIMARY AND SECONDARY DRUG PACKAGING

Ana Sofia Lobato; Carlos Oliveira; João Simões

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Farmácia, Coimbra, Portugal

The quality of the drug is closely dependent on the primary packaging in association with the secondary packaging, which ensures a protective, functional and identification function.
The package material used must provide adequate protection from environmental conditions. All drugs must be packaged with primary packaging that can vary from a glass vial to a blister, or even glass, plastic or metal tubes. Surrounding the primary packaging is often a secondary packaging, usually called cartonage, which should repeat the information contained on the primary packaging The secondary packaging is usually presented in the form of cardboard boxes. There is a Packaging Register, prepared in an internal model and containing all the packaging instructions according to the AIM holder's specifications. This document contains all the information concerning the conditioning process, namely the description of the product and the packaging material, the composition of each box of finished product, and the operations to be performed.
The labeling must contain an invented name or generic name, the name of the active substance, the pharmaceutical form, the number of units, the batch number, and it is also mandatory to clearly indicate the date of manufacture of the drug, the expiration date and the storage conditions.
Each package of finished product shall consist of blister packs, ampoules, vials or tubes, the respective package insert and legible marking of the batch and expire date.

Keywords: Package; Conditioning; Drugs.

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 101

Edition 16/21

CLIMATE CHANGE AND ITS IMPLICATIONS FOR FOOD SECURITY

Érica Grangeia; Rita Medeiros; Marta Machado; Sofia Jacinto

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Climate change is one of the most important topics nowadays. Food safety is defined as a need for all people, at any moment, to have physical, social and economic access to enough safe and nutritious food that satisfies their preferences and dietary needs for an active and healthy life.
The objectives of our study were to understand the impact of climate change on food safety, and to acknowledge the inquired population's level of knowledge on the topic.
To develop this essay, a bibliographic revision of the topic in study was carried out, as well as the implementation of an online questionnaire to a diversified population.
Through the results of the questionnaire, we can conclude that the population's level of knowledge about the impact of climate change on food safety is high (89,5%), being that 35,7% shows concern to choose food that is sustainable. The problematic of packaging is also taken into consideration, given that plastic plays a negative role on climate change, however, it is quite important when it comes to food safety.
Food safety becomes a challenge when thinking globally and is underestimated by governments and commercial entities a lot of times. The necessary measures of hygiene and food safety must be taken into account from production to distribution, in order to not present any form of danger to the public health.

Keywords: Climate change, Food security, Environment, Health

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 102

Edition 16/21

CLIMATE CHANGE AND FOOD

Andreia Curinha; Inês Esteves; Inês Mota

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Climate change has been recognised worldwide as one of the most important factors that can affect the safety of food consumed in the world, given its potential impact on the occurrence of hazards in foodstuffs, from primary production to consumption. In recent years there has been the impact of climate change on agriculture, particularly on soil quality, water availability and biodiversity, affecting food production.

In this article, we intend to evaluate the perception of the population about the relationship between Climate Change and Food. So, we did a bibliographic review and a survey. This survey consisted in 11 questions and obtained 78 answers.

After analyzing the results, we were able to conclude that more than half of the population surveyed live in urban areas and consider their diet reasonably healthy, they consume mainly natural foods and foods of their own cultivation at least once a week. We could also see that the majority of the population surveyed is informed about the influence of climate change on food and vice versa. However, it turns out to be worrying that more than 1/4 of the population surveyed consider that man has a direct influence on climate change and that these are a minor and short-term change.

Climate change caused by exponential increase in greenhouse gas emissions will have serious and broad impacts on the oceans and economy. At long term, these changes could even lead to disasters such as rapid sea level rise, food and water shortages in some parts of the world.

Keywords: Climate Change, Impact, Food, Survey, Influence

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 103

Edition 16/21

EATING BEHAVIORS IN THE PANDEMIC

Beatriz Silva; Joana Moutinho; Rita Ferreira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Eating behavior has two main functions: maintaining the amount of nutrients necessary for our survival and the pleasure that eating provides us, releasing neurotransmitters responsible for pleasure and well-being.

In March 2020, the COVID-19 outbreak was declared a pandemic by the World Health Organization, affecting the economy, health care, and well-being of the population.

As psychoemotional and environmental changes established and are related to the alteration of eating behavior. Tension leads to increased hunger sensations, with the next in search of sugary "comfortfoods".

This article aims to evaluate the eating behaviors of the population in the COVID-19 pandemic. For the elaboration of the same, a bibliographical research was carried out on the subject and a survey was applied to the general population.

The majority of the population studied, that is, 48.1% rarely practiced physics in the last months of the past months, about 15.1% practiced some types of physical exercise every day, 25.5% with some regularity and 11.3% pratitic type of exercise. Although 72.6% believe that their sedentary lifestyle suffered a negative change during a pandemic, 27.4% said that this change was positive.

The World Health Organization and an American Heart Association have defining strategies to reduce the risk of disease. Among them is the adoption of a diet rich in fruits and vegetables, giving whole grains, rich in fiber, fish, meat and dairy products with low fat content.

Keywords: Pandemic; Stress; Physical activity; Sedentary lifestyle; Feeding

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 104

Edition 16/21

FOOD SAFETY WHEN USING LUNCH BOXES

Ana Gonçalves; Eduarda Sousa; Francisca Carvalho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Food is a process in which living things assimilate the food needed to carry out their vital activities. Without food it is not possible to perform basic functions. Food safety must be understood as a vital commitment and goal by all food organizations throughout the entire supply chain.

The lunch box has come to strengthen proper nutrition associated with a healthier lifestyle. In the lunch boxes it is important the thermal coating to preserve the food temperature until the moment of ingestion.

Of the 162 respondents we concluded that 63.6% carry their food in plastic, although 88.3% of the population knows that the best material to carry food is glass. Simply, 20.4% of the respondents know the safe temperatures to keep the food.

With this work, we intended to evaluate the level of knowledge and good practices about food safety in the use of lunch boxes. We found that it would be interesting to conduct awareness-raising actions because 76% of respondents do not know what temperatures are necessary to keep food safe.

Keywords: Food; Lunchboxes; Plastic; Good practices; Temperature

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 105

Edition 16/21

GOOD FOOD SAFETY PRACTICES IN HIGHER EDUCATION STUDENTS

Carolina Brás; Mafalda Azevedo; Tatiana Gonçalves

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

With the growing demand for a healthy lifestyle, food safety now plays an extremely important role in consumers' daily lives, making them also more aware and informed in this field.
As such, consumers have a greater perception of the dangers that incorrect handling of food can present. One of the concerns is to minimize events that are harmful to health, taking into account the entire process, from the production of food to its consumption. To ensure consumer safety, it is essential that good hygiene practices are applied to food products.
The aim of this study was to understand how Portuguese students perceive food safety in their daily activity and what behaviors they adopt in the purchase, transportation, storage, preparation and preservation of food. Regarding methodology, we conducted a survey, using bibliographic research, which we then applied to the community of Higher Education students.
Through the 95 responses obtained, it appears that these students give importance to food safety in their daily lives (93.7%), adopting mechanisms and practices aimed at minimizing the risk of food contamination and, consequently, preventing foodborne diseases. It was also found that respondents are able to classify foodborne diseases, as well as the procedures to be adopted in case of suspected food poisoning.
Given that these young people play an important role in the country's development, they should be empowered with health skills that enable them to make healthy and safe food choices.

Keywords: Food safety; Practices; College education; Food poisoning; Skills

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 106

Edition 16/21

FOOD WASTE IN THE PORTUGUESE POPULATION

Ana Jesus; Maria Pinto; Maria Vieira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Food waste is a major global problem, with an estimated 30-50% of edible food wasted annually in Europe, representing an annual loss of 89 million tons in the European Union. This problem occurs at all stages of the food life cycle, from harvest, processing and production, to trade, transport and finally consumption.

This work aims to analyze, through the applied questionnaire, the knowledge and behaviors of the general population about food waste, its implications and consequences on the environment in which we live. For this, a questionnaire was applied, with online response, to the Portuguese population on the explored theme.

In the survey, 120 answers were obtained, with the majority of respondents presenting knowledge on the subject and showing concern about performing good practices to mitigate food waste. It is noteworthy that the level of knowledge about food waste today was another topic addressed in the survey, to which 65% of people chose the option "Medium", 18.3% chose the answer "High", and 15.8% claimed to have a low level of knowledge on the subject.

As Environmental Health Technicians we have a key role in mitigating this problem and, from the perspective of sustainable development, we are responsible for the application of specific technologies for food waste treatment, namely biological composting processes, in order to create strategies to prevent the production of this waste stream.

Keywords: Food Waste; Impacts; Level of Knowledge; Food Chain; Reduce

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 107

Edition 16/21

EATING BEHAVIORS OF STUDENTS AT UNIVERSITY

Ana Henriques; Ana Ruivo; Larissa Monteiro; Maria Anjos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The entrance to the university is defined by a transition sometimes drastic that leads to changes in student's lifes, like eating habits, physical and cultural activities, and others. We know that food habits and choices are influenced by several factors, including economic, psychological, social, cultural, as well as knowledge about food and nutrition. We all have different eating habits and it is normal that the way we eat can be affected, like when we feel under pressure, suffering or stress.

This work aimed to identify, evaluate and understand the eating behaviors of students before and after their entrance into university.

Our research method applied in this study was based on bibliographic research and application of a questionnaire to university students.

From the results obtained we got like 144 responses. About students' diet, 68.8% answered that it got worse after entering university. In respect to breakfast, it was found that most of the students practiced and actually practice this act. About coffee consumption, most people drink two or more coffees a day so there was an increase of 10.4% after entering university. It was found that school pressure influences the consumption of coffee and energy snacks (51.4%).

To finish, we think that it is very important to alert students about the need of changes in their eating behaviors, such as trying to reduce the consumption of fast food and sweets, because these behaviors tend to continue into adulthood.

Keywords: Eating behaviors; University; Healthy Eating; Students; Stress

Discipline: Quality and Food Safety

Professor: Cristina Santos

Degree: Environmental Health

A 108

Edition 16/21

FOOD SAFETY DURING THE PANDEMIC

André Prior; André Mendes; Tiago Oliveira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Food safety is about handling, storing and preparing food to prevent infection and to help ensure that our food retains enough nutrients for us to eat a healthy diet. Unsafe food and water means that it has been exposed to dirt and germs, or may even be rotten, which can cause infection or disease.

Nowadays, food safety is a major concern for citizens and entities in the food and catering industry, it is a necessary condition for consumer protection.

The objective of our work is to evaluate the Portuguese population regarding the conditions of food safety, for this we made a literature review and a questionnaire on "Food safety during the pandemic".

The pandemic by COVID-19 represents one of the greatest public health challenges of this century, causing impacts on the health and living conditions of populations around the world. As we live through this pandemic, it is essential to implement good hygiene practices, as it justifies the care to be taken with food preparation, handling and ingestion. The types of contamination can be biological, chemical or physical, so all companies that move or manipulate with food must present enough knowledge to avoid any kind of contamination.

The relevant authorities have a critical role to play during this pandemic, working with all sectors of the food industry so that food producers and processors can continue to operate effectively and keep safe food supply lines open.

Keywords: Food Safety, Covid-19, Pandemic, Good practices, Food

FOOD SECURITY IN FOOD DONATION

Frederico Pascoal; Hugo Ruas; Rodrigo Semedo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The importance of food in the health of consumers and the dangers that food can represent when it is not properly handled throughout the agri-food chain are now well recognized by all. The transport and distribution of food products is often one of the weakest links in ensuring food safety. This work aimed to verify the safety in the handling and distribution of foodstuffs donated by two companies. To carry out this work we evaluated the structural and functional hygienic-sanitary conditions in the donation of foodstuffs. According to our results we can state that the transportation and storage of products differ according to the type of foodstuffs donated by the various social solidarity institutions. Although there are aspects to improve, we verified that both institutions were careful in transporting the food, since it arrived sealed, properly identified, and within the legislated time frame. Regarding storage, we verified that Company 1 follows a strict routine so that all food products are stored, prepared and cooked in a way to reduce any type of contamination. We conclude that the transportation of foodstuffs is of great importance for food safety, since a variation in temperature or a failure in insulation can lead to microbial growth, putting the health of consumers at risk. The adequate and hygienic storage of food presents equal importance in preventing the spread of pathogenic microorganisms.

Keywords: Transport, Donation, Public Health, Food Safety, Storage

PULSES-BASED PASTA: IS IT A GOOD ALTERNATIVE?

Ana Stanczyk; Carlota Rego; Daniela Teixeira; Mariana Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Pulses are an essential part of a balanced diet. Pulses-based pasta usually has pulses as the only ingredient and it can be a good option in certain situations. As it does not have gluten in its composition, it is suitable for celiacs and people with gluten sensitivity.
Aim: Analyse the nutritional label and the price of pasta based on pulses, from different brands and their respective comparison, to understand its potential benefits.
Methods: Data collection was carried out on the websites of the product and also physically at a large random commercial area. Pulses-based pastas of three different flavors were chosen - red lentils, buckwheat and chickpeas - from three brands (nine pastas in total). Nutritional data, such as energy value, lipids, saturated fatty acids, carbohydrates, sugars, proteins, salt and fiber was analyzed.
Results: Pulse-based pasta contains twice as much protein and four to eight times as much fiber as pasta made from wheat. When comparing the information on the label of pasta per 100 grams with the information provided in the label decoder, all the pasta was within the values considered healthy, except for the pasta that contained chickpeas and a buckwheat pasta that had values for the lipids above those considered healthy.
Conclusion: From a nutritional point of view, in addition to their richness in protein and fibers, the pulses pasta also contains higher resistant starch than gluten-free cereal pasta, which could be interesting to expand the range of this type of pasta available on the market today.

Keywords: “Pulse-based pasta”; ‘’Fiber’’; ‘’Gluten-free’’

ENERGY BARS: SUGAR IN ATHLETES' PERFORMANCE

Íris Fartura; Joana Rosa; Joana Silva; Liliana Almeida; Mariana Cruz Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Energy bars, which contain mainly sugar, are a practical snack for people who need quick energy. The sugar we get through our diet is an important source of glucose for the body. Ingesting these may improve endurance performance and delays fatigue in athletes.
Aim: Analyse the sugar present in energy bars available on the market, and its impact on improving the performance of athletes in their physical activity.
Methods: For this study, 4 brands of energy bars were selected (3 supplier brands and 1 own brand), and within each brand two flavours (chocolate and banana), for a total of 8 samples. In November, through online sites, we analysed the ingredients, energy value, macronutrients, salt, sugar, and price, from each bar.
Results: The role of sugar, specifically glucose and glycogen, in different types of exercise (submaximal, supramaximal, and intermittent) varies. The analyzed energy bars contain large amounts of carbohydrates, especially sugars, and can be used as muscle fuel, increasing the ability to perform prolonged exercise. It was found that there is no great difference between the two flavours regarding the amount of sugars, except in the MF3 brand, where the chocolate one is lower.
Conclusion: The consumption of energy bars is a quick and effective option for athletes to restore or increase their muscle glycogen stores, and thus not limit their performance capacity. However, it is essential that athletes have a correct diet in addition to consuming these snacks, as a practical alternative, to maximize their performance.

Keywords: "Glicose", "Frutose", "Athletes", "Sugar and Performance"

Discipline: Nutritional composition of foods

Professor: Sónia Fialho

Degree: Dietetics and Nutrition

A 112

Edition 16/21

NUTRITIONAL COMPOSITION OF PLANT-BASED ALTERNATIVE MILKS AND THE IMPACT OF THEIR CONSUMPTION BY CHILDREN

Cintia Antunes, Ines Fernandes, Natalia Souza, Rafaela Manso, Sandrina Domingues

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Background: Ethical, environmental and health concerns are increasing the consumption of plant-based alternative milks (PBAM), but most of them don't provide the total nutritional value of cow's milk, and are often nutritionally unbalanced, generally not meeting nutritional needs especially in infants and children. Therefore, these plant-based alternative milks are typically fortified with vitamins, amino acids and minerals.

Aim: Evaluate the nutritional composition of plant-based alternative milks and the impact of their consumption by children.

Methods: During the month of October, three plant-based alternative milks were selected to analyze throughout this work from an Online platform of a commercial surface, in this case, almond drink, rice drink and soy beverage from three distinct brands: one of own brand and two of supplier brand. The label analysis was carried out in a local supermarket.

Results: According to the label analysis, soy milk is an important source of protein, having the highest values compared to almond and rice beverages. Almond milk has the lowest calorie value, while the highest sugar values are recorded in rice drinks.

Conclusion: When plant-based alternative milks are used as substitutes of cow's milk, the consumer should consider the nutritional density and the bioavailability of certain nutrients. Vulnerable groups like infants should consume fortified plant drinks, in order to prevent nutrient deficiencies.

Keywords: ''Cow's milk allergy'', ''Milk beverages'', ''Plant-based alternative milks'', ''Soy milk''

VEGETABLE ALTERNATIVES TO YOGURT

Andrea Tomás, Inês Lisboa, João Silva, Matilde Ascenso, Patrícia Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Nowadays, it is suggested to privilege the presence of plant foods in our diet. Vegetable alternatives to yogurt (VATY) seem to be a good option for those who follow a specific diet, where animal or dairy products are not a part of it. However, plant-based dairy alternatives are often perceived as healthy and their inadequate use may lead to possible nutritional deficits.
Aim: Understand the nutritional profile and potential health impact of the VATY , with special focus on sugar and fat content.
Methods: The products were selected between October and November, through e-commerce and a supermarket visit, based on their nutritional declaration and ingredients, which resulted in a selection of 6 different VATY differing on the base and aroma.
Results: Half of the products contain more sugar than recommended (>5g/100g) and in terms of saturated fat content, the oat base products reveal a superior value according to the recommendations (>1,5/100g). Only 2 VATY are fortified with calcium and certain vitamins.
Conclusion: Depending on the base or aroma, nutritional profile of the product may vary. It's important to consider it when choosing the product, since some of them may have certain substances that in a daily consumption don't benefit the general health.

Keywords: ''Vegetable alternative to yogurt''; ''Plant based''; ''Dairy alternatives"

ARE GRANOLAS/MUESLIS A GOOD OPTION FOR A HEALTHY LIFESTYLE? NUTRITIONAL COMPARISON OF SEVERAL COMMERCIALISED BRANDS

Ana Beatriz Almeida, Ana Filipa Ferreira, Ana Margarida Almeida, Camila Matos, Cláudia Araújo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Concerns about health and nutrition have been rising in the last decades. Adopting a healthy diet implies eating breakfast, where the incorporation of cereals has been described as beneficial.

Aim: Perform a comparative analysis of granola/mueslis, assessing their nutritional quality as part of a healthy diet, and acknowledging the guidelines for intake of saturated fats, sugars, and salt.

Methods: Ingredient statement, nutrition declaration, and price of 12 commercial granolas/mueslis were collected. Food products were classified according to their flavour. Aggregate and individual analyses were made and selected per portion values were compared with WHO guidelines.

Results: Three varieties were obtained (chocolate, fruit, nuts) from two supplier's brands, a retailer's own brand, and an organic brand. Analyses revealed a large average number of ingredients and a non-trivial presence of multiple types of sugars, notwithstanding a few exceptions. The nuts variety had less saturated fats than chocolate, less carbohydrates than fruit, and less sugar than the other two (per 100g). Three out of four nuts' granolas/mueslis achieved an "A" in the Nutri-Score. Likewise, granolas/mueslis from the nuts variety showed the lowest per portions values of saturated fats, sugars, and salt.

Conclusion: Although granola/muesli is seen as part of a healthy lifestyle, not all can be considered healthy. Aggregate and individual analyses indicate the nuts variety as having the healthiest products. Overall, this study concludes that there is no single indicator of a product's nutritional quality, becoming necessary to examine multiple information to make a more complete assessment of food products.

Keywords: "Breakfast cereals"; "Food labelling"; "Nutrition declaration"; "Nutritional quality"; "Healthy diet".

HIGH PROTEIN YOGURT: A NUTRITIONAL LABEL ANALYSIS

Filipe Duarte, Marta Cardoso, Milena Santos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Nowadays there is an increasing trend associated with dietary pat-terns that emphasize benefits of a high protein intake. Protein yogurts are becoming a much sought-after alternative for athletes due to their protein content and variety in a diet plan.

Aim: Analysis of the labeling of protein yogurts of 5 brands, nutritional claims made and compliance with current legislation, and how these yogurts can play an important role in protein intake in athletes.

Methods: Data was collected between the months of October and November 2021, through field research and in e-commerce analysis. The samples consisted of 5 different brands of protein yogurts and different flavors.

Results: By analyzing the labels of the samples collected, we found some differences in the protein content, with values ranging from 7.5g to 11g. Naturally flavored yogurts had the highest protein content, along with distributor brand 1. All allegations made, are ac-cordingly to legislation in force. Other fluctuations in values analyzed seem to meet the differences found in the ingredients list.

Conclusion: With approximatively 30% of daily intake being comprised of snacking, yogurts are an available option, which can easily be consumed. Considering the values recommended for protein intake in athletes, by stipulating an average value of 1,7g, an individual with an average weight of 70kg, requires 119g/day of protein. Protein yogurts, depending on the product chosen, can provide from 6% to 9% of the recommended intake.

Keywords: "Food fortification", "Protein intake in the athlete", “High protein yogurts”

WHAT IS THE MOST SUITABLE MILK REPLACER FOR YOUR BABY?

Ana Beatriz Santos, Ana Pinheiro, Luísa Capela, Rita Marinho, Tânia Venâncio

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Milk baby cereals is very important in baby's diet from the 6th month of life on because it increases food diversification with the introduction of new foods. Porridge has a pleasant taste, smooth texture, and is easy to digest.

Aim: Evaluate the nutritional labelling of milk porridge, with special emphasis on the sugar content in it, given the target population for this type of product, children over 6 months of age.

Methods: Data collection for this study was carried out between November 4 and 11, 2021. We conducted an online search in the e-commerce of commercial surfaces, as well as a presencial search in the stores, to compare different existing porridges. Depending on the largest availability in the stores, we selected 2 own-brand and 3 supplier brands. Based on the selected brands, we chose identical flavours to allow a proper comparison in terms of macronutrients, micronutrients, and ingredients.

Results: Our results show that there are some differences between the different milk baby cereals both in terms of macronutrients and price. Nowadays there is a big concern with the amounts of sugar and salt ingested, in this case the one with the most amount of salt has 0,36g per 100g and all analyzed products have more than 5g per 100g of sugar.

Conclusion: The information of this study can be used to design specific feeding strategies within public health initiatives to improve infant diets and to guide parents on appropriate food selection.

Keywords: "Baby cereals", "Analyses of macronutrients"

Discipline: Nutritional composition of foods

Professor: Sónia Fialho

Degree: Dietetics and Nutrition

A 117

Edition 16/21

ANALYSIS OF THE SUGAR CONTENT IN FLAVORED SOLID YOGURTS OF DISTRIBUTION BRANDS

Beatriz Gouveia, Gonçalo Castanheira, Inês Alves, Luísa Moreira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Products that result from the processing of milk are called dairy products and yogurt is an example of them. Yogurt is a coagulated product, done by lactic fermentation on milk and milk products; coagulation takes place in the individual packages to keep the specific flora in high values. In this type of yogurt, the dairy portion can´t be lower than 75%. A flavoured yogurt results from the addition of flavourings to natural yogurt. In Portugal, Integrated Strategy for Healthy Eating (EIPAS) recommends an added sugar content lower than 5g/100g.

Aim: Analyse the labelling of flavoured solid yogurts of different brands and flavours, especially their composition in terms of sugar content, and then compare the data obtained with the values recommended by EIPAS.

Methods: In November 2021, through the websites of 3 different distribution brands, we collected information about flavoured solid yogurts. From each one, we selected three different flavours. In order to find relations between the different brands, we chose the same flavours between brands (strawberry, coconut, and tutti-frutti). To evaluate the sugar content in yogurts, we compared the values obtained with the values recommended by EIPAS.

Results: In the total of 9 yogurts, none complies the EIPAS recommendations for 2020 an added sugar content of 5g/100g. The lowest sugar value was 5,8g/100g. This shows a 0% satisfaction rate with the value recommended by EIPAS.

Conclusion: The effort to decrease the sugar contents must continue, showing the collaboration of the food industry in improving these products.

Keywords: “Flavoured solid yogurts”, “Dairy products”, “Sugar content”

Discipline: Nutritional composition of foods

Professor: Sónia Fialho

Degree: Dietetics and Nutrition

A 118

Edition 16/21

THE USE OF PROTEIN BARS IN PHYSICAL EXERCISE

Inês Maltez, Maria Ana Serrano, Sara Faria, Vitória João

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Protein bars emerged as a food supplement, for quick snacks, in order to temporarily satisfy hunger. It is often consumed by athletes, for the growth of muscle tissue, used in the nutrition of elderly and people at risk of developing sarcopenia, such as space food, military food and emergency food. In addition to protein, there are other value-add components that have an impact in the choice of protein bars.

Aim: We intend to analyze and compare the nutritional composition of different protein bars existing in the market and understand their consumption in sports practice.

Methods: In conducting this analytical observational study during October, four flavors of protein bars were selected to analyze throughout this work from online platforms of various commercial surfaces. We analyzed six distinct brands, five of them corresponding to a supplier brand and one to a distribution brand. Based on the values found in several scientific articles, we compared the amounts of protein, saturated fat, carbohydrates and sugars in the different protein bars.

Results: In nutritional terms, comparing protein, carbohydrates, sugars and fatty acids and considering the 4 flavors, chocolate, hazelnut chocolate, chocolate and caramel and caramel, the 4 that stood out were the distribution brand 1. Among them all, the protein bar that stood out the most was the one with caramel flavor from the distribution brand 1.

Conclusion: Protein bars can be a good way to introduce more protein in several diets according to different lifestyles, but we must acknowledge that protein bars provide other nutrients such as carbohydrates, sugars and fatty acids. When choosing them we must consider their nutritional status and the ingredient list.

Keywords: “Protein bars”; “Sports practice”; “Proteins”; “Protein bars athletes”; “Nutritional composition”.

Discipline: Occupational Health

Professor: Hélder Simões

Degree: Environmental Health

A 119

Edition 16/21

THE WOMEN AND THE SAFETY AND HEALTH AT WORK

Célia Fontes, Elisa Cordones, Lara Morais, Mariana Serralheiro

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The objective of this work was to understand women in the context of Safety and Health at work and what the main problems are. In order to carry out this work, a research was conducted on this recurring problem in the daily lives of female workers.

In the last decades of the 20th century, we have seen an increasing number of women in the labor market, proportionally much higher than the number of men. This great achievement brings with it issues related to the gender dimension in Occupational Safety and Health. These issues are mainly related to the different repercussions associated with work for men and women.

Women's exposure to some hazardous substances has serious impacts on biological agents on reproductive health, the physical demands of heavy work and the length of working hours, especially when reconciled with family life and responsibilities, must be equally considered in women's safety and health at work. The issue of pregnancy remains a factor in not being hired in some jobs.

As it is an achievement for women to be able to enter the labor market more and more, the policies of safety and health at work are still something to be conquered, so much so that the risks for men are currently much more known and taken seriously and where safety and health at work acts more, forgetting women.

According to data from the 5th European Working Conditions Survey, 2010, we can state that in Portugal: 7.7% of women and 5.7% of men stated that they were exposed to materials that can transmit infectious diseases; 9.4% of women and only 3% of men stated that they lift or move people at least 1⁄4 of their working time. These figures have remained virtually unchanged since 2010.

Keywords: Women; Safety and Health at work; risk; achievement.

GREEN JOBES

Beatriz Fonseca; Bernardo Fontinha; Bianca Fontes; Daniela Leitão; Mafalda Póvoa

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The United Nations Environment Programme defines green jobs as all those that contribute considerably to preserving or restoring the quality of the environment. These make it possible to increase the efficiency of energy consumption and raw materials, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems, and contribute to adapting to climate change (Iberdrola, 2021; OSHA, 2020).

Through a literature review, with information taken from official websites of duly certified entities and various scientific articles, information was gathered in order to expose this theme.

The United States of America is the country with the highest percentage of green jobs, followed by Germany and the Dominican Republic. In Portugal, it is possible to verify that most of the green jobs are located in the central zone, Lisbon and Algarve (CSI, 2012).

These are closely linked with the concept of sustainable development, a model that allows meeting the needs of the present without compromising the ability of future generations to meet their own needs (CEDS, n.d.).

With the European Union's transition to a circular economy, it is expected to bring significant changes to the world of work. In fact, green jobs are a recent context and therefore the information available about the risks and accidents associated with them is limited. The scenarios considered by more recent studies, aim to inspire and inform the debate around the circular economy to reduce occupational accidents and health problems in the coming years (OSHA, 2021).

Keywords: green jobs, sustainable development, sustainable economy, environment

Discipline: Occupational Health

Professor: Hélder Simões

Degree: Environmental Health

A 121

Edition 16/21

BENEFITS OF OCCUPACIONAL HEALTH AND SAFETY

Jéssica Oliveira, Nuno Correia, Renato Palricas, Rute Costa, Tatiana Dias, Vanessa Cardoso

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Occupational Health and Safety (OHS) refers to a series of regulations and procedures legally required from employees and companies to reduce accidents or occupational diseases. OHS is an important topic nowadays, since companies have realised that being concerned with the health and safety of workers is essential to guarantee the integrity of people, thus enabling continuous improvements in results.

Being a subject of extreme importance, this work aims to make known the benefits of OHS.

The elaboration of this work resulted from a bibliographical revision of various scientific databases.

The implementation of OHS in organisations is necessary, besides being a legal and social obligation, it allows the development of a company culture for the prevention of occupational injuries and diseases. Effective OHS measures can save lives by eliminating or mitigating risk situations associated with activities. In addition, healthy companies have better overall results in terms of productivity, motivation and happiness at work. Among the numerous benefits of companies that invest in OHS, we can highlight, greater productivity in the daily lives of employees, reduction of risks for workers and reduction of costs for the employer.

It is safe to say that the implementation of an OHS system brings numerous benefits to organisations. It has to be, or should become, seen as part of the company's culture and DNA. When we get closer to that point, we will be on an excellent path.

Keywords: health and safety of workers, occupational injuries and diseases, risk situations, reduction of risks, benefits to organisations

Discipline: Occupational Health

Professor: Helder Simões

Degree: Environmental Health

A 122

Edition 16/21

MUSCULOSKELETAL INJURIES

Ana Cruz, Carolina Tavares, Íris Milheiro, Joana Teixeira, Mariana Machado, Mariana Santos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Occupational Health is, according to the definition of the Directorate-General for Health (DGS), "an area of intervention that values the workplace as a privileged space for the prevention of occupational risks, the protection and promotion of health and workers' access to Health and Safety Services at work."

With this work, through a bibliographical research, it was intended to make known the musculoskeletal lesions, symptoms and how to prevent this type of disease. Therefore, musculoskeletal injuries (MSDs) are one of the most common work-related diseases, are cumulative and motivated by repetitive efforts over an extended period of time, however and due to work accidents may also have the form of acute traumas such as fractures. In this way, it is important for everyone to participate in combating them. The preventive part is of high value for a Security Technician, as this aims to prevent the onset of these and other diseases and thus, be part of the medical team of the work or by doing training actions.

The practice of work gymnastics helps not only to combat, but also to prevent, among other diseases, musculoskeletal injuries, increasing productivity and worker satisfaction. The exercises of work gymnastics, try to exercise the parts of the body where the lesions are more frequent, and can be practiced daily.

Keywords: Health, Musculoskeletal Injuries, Diseases, Prevention, Combat

Discipline: Occupational Health

Professor: Helder Simões

Degree: Environmental Health

A 123

Edition 16/21

WORK-RELATED DISEASES

Bruno Santos; Diogo Paiva; Diogo Serem; Joana Carvalho; João Maurício

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Work-related diseases are caused by occupational factors, i.e., caused by exposure to a risk factor at work, whether of a physical, chemical, biological or organizational nature.

The preparation of this work was based on an online research on the topic with special focus on information made available by the European Agency for Safety and Health at Work.

The objective of this research is to identify possible risk factors in the occupational environment in order to improve the lives of workers and consequently minimize the costs associated with work-related illnesses and deaths.

Diseases such as cancer, respiratory, cardiovascular, infectious, skin diseases, musculoskeletal disorders, and mental problems can be caused or aggravated by work. Although the causes may be complex, exposure to hazardous substances, radiation, physical factors such as vibrations, noise, sedentary work, and psychosocial factors such as shift work and stress, contribute to the development or onset of these diseases.

Environmental Health Technicians have the duty to sensitize and make companies aware of the adoption of good practices, including the prevention of risk factors, promotion of safe and healthy workplaces, medical examinations of workers, and inspections of the workplace and work equipment.

Keywords: diseases; risk factors; healthy work; raising awareness; occupational safety and health;

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 124

Edition 16/21

INCIDENCE OF ANEMIA IN DEVELOPING COUNTRIES: HOW IS MALNUTRITION A SET OFF?

Inês Fernandes, Rafaela Manso, Sara Faria

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Anemia affects a quarter of the world's population, mainly developing countries.
This disease compromises an adequate supply of oxygen to the tissues, which will be reflected in multiple symptoms.
Objective: Explore the prevalence of anemia, especially in developing countries, and the contribution of malnutrition to this problem.
Methodology: A review of several articles published in the last 6 years referred us to PubMed and ScienceDirect. From the 123 articles in our search we selected 28 for analysis of the abstracts. The keywords used were "anemia", "developing countries" and ”supplementation", individually and together. After reading the 28 selected articles, only 8 were used.
Results: Of all cases of anemia, 97% are found in middle-income countries. The risk groups are mainly children under the age of 5 and pregnant women.
Poverty is associated with an increased risk of contracting anemia due to the consequences of nutritional deficiencies. Malnutrition is the main cause of the increased cases of anemia, both in children and adolescents, and as well as in pregnant women.
Conclusion: Anemia has significant consequences both on health and also on social and economic development.
The worldwide prevalence of anemia has declined slightly over the past 20 years, but still remains a concern in low-income countries.To mitigate the prevalence of this disease, it is important to implement a program that promotes healthy eating and iron supplementation alone or in combination with other micronutrients.

Keywords: ‘’Anemia’’, ‘’Developing countries’’, ‘’Supplementation’’

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 125

Edition 16/21

THE IMPACT OF HOME-DELIVERED MEALS ON ELDERLY MALNUTRITION: A SYSTEMATIC LITERATURE REVIEW

Ana Margarida Rodrigues Almeida, Ana Filipa Ferreira, Camila Frias Matos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Background: Malnutrition is associated with physical and psychosocial consequences, and with an overload in public health services. The estimated worldwide prevalence of elderly malnutrition is 22.8%, ranging from 5.8% in the community to 50.5% in rehabilitation. Home-delivery of meals to non-institutionalised elders is an adopted practice that may help tackle malnutrition in the community.

Objective: The purpose of this study is to develop a systematic literature review to assess the impact of home-delivered meals on elderly malnutrition and to provide suggestions on how nutritionists could enhance their contribution to tackle this serious public health problem.

Methods: A complete review of articles included in Web of Science and PubMed was conducted with the terms “mini nutritional assessment”, “elder”, and “home care”, and variants. Titles and abstracts were screened for relevance. A total of five articles were considered for inclusion.

Results: Two of the five articles used a cross-sectional design, while the other three investigated the effects of home-delivered meals on elderly nutritional status across different timespans. Pooled findings reveal inconsistent results. While some studies report an improvement of nutritional status after the implementation of a home-delivered meal program, others did not. Nevertheless, almost all articles found a high prevalence of elders at risk of malnutrition.

Conclusions: Nutritionists have a prominent position to help combat malnutrition, namely by recognising that home-delivered meals should be adjusted to the nutritional status of its recipient. Overall, more rigorous quantitative research is needed to verify the relationship between home-delivered meals and elderly malnutrition.

Keywords: malnutrition; elder; home-delivered meal; systematic review.

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 126

Edition 16/21

CHRONIC KIDNEY DISEASE: A PUBLIC HEALTH PROBLEM FROM THE STANDPOINT OF NUTRITION

Filipe Duarte, Marta Cardoso, Milena Santos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

INTRODUCTION: Chronic Kidney disease is a major public health problem defined by abnormalities of kidney structure or function, often characterized as a progressive loss of renal function. A comprehensive public health strategy to prevent the development, pro-gression and complications of chronic kidney disease is required.

OBJECTIVES: Understanding which initiatives and public health policies are being implemented and their potential benefits.

METHODS: Research was conducted on PubMed and the American Journal of Kidney disease, using the following keywords: “Chronic kidney disease”, “public health policies”, “chronic kidney disease and nutrition”, “tax on sugar sweetened beverages”, “Public health nutrition”. 14 articles, published between 2000 and 2020, were selected for analysis.

RESULTS/DISCUSSION: Chronic kidney disease Screening and surveillance programs focusing on early detection prevent disproportionate amounts of global health care budg-ets. Evidence shows that pre-dialysis psychoeducational interventions may produce im-portant benefits. Globally, taxes on sugar sweetened beverages had impact in reducing pur-chase and intake. In Portugal, The EIPAS published in 2017, encourages adequate food consumption, thus improving nutritional status, showing potential to reduce the burden of Chronic kidney disease.

CONCLUSION: Although there is already some progress in terms of measures and poli-cies implemented to address chronic diseases, low Chronic awareness in many countries may impose barriers to early intervention. Only a universal health coverage that ensures effective screening, prevention and early treatment can tackle kidney disease successfully.

Keywords: “Chronic kidney disease”, “public health policies”, “chronic kidney disease and nutrition”, “tax on sugar sweetened beverages”, “Public health nutrition”

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 127

Edition 16/21

HYPERTENSION: A PUBLIC HEALTH CONCERN

Ana Pinheiro, Carlota Rego, Daniela Teixeira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Hypertension is one of the most concerning public health problems. The number of adults aged 30–79 years with hypertension has increased from 650 million to 1.28 billion in the last thirty years, according to the first comprehensive global analysis of trends, led by Imperial College London and nearly half these people didn't know they had hypertension. Hypertension significantly increases the risk of heart, brain and kidney diseases, and is one of the top causes of death throughout the world.

Objective: Analyse the hypertension situation and the steps taken to solve this public health problem.

Methods: A comprehensive literature search was carried out on PubMed and ScienceDirect to identify peer-reviewed articles on hypertension published since 2016. Search strategies included the keywords: "arterial hypertension"; "nutrition"; "diet". 11 articles were chosen by their title. After reading each article carefully, only 5 were used.

Results: The regular consumption of sodium, fat and sugar and the low consumption of fruits and vegetables increases the risk of developing hypertension. To prevent it, the first step is to improve your lifestyle: do not smoke, have a balanced diet and avoid excessive alcohol consumption.

Conclusion: One of the global targets of WHO is to reduce the prevalence of hypertension by 33% between 2010 and 2030. Nutrition interventions, such as the Dietary Approaches to Stop Hypertension (DASH) diet or the Mediterranean diet, as part of a lifestyle modification program, are recommended as one of the primary intervention in hypertension treatment guidelines to improve clinical outcomes.

Keywords: "arterial hypertension'', ''nutrition'', ''diet''

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 128

Edition 16/21

IODINE DEFICIENCY IN PREGNANCY

Cíntia Antunes, Luísa Capela, Rita Marinho

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

INTRODUCTION: Iodine deficiency is a prevalent public health problem, especially in pregnant women and children. Can impair the growth and neurological development of offspring, and even increase the infant mortality rate. The adequate intake of this nutrient, in this period, is associated with the proper functioning of the thyroid gland.

OBJECTIVE: To understand whether the lack of planning, or even an unwanted pregnancy aggravated by maternal iodine deficiency, can cause irreversible damage to the fetus, neonate or child.

METHODOLOGY: A search in PubMed and Science Direct for articles in English with the terms "iodine deficiency", "iodine", "pregnancy" led us to several study reports, also obtained from book chapters and through correspondence with experts on iodine. About 691 articles were found, and of these, were selected the ones that talks about high-risk pregnancies and who meets de objective. Approximately 15 full papers were read. Five were excluded for not meeting inclusion. From here 10 studies were carefully analysed for this review.

RESULTS: According to recent guidelines, to improve maternal thyroid status and prevent neurocognitive defects in the child, all pregnant or intending pregnant and breastfeeding women should take 150 µg of iodine supplementation. Iodized salt can minimize the amount of thyroid dysfunction in populations. Ensuring adequate iodine level during parenteral nutrition has become important

CONCLUSION: Dietary modifications are necessary when a woman becomes pregnant, which helps ensure optimal fertility, conception, and pregnancy. Several medical and public health groups recommend iodine supplementation for women who are pregnant, lactating, or planning a pregnancy.

Keywords: "iodine deficiency", "iodine", "pregnancy"

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 129

Edition 16/21

ISOLATION AND RISK FOR MALNUTRITION AMONG OLDER PEOPLE

Ana Beatriz Santos, Ana Stanczyk, Inês Maltez

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Malnutrition is a frequent and serious condition among older. With increasing age, social isolation and loneliness become important issues that might influence food intake and in turn nutritional status. As the population lives longer, it is important to know how to live better and to age healthier, and to achieve that we must improve our knowledge about older people's health.
Objectives: To understand how the risk of social isolation can be related to the nutritional status of older people. Therefore, problems in public health.
Methods: A literature was carried out in Science Direct, PubMed and Google Scholar databases with the following keywords and expressions: malnutrition, “nutritional status”, “social isolation” and “older people”. Articles published in the last 10 years were considered. A total of 11 articles in English were analyzed. After reviewing the title, we selected 8 articles for full reading.
Results: However, it is possible to affirm that the elderly has several nutritional deficiencies, which can lead to several public health problems.
Conclusion: It was verified that there was a need to increase awareness about social determinants of malnutrition among older people. Thus, it might be essential to refer these older people to available resources within the community to strengthen social ties and interaction. This might help to prevent further isolation, as well as reduce the risk of negative effects on different health outcomes including nutritional status. To complete, it is possible to affirm that the elderly has several nutritional deficiencies, which can lead to several public health problems.

Keywords: Malnutrition, Nutritional Status, Social Isolation, older people

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 130

Edition 16/21

VITAMIN B12 DEFICIENCY IN A VEGETARIAN DIET: A PUBLIC HEALTH ISSUE

Luísa Moreira, Mariana R. Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The deficiency of vitamin B12 is progressively becoming a public health issue, in consequence of the recent popularity of the vegetarian diet which is one of the biggest causes of this deficiency.

This essential micronutrient is obtained from dietary sources such as meat, eggs, and dairy products. For this reason, the prevalence of vitamin B12 deficiency is higher among vegetarians.

Objective: To identify the relationship between a vegetarian diet and the deficiency of the B12 vitamin in a matter of public health, due to the recent popularity of this diet.

Methods: The research was performed using the keywords “vitamin B12”, “cobalamin”, “public health issue”, “vitamin B12 deficiency” and “vegetarian diet” in PubMed, ScienceDirect, and Google Academic database. 7 articles were chosen in Portuguese and English, published between 2003 and 2021. The article selection was made through the title and abstract content, and through the complete reading of each article.

Results: Direct relationship between the vegetarian diet and the low levels of the vitamin B12 was founded by 5 authors. The other 2 only referred to the importance of vitamin B12 and health risks associated with the deficiency of this vitamin.

The prevalence of deficiency varied by age group, and there is a direct relationship between this and the prevalence. Reported results found 47.8% deficiency among vegans.

Conclusion: Vegetarians are a risky group for B12 vitamin deficiency, however, the most common cause of this deficiency is malabsorption, which depends on the metabolism of each person, regardless of the diet they follow.

Keywords: “vitamin B12”, “cobalamin”, “public health issue”, “vitamin B12 deficiency”, “vegetarian diet”

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 131

Edition 16/21

NUTRITION AND BEHAVIORAL HEALTH DISORDERS: DEPRESSION AND ANXIETY

Ana Beatriz Almeida, Inês Alves, João Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Depression and anxiety are progressively becoming a public health problem. Poor quality nutrition has been implicated in these disorders and may influence treatment and recovery due to the essential role of nutrients.

Aim: To describe depression and anxiety as a public health problem and to report the role of nutrition in the prevention and management of these disorders.

Methods: Literature review was carried out through PubMed platform, using the expressions ‘’Depression and anxiety” and “Nutrition”. Search was conducted in October 2021. 380 articles published in the last 10 years were found and after reading the title, abstract and full paper, 10, 5 and 3 articles were chosen, respectively.

Results: Evidence suggests that healthy eating patterns may assist in the prevention and treatment of depression and anxiety. Subjects diagnosed for anxiety and depressive disorders show lower omega-3 in their blood and brains compared to healthy subjects which enhances the role of Poliunsaturated Fatty Acids metabolism as an important mechanism in depression and anxiety disorders treatment. Also, a higher prevalence of anxiety and depression was found in stroke patients.

Conclusion: Nutrition should be a focal point in psychiatric practice for behavioral health disorders. Low omega-3 PUFAs intake may predispose certain individuals to depression and anxiety and supplementation represents an interesting strategy for prevention or treatment. Also, anxiety and depression of stroke patients negatively influences their food intake, activities of daily living and quality of life.

Keywords: ”Depression and anxiety”, “Nutrition”, "Depression", "Anxiety"

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 132

Edition 16/21

EFFECT OF VITAMIN D ON ASTHMA AS A PUBLIC HEALTH ISSUE

Andrea Tomás, Matilde Ascenso, Patrícia Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: Asthma is one of the most common chronic diseases worldwide, affecting more 300 million people. Certain nutrients, like Vitamin D, are suggested to manage its development. However, vitamin D insufficiency is a common issue, which can compromise the management of asthma.

Objective: Understand the relation between Vitamin D and asthma as a public health issue.

Methodology: It was conducted a literature review through the platform, ‘’PubMed’’, with the key-words ‘’asthma’’ and ‘’vitamin D’’, with the determinant ‘’AND’’, in October 2021. Initially, 17 articles were selected by the titles, followed by an analysis of the abstract that excluded 5 and lastly the full reading of it, remaining 10.

Results: There has been shown an association between vitamin D insufficiency and increased asthma incidence, especially in patients with severe and uncontrolled asthma. Others revealed Vitamin D supplementation may reduce asthma exacerbations, while its deficiency promotes it. Moreover, low serum levels of it may be associated with reduced lung function. However, there are others who report no association between its supplementation and asthma.

Conclusion: Since the impact of Vitamin D on asthma is still controversial, it requires more investigation. Nevertheless, the right daily intake of Vitamin D should be guaranteed, either in the presence of asthma or not, through regular solar exposure.

Keywords: ‘’vitamin D’’; ‘’asthma’’; ‘public health issue’’

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 133

Edition 16/21

BINGE EATING: A PUBLIC HEALTH PROBLEM

Íris Fartura; Joana Rosa; Mariana Cruz Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: The eating disorders (ED) are highly distinctive psychiatric disorders. The prevalence is rising in high-income countries, especially in combination with obesity.

Binge eating disorder (BED), the most common ED, is characterised by episodes of eating large amounts of food, more than usual, and over a short period of time. This's a common public health concern among youth and young adults worldwide, with a lifetime prevalence to be 1.4%.

Objectives: The main objective is to frame this ED as a growing public health problem, mentioning the impact COVID -19 has had.

Methods: For the research, scientific databases as Pubmed and Google Académico were used, with keywords: "Binge eating", "eating disorder", "COVID -19" and "public health". 30 articles were analyzed, by title and abstract. Subsequently, 10 articles, published since 2016, were analyzed.

Results: BED is a disease with several comorbidities such as obesity, diabetes, hypertension, and chronic pain.

There has been a significant increase in emotional eating and uncontrolled eating behaviors of individuals in the process of pandemic and social isolation, caused by COVID -19. The pandemic exacerbated the eating disorder and related mental health symptoms due to increased economic stress and resulting food insecurity.

Conclusion: In conclusion, the BED has been increasing over the past few years, mainly due to the pandemic.

An organized effort by society is needed, such as inclusion of activities that promote and prevent health, and treat diseases. Leading to changes in public policies and community actions.

Keywords: Binge Eating, Eating Disorder, COVID-19, Public Health

WHAT ARE THE CONSEQUENCES OF QUARANTINE DUE TO COVID-19 ON DIET AND PHYSICAL AND MENTAL HEALTH? HOW CAN A HEALTHY DIET HELP?

Beatriz Gouveia, Cláudia Araújo, Gonçalo Castanheira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction: COVID-19 is a leading challenge across the globe. By November 19, 2021, 256 million cases of infection and 5.13 million deaths have been reported worldwide. The first case emerged on December 31, 2019. Then, as the virus spread worldwide, countries were forced to go into quarantine. During this lockdown, people couldn´t leave their homes, increasing psychological problems, leading to poor dietary choices and sedentary lifestyles.

Objective: Study how the lockdown caused by COVID -19, influenced eating habits and physical activity, and its impact on health.

Methodology: Literature review was conducted on PubMed with the expressions, “covid-19 and diet”, “COVID -19 and physical exercise” and “covid-19, anxiety and stress”, which resulted 9041 articles. Papers were selected first by title, then by abstract (N=16 articles) and after by full reading (N=9).

Results: Due to the lockdown, the studies showed, in general, an increase in the health risk behaviors. The physical activity decreased, and the consumption of junk-food increased. Risk factors for covid-19, like obesity, hypertension, and diabetes, were improved. In the other way, a diet rich in vitamins, minerals can help in reduce the complications caused by an infection with the virus. A proper diet, rich in fruits, vegetables and nuts can ensure that the body is in proper state to defeat the virus, since this improves body immunity.

Conclusion: lockdown due to Covid-19 decreased physical activity and increased mental diseases like anxiety or stress. Despite that, a healthy diet can help in reducing the consequences caused by an infection with the COVID -19.

Keywords: “COVID -19 and diet”, “covid-19 and physical exercise” and “COVID -19, anxiety and stress”

Discipline: Nutrition and Public Health

Professor: João Lima

Degree: Dietetics and Nutrition

A 135

Edition 16/21

FOOD WASTE: SINGLE SOLUTION FOR SUSTAINABLE DIET IN THE FUTURE?

Inês Lisboa; Maria Ana Serrano; Tânia Venâncio

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Dietética e Nutrição, Coimbra, Portugal

Introduction:Food waste represents an environmental and ethical problem and has repercussions. It occurs throughout the food chain, during production, processing, distribution, and consumption. Dietary guidelines should take into account sustainability and the impact of dietary patterns on the future.

Objective: Understand the impact and the sustainable diet in the future.

Methodology: Through a research on Pubmed it was selected 4 articles out of 132 found, between 2010 and 2021, The key-words used were ‘’food waste’’, ‘’food chain’’ and ‘’public health’’. Firstly, 20 articles were selected by the title, followed by an analysis of the abstract, excluding 10 articles, and lastly by the full reading of it, remaining 4 articles.

Results: The World has expressed great concern about the food consumption of populations. Despite all the efforts, combating wastage is a huge challenge. About half of the total food supply is consumed by humans, more than a quarter goes to animal feed, and 16% is lost or wasted. The total food production of the analyzed products (76%) is used by humans, and (24%) is lost or wasted.

Conclusion: Current findings suggest that simultaneous efforts to improve diet quality and reduce food waste and sustainability be critical in practice because of the increasing number of consumers.

Keywords: Key-words: food waste; food chain; Food service sector; public Health; sustainability

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 136

Edition 16/21

NEURODEGENERATIVE DISEASES: PARKINSON AND ALZHEIMER

Mariana Brites, Afonso Martins, Rodrigo Fernandes, Cristina Trindade, Maria Gomes.

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

Neurodegenerative diseases are a large-scale term for a range of conditions which primarily affect the neurons in the human brain. They are incurable and debilitating conditions that result in progressive degeneration or death of nerve cells, thus a chronic disease. The two most prevalent degenerative diseases are Alzheimer and Parkinson.

Alzheimer is a disease that causes a progressive and irreversible deterioration of cognitive functions. This brings, as consequences, changes in behavior, personality and functional capacity of the person, making it difficult to carry out their activities. People with Alzheimer have low levels of acetylcholine in the brain. In neuropathological terms, it is characterized by the reduction in the size of neurons and their death in cortex cells and hippocampus. The appearance of neurofibrillary braids (Tau protein) and senile plaques (ß-amyloid) make communication between nerve cells impossible, causing changes in the overall functioning of the organism.

Parkinson's disease mostly presents in later life with generalized slowing of movements (bradykinesia) and at least one other symptom of resting tremor or rigidity. Parkinson occurs when nerve cells in the basal ganglia become impaired and/or die. These produce an important brain chemical known as dopamine. When the neurons die or become impaired, they produce less dopamine, which causes the movement problems of Parkinson. Scientists still do not know what causes dopaminergic cells to die.

There’s a lot of treatment a physical therapist can do to help improve a patient’s quality of life. Treatment may include aerobic exercise, strength training, balance and coordination work.

Keywords: Neurodegenerative, death, dopamine, physiotherapy.

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 137

Edition 16/21

DEMYELINATING DISEASES

Inês Lourenço, Beatriz Oliveira, Martim Machado, Bernardo Mendonça

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

Myelin is a lipoprotein that makes up the myelin sheath, a layer of non-continuous adipose tissue that protects and lines the axons, and allows the rapid and effective conduction of nerve signals along them. Due to demyelizing diseases, this substance is damaged and the nerves are demyelized, which makes them unable to send and receive messages correctly, making it difficult to reduce the energy expenditure involved, as it is the myelin sheath that allows the conduction of these nerve signals along the nerve fiber with speed and precision.

Most of these diseases, in the long or short term, lead to a functional impairment of individuals, progressive or immediate. These diseases can come from non-development of the sheath due to hereditary diseases such as Gaucher disease or after an autoimmune reaction of the body's own tissues to a viral infection or vaccination, such as with primary demyelizing diseases such as multiple sclerosis, encephalomyelitis acute disseminated (ADM) and leukodystrophies, or due to other causes such as strokes, infections, antibiotics, metabolic and immunological disorders.

They mostly affect the central nervous system (CNS) but others, such as chronic inflammatory demyelinating polyneuropathy (PDCI), affect nerves elsewhere in the body.

There are some treatments, such as the use of physiotherapy, to improve the individual's quality of life, as there are several methods and tools available that slow down the progress of the disease.

In conclusion, demyelinating diseases have uncertain causes and still have no cure.

Keywords: myelin, demyelination, treatments, nerve signals

CHRONIC PAIN

Beatriz Valente; Sara Ferreira; Neliza Mendes; Tiago Henriques; Lara Melo; André Lucas

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

Chronic pain is present for long periods of time, it is generally persistent or recurrent for at least 3-6 months, thus losing its warning and protective purpose. Therefore, its intensity is not correlated with the causal stimulus.

The mechanism responsible for regulating nociceptive impulse inflows at the spinal cord level is the gate mechanism. The gate theory explains that any nociceptive stimulus stimulates Aβ and C fibres, Aβ fibres being associated with acute pain and C fibres with chronic pain. When we experience painful stimuli, both the inhibitory neuron and the excitatory neuron are stimulated. If the action potential of the excitatory neuron is greater than that of the inhibitory neuron, the stimulus is sent to the cerebral cortex and we experience pain. If the stimulus is stopped, it does not reach the cortex and therefore we do not feel pain. Thus, nociception happens when there is more stimulation from the C fibres, activating the excitatory neuron and deactivating the inhibitory neuron by driving the action potentials to the cortex (i.e. opening the "gate").

There are different possible causes for chronic pain, for instance chemical, neurogenic and psychogenic. Chemical causes refer to the failure of the gate mechanism (the mechanism that normally eliminates chronic pain); neurogenic causes refer to the failure of pain perception (damage to the peripheral nervous system) and psychogenic causes refer to the failure of the connection between pain and memory (damage to the central nervous system).

Keywords: chronic pain, gate mechanism

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 139

Edition 16/21

THE PINEAL GLAND

Catarina Martins, Edgar Correia, Gonçalo Rodrigues, Joana Correia, Sara de Jesus Ferreira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

The pineal gland is an endocrine gland that is located in the diencephalon, in the epithalamus area, more exactly in the third ventricle of the brain.

The pineal gland is photosensitive. This means it's activated in the absence of light and inhibited in its presence (especially white light). The dark starts the secretion of melatonin, a hormone that is best known for the role it plays in regulating sleep patterns besides other actions as inhibition the gonad's functions decreasing the sexual organs activity (this gland is bigger in childhood and decrease its size in puberty). The release of melatonin is controlled by a group of neurons present in the hypothalamus that receive stimuli from special neurons sensitive to light in the retina generating an action potential (this potential is transmitted to the hypothalamus before it goes to the pineal gland). Melatonin and its precursor, serotonin, are derived chemically from the alkaloid substance tryptamine.

With aging the pineal gland starts to lose its function on average by the age of 60. This process is explained by the decrease of pinealocytes and it will affect the melatonin production and its function, which will have a negative impact on the sleep cycles. The circadian organisation of other physiological functions depend also on the melatonin signal, for instance immune, menstrual cycles, antioxidant defences, homeostasis and glucose regulation.

The pineal gland acts as a recovery sistem helping with important endocrine functions that contribute to the body's homeostasis.

Keywords: Melatonin, circadian rhythms

ELECTROCARDIOGRAM AND IF CURRENTS

Constança Coelho, Gaspar Domingues, Mariana Salgado, Rute Macedo, Vânia Brito

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

The diagnosis of various heart conditions such as arrhythmia and myocardial infarction, and the effects of hypertension and pulmonary embolism are possible by observing the perturbations of the normal electrical pattern of the heart. Funny currents (If) or pacemaker currents translate the dissemination of depolarization by the atrial myocardium from beginning to the end. It is a mixed sodium-potassium current which is inward and gets activated on hyperpolarization. Since the funny current controls the rate of the sinus node activity, it determines the heart rate.

Electrocardiogram (ECG) is a register of the heart's electrical activity. The electrocardiograph, the equipment used in the exam, is formed by a monitor, wires, and electrodes that are attached to the skin's patient, in specific positions. It has an electronic system that captures the electrical stimuli emitted by the heart muscle, through the skin. In the most common type of ECG, 10 electrodes are required. Four peripheral electrodes are attached to the patient's arms and ankles, while six electrodes are placed on the chest. These register a total of 12 derivations, that include unipolar, precordial and bipolar. This last one constitutes the "Einthoven triangle", that represents the three standard limb leads of the electrocardiogram.

There are 3 types of ECG: Resting ECG, Stress ECG and Holter monitor (ambulatory).

The electrocardiographic tracing expresses the movement caused by the electrical stimulus and is formed by P, Q, R, S and T waves, each one of them having its meaning related to the phenomena of depolarization and repolarization.

Keywords: electrocardiogram, electrodes, waves, depolarization

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 141

Edition 16/21

PHYSIOLOGY OF BONE REABSORPTION AND BONE CELLS

Alice Andrade, Ana Loureiro, Mariana Tomás, Sara Filipa Ribeiro

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

Human bones are divided into four groups: long, short, flat and irregular, and are in constant change: generation, replacement and reconstruction, preserving integrity, optimising function and preventing degradation of these, which means they aren't static organs. This change is called bone remodelling and is divided into bone formation and bone reabsorption.

Bones contain two main bone cells: osteoclasts (bone destroyers) and osteoblasts (bone generators).

Ossification is the process of bone formation. Osteoblasts attach themselves to cellular extensions of others in the communicating joints, forming new bone. Once they're surrounded by the bone matrix, they're called mature cells. In bone reabsorption, osteoclasts break down bone tissue and release minerals, resulting in the transfer of Ca from bone tissue into the blood.

There are two hormones that contribute contrarily to the regulation of the concentration of this ion. While PTH motivates the activity of osteoclasts and thus there is an increase of calcium concentration in the blood, calcitonin inhibits osteoclast activity, which will have the opposite effect. When the Ca concentration falls, PTH is produced, and the calcium reabsorption increases, stimulating the formation of vitamin D in the kidneys and calcium absorption in the small intestine.

Other factors involved in regulating the amount of calcium is the protein RANKL and its two receptors RANK and OPG, through the activation or inhibition of osteoclasts. RANKL is produced when PTH binds to its receptor on osteoblastic cells, here, too, inhibition of OPG expression occurs.

Thus, in a connection between RANK and RANKL, there's a stimulation of the activation of osteoclasts, and in a RANKL and OPG connection, there's an inhibition of this stimulation

Keywords: bone reabsortion, bone cells, ossification, osteoblasts, RANKL

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 142

Edition 16/21

MUSCLE ADAPTATIONS TO PHYSICAL EXERCISE AND REGULATION BY THE AUTONOMIC NERVOUS SYSTEM (ANS)

Beatriz Magalhães, Diana Silva, Rui Fraga, Tiago Oliveira, Nuemy Género, Susana Nogueira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

Muscle adaptation is an intrinsic property of the organism that provides the ability to adapt to homeostasis-disturbing stimuli. It is through the overload principle that an attempt is made to induce a response in the muscle fibers that make up the musculoskeletal system. During physical activity, muscles' contractions are promoted, which can be isometric or isotonic (eccentric and concentric), causing the muscle to increase in size (hypertrophy), strength, and/or endurance. These contractions fall on two groups of muscle fibers: the fast-twitch fibers (Type IIa and Type IIb), mostly recruited in anaerobic conditions, being responsible for the increase of strength and muscle mass; on the other hand, the slow-twitch fibers (type I), are in greater number when conditions are aerobic, where they increase the vascularization of the muscle, leading to its enlargement.

Physical activity requires a set of physiological adjustments necessary for energy's supply to muscle tissue and to maintain ideal operating conditions. Such adaptations may be immediate (acute adaptation), on the increase of heart rate (HR) and temperature; or chronic, on the muscle hypertrophy and the HR's decrease. Through the ANS, it is possible to regulate the organism, preparing it for a great physical effort. Consequently, two neurotransmitters are important, norepinephrine and epinephrine. While the former acts more quickly, it is mainly directly onto the tissues, adrenaline is free into the bloodstream, but its effect is longer lasting. Some of the consequences caused are tachycardia, constriction of blood vessels, stimulation of the breakdown of glycogen for the release of glucose.

Keywords: Muscle adaptation, homeostasis, autonomic nervous system, physical exercise

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 143

Edition 16/21

ENDOTHELIAL DYSFUNCTION, ATHEROSCLEROSIS, AND ARTERIAL HYPERTENSION

Ana Catarina Leitão, Camila Santos, Diana Ravella, Maria Beatriz Oliveira, Mariana Pais

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

One third of global deaths are due to Cardiovascular pathologies, both in industrialized and non-industrialized countries. One of the main causes can be related to hypertension, posing an important risk factor, with an incidence of about 35-40% of the world population. Also, atherosclerosis plays an important role in the incidence of these pathologies.

Nitric oxide is produced by endothelial cells and is a strong vasodilator signaling molecule and anti-inflammatory. Hypertension is characterized by excessive blood pressure in the wall of the arteries, above values considered normal and atherosclerosis is characterized by a progressive hardening, loss of elasticity and thickening of the artery walls. Atherosclerosis and hypertension have a high probability of incidence when the levels of the molecule named nitric oxide are not balanced. This molecule has several roles in maintenance of vascular homeostasis. The term “endothelial dysfunction” is commonly used to refer to abnormalities in nitric oxide production or bioavailability and consequent changes in vascular reactivity.

When this endothelial dysfunction occurs, the endothelium is injured. Thus, certain leukocytes are activated, come out of the bloodstream and reach the walls of the arteries, where they are transformed into fat-laden cells. Over time, smooth muscle cells move from the middle layer to the lining of these multiplying. This accumulation of cells, both fat and smooth muscle cells and other materials form an irregular deposit called atheroma. As they grow, they make the walls of the arteries thicker and invade the artery canal, to which we call it atherosclerosis.

Keywords: atherosclerosis; arterial hypertension; endothelial dysfunction

Discipline: Physiology I

Professor: Paulo Matafome

Degree: Physiotherapy

A 144

Edition 16/21

HORMONES OF THE MUSCLE AND BONE: OSTEOCALCIN AND MIOKINES

João Bettencourt, Matilde Amaral, Sara Maltez, Fábio Henriques, Mariana Santos, Matilde Madureira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisioterapia, Coimbra, Portugal

The musculoskeletal system functions as an endocrine organ and is made of muscle and bone. This system plays a crucial role in the human body´s movement, stability and structure. Its functioning can be regulated by the action and production of hormones.

Among the non-collagenated proteins present in the bone extracellular matrix, osteocalcin is the most abundant. This protein is synthesized by osteoblasts and undergoes post- translational modifications that lead to the formation of decarboxylated osteocalcin and carboxylated osteocalcin, which are sent to the bloodstream and to the bone matrix, respectively. For this carboxylation process, vitamin K is an essential cofactor. The action this protein plays on the muscles occurs mainly during physical exercise since it helps muscle fibers in the uptake of glucose and fatty acids. Furthermore, it increases insulin sensitivity and reduces triglyceride levels resulting of a decrease of visceral fat in the body.

Myokines are cytokines or other proteins that are produced, expressed and released by muscle fibers during muscle contraction. An increase in its production induces metabolic, immunological, endocrine, paracrine and autocrine effects to maintain whole-body homeostasis. There are several types of myokines, including: IL-6, IL-8, IL-15, irisin and myosin.

Besides being fundamental in the movement, the musculoskeletal system is also remarkably important in the functioning of our organism as a whole, since the hormones that are part of its constitution prevent various diseases such as: obesity, cardiovascular diseases, type 2 diabetes, insulin resistance.

Keywords: Bone, muscle, hormone, osteocalcin, myokines

Discipline: Dissertation

Professor: Joaquim Pereira, Rui Gonçalves

Degree: Master in Physiotherapy

A 145

Edition 16/21

NECK PAIN AND HEART RATE VARIABILITY: CORRELATIONS AND INFLUENCE OF PERSONAL FACTORS

Vasco Vicente

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisiologia Clinica, Fisioterapia, Coimbra, Portugal

Heart rate variability (HRV) is currently the most used indicator to assess the Autonomic Nervous System (ANS) and the activation balance between the Sympathetic Nervous System (SNS) and the Parasympathetic Nervous System (PNS), in a non-invasive way.

The ANS participates in the control of inflammatory response associated with painful stimulus and tissue regeneration.

Moreover, non-specific neck pain is one of the musculoskeletal conditions with the highest prevalence rate in the world, especially in middle-aged adults. On the other hand, the decrease in sleep quality is also a public health problem across all age ranges, having a close relationship with lifestyle, as well as the HRV, and with the control of inflammatory processes.

This is a cross-sectional study with a single collection point divided into two phases: I – Gathering of sociodemographic and clinical data through an online questionnaire; II – Collection of data using three instruments in paper format (Fantastic Life Style, Pittsburgh Sleep Quality Index, Neck Disability Index) and, afterwards, monitoring of HRV in the supine position for six minutes. Subsequently, the data collected will be statistically analysed in order to assess the existence of any correlations between the ANS balance (extrapolated from the HRV data) and the prevalence of nonspecific neck pain, taking into account the effect of individual factors such as sleep quality, lifestyle or sociodemographic characteristics. Thus, we hope to contribute to a better understanding of neck pain pathophysiology, reinforcing its multifactorial nature, and therefore helping to establish bases for new treatment methodologies.

Keywords: HRV; ANS; Neck Pain; Sleep; Lifetyle

Discipline: Applied Research II

Professor: Joaquim Pereira

Degree: Clinical Physiology

A 146

Edition 16/21

EFFECT OF ENNERGY DRINKS ON COMPLIANCE AND ARTERIAL STIFFNESS IN YOUNG ADULTS

Tânia Matias

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisiologia Clinica, Coimbra, Portugal

The consumption of energy drinks is something that has been increasing over the years, especially among younger people, due to its ability to improve cognitive function, concentration, and even athletic performance, being also a great source of energy.

Red Bull is one of many choices in this world and it's composed by 80 g of caffeine and 11 g of sugar per 250 mL. Thanks to the growing of intake of these energy drinks in early ages, the concern regarding potential adverse effects has also raised. Caffeine being the main ingredient is associated to undesirable effects at cardiovascular level.

Through some studies, it's known that the consumption kind of drinks causes changes not only in terms of heart rate (HR), but also in blood pressure (BP), triggering the increase of both parameters, mainly due to the major component – the caffeine.

BP is closely related to arterial stiffness. Arterial stiffness is characterized by the reduced elasticity of the arterial walls, being associated with endothelial dysfunction, impairing the cardiovascular system (in the heart itself and in blood circulation). Arterial stiffness can be measured by several non-invasive methods, including the one I'm going to use that focuses on measuring pulse wave velocity (PWV).

The present study to be carried out has the objective of verifying if the consumption of Red Bull causes significant cardiovascular alterations, with a focus on BP and arterial stiffness, being sustained by recent research regarding this concerning theme that didn't exist years ago.

Keywords: Energy drinks; Arterial stiffness; Blood pressure; Pulse wave velocity

Discipline: Applied Research II

Professor: Joaquim Pereira

Degree: Clinical Physiology

A 147

Edition 16/21

ELECTROCARDIOGRAPHIC PARAMETERS AND SARS-CoV-2

Inês Mendes

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisiologia Clinica, Coimbra, Portugal

The pandemic of the SARS-CoV-2 virus that started in 2020 has been bringing several sequelae to the patients, namely pulmonary, neurological, renal, vascular, and cardiac. Although most of the sequelae found in these patients are respiratory, there are far more cases reported about cardiac sequelae, namely cardiac arrhythmias, which may result from the inflammatory effect, the effect of drug interactions, the autonomic imbalance, the pro-arrhythmic effect, and the effect of COVID-19 pharmacotherapies on the respiratory and cardiovascular system, which results in increased arrhythmias.

Cardiac arrhythmias consist of a disturbance in the heart rhythm, making it irregular, the rhythm can become slower if it is inferior a 60bpm, or faster if it is higher than 100bpm, there are several types of cardiac arrhythmias, which can be caused by errors in the inappropriate automaticity or sinus tachycardia, their severity depends on whether there is structural heart disease or not, in the presence of this the symptoms are more exacerbated.

In this way, it can be stated that there is still no complete and well-defined association between the spread of this virus and the existing relationship with underlying cardiovascular disease and new arrhythmias, but it is known that SARS-COV-2 infection is linked to pro-inflammatory mediators drugs that play important roles in the pathophysiology of cardiac and arrhythmic complications. The most common arrhythmias found in these patients are supraventricular tachycardia, ventricular tachycardia, and ventricular fibrillation.

In this way, the focus of this study will be the cardiac sequelae of covid-19 namely cardiac arrhythmias.

Keywords: SARS-CoV-2; Sequelae; Cardiac arrhythmias; Holter;

Discipline: Applied Research II

Professor: Joaquim Pereira

Degree: Clinical Physiology

A 148

Edition 16/21

CIRCADIAN AND BIOLOGICAL RHYTHMS IN SHIFT WORKERS- A FIREFIGHTERS' STUDY

Inês Duarte

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisiologia Clinica, Coimbra, Portugal

Nowadays, shift work has become an increasingly common type of labor that demands an adjustment, by its employees, to unusual schedules. The consequences of the change in sleep-wake cycles are under study, and results show that these workers are keener to develop a variety of health problems, in which we highlight a circadian rhythm disorder.

Circadian rhythms are 24-hour cycles present in physiologic and behavior functions that coordinate the internal organism with the external world. The sleep-wake cycle is one of the most prominent, and a disruption of this rhythm increases the risk of a metabolic syndrome, which might lead to hypertension, dyslipidemia, and obesity. Shift workers- given the sleep deprivation they are constantly subjected to- are more predisposed to develop these diseases.

Few projects explore the effects these working hours have on blood pressure, and even less characterize the subjects' blood pressure circadian profiles.

The question we therefore present is: Are There Changes in Blood Pressure Profiles in Shift Workers?

To acquire an answer, we will use an ABPM machine- ambulatory blood pressure monitoring- to describe the workers' circadian profiles. We will separate the individuals into four categories according to the progression of systolic blood pressure between day and night, already well acknowledged: dippers, non-dippers, invert-dippers, and extreme dippers.

Since both non-dippers and invert-dippers are phenotypes associated with a higher risk of renal, cardiovascular, and cerebral pathologies, it becomes clear that the findings subsequent to this project can be vital to protect this working class.

Keywords: Shift workers; Circadian rhythm; ABPM; Circadian blood pressure profiles

Discipline: Applied Research II

Professor: Joaquim Pereira

Degree: Clinical Physiology

A 149

Edition 16/21

ARTERIAL STIFFNESS IN A COIMBRA VOLUNTEER FIRE DEPARTMENT

Ricardo Pereira

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Fisiologia Clinica, Coimbra, Portugal

Cardiovascular disease remains the leading cause of death in Portugal.

With a significant prevalence, high blood pressure is the second risk factor contributing to the total number of healthy years of life lost.

Arterial stiffness is a strong predictor of cardiovascular risk, especially with regard to hypertension, being characterized by a reduction in the elasticity of the arterial wall and affects the cardiovascular system through the distribution of constant blood flow, from the heart to the peripheral capillaries, with a devastating effect on the heart and microcirculation.

In clinical practice, arterial stiffness can be estimated, non-invasively, through three main methods: assessment of pulse wave velocity; analysis of the contour of the blood pressure curve; and direct estimation of stiffness, using measurements of arterial luminal diameter or area and distending pressure, measured at the site where the change in diameter occurs.

However, pulse wave velocity is accepted as the most accurate method in assessing arterial stiffness as well as in assessing target organ damage.

The aim of the study will be to identify the disease, arterial hypertension, through arterial stiffness, and a sample made up of the Coimbra Volunteer Fire Department, of both sexes, will be used, and a single pulse wave velocity measurement will be carried out, for a total period of 5 minutes.

Keywords: Arterial stiffness; Pulse wave velocity; Coimbra Volunteer Fire Department; Hypertension

Discipline: Occupational Health

Professor: Helder Simões

Degree: Environmental Health

A 150

Edition 16/21

HAZARDOUS SUBSTANCES

Fernando Sousa; Gonçalo Martins; Helder Pereira; João Lima; Felipe Macedo

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Hazardous substances are any liquid, gas or solid that poses a risk to workers' health or safety. They are present in almost all workplaces and, throughout Europe, millions of workers come into contact with chemical and biological agents that can affect their health.

According to the Directorate-General of Health (DGS), Occupational Health is an area of intervention that values the workplace as a privileged space for the prevention of occupational risks, the protection and promotion of health and the access of workers to occupational health and safety services. A work-related disease is the set of several diseases that can cause alterations in the health and well-being of the worker, prevented by extrinsic factors of the professional environment.

This work aims to identify and evaluate dangerous substances that can cause various health problems, in order to alert the population and exposed workers, with the purpose of preventing and reducing associated diseases, such as allergies, skin diseases, cancers, respiratory diseases and intoxication.

There are more and more workers exposed to hazardous substances in service sector occupations such as home care and waste management, just as the expansion of activity sectors, new technologies and changes in work organisation may increase the risk of harm from biological or chemical agents.

Keywords: Hazardous substances, occupational risks, prevention

Discipline: Occupational Health

Professor: Helder Simões

Degree: Environmental Health

A 151

Edition 16/21

PSYCHOSOCIAL RISKS AND STRESS AT WORK

Adérito Leitão; Ana Abrantes; Ana Vitorino; Doigo Doutor; Paula Bagrin; Ricardo Marques; Tiago Barbosa

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Socio-economic and industrial developments have seen a change in the way we work. The occupational safety and health profession has a significant contribution to make in preventing the occupational causes of mental illnesses and is engaged in managing the psychosocial risk of stress, fatigue, bullying and harassment, violence and aggression.

It is crucial to consider the characteristics of a constructive work environment, where workers are well prepared and motivated, thus creating a favourable psychosocial environment that not only provides good personal development and performance, but also the mental and physical well-being of workers. On the other hand, prolonged stress can lead to serious physical health problems, such as cardiovascular diseases or musculoskeletal injuries.

The objective of this the work is to approach the psychosocial risks, the concept of burnout, occupational stress, mental health, and the role of the Environmental Health Technician in this area to prevent poor overall company performance, increased absenteeism, rising accident rates that can guide to injuries and burnout states, which would incapacitate the employee's work.

Professional like Environmental Health Technicians use tools that incorporate the identification, assessment, development of evaluation actions and surveillance of workers' health and health in the workplace, minimizes exposure to psychosocial factors by consolidating a health-promoting environment, with the highest level of health and physical, mental, and social well-being of workers.

Keywords: Psychosocial risks; safety at work; work-related stress; burnout; occupational health.

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 152

Edition 16/21

EPIDEMIOLOGICAL INVESTIGATION AND DISEASES OF COMPULSORY PARTICIPATION

Alda Camacho; Ana Rama

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Epidemiological surveillance and Environmental Health are areas in which their main concern is prevention, either in inhibiting the development of a disease, as well as in the implementation of measures to prevent or delay its progression. Epidemiological surveillance is a priority area of intervention with the objective of monitoring the evolution of infectious diseases, identifying and investigating outbreaks, developing public health responses to the occurrence of serious threats to the health of the population, and implementing intervention and risk reduction programs, including surveillance systems.

The aim of the study is to inform which communicable diseases are mandatory to notify through the national epidemiological surveillance system (SINAVE), highlighting tuberculosis as a serious infectious disease.

Through bibliographic research that we based the information on, contained in reliable websites, especially the National Health Service and National Institute of Health Doctor Ricardo Jorge.

After this study, it is possible to verify that tuberculosis is transmitted mainly by air through inhalation of droplets expelled by the sick person, and the risk of acquiring the higher disease in children and the elderly. Due to certain risk factors such as alcoholism and smoking, men have a higher incidence to contract the disease.

Infectious diseases have a huge impact on public health, health care, the economy and society. The availability of options to control and prevent the appearance and expansion of pathogens requires continuous evaluation.

Keywords: Epidemiological Surveillance; Compulsory Infectious Diseases; Infectious Diseases; Tuberculosis

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 153

Edition 16/21

HEALTH-DISEASE EVOLUTIONARY PROCESS

Beatriz Beleza, Beatriz Nazaré, Carolina Corgas, Francisca Medeiros, Rafaela Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

This work, entitled health-disease evolutionary process, was requested under the curricular unit of epidemiology, in the Environmental Health degree, of the School of Health Technology of Coimbra. Using the research developed, it is perceived that these concepts evolve according to human experience due to various factors, economic, political and social.

To carry out this work we resort to web pages and the learning in the curricular unit.

Understand the evolution, the concept of health and disease, including the differences between countries developed and underdeveloped and finally the new reality after the pandemic. According to the World Health Organization (WHO), Health is the state of complete physical, mental and social well-being, not just the absence of diseases.

Throughout human history, this concept has been changed, because a social, economic, political and cultural set has been included. Disease is characterized by the lack of health that causes disorders of physical and mental functions, this can be divided into two different types, infectious (transmissible) and chronic (non-transmissible). In developed countries, scientific and technological advances, combined with the improvement of food, hygiene and a dense high quality hospital network, allows people to have good health and consequently live longer.

In developing countries, many factors are responsible for poor health. In particular, malnutrition, lack of hygiene and vaccines and poor medical-sanitary coverage. These factors cause the appearance and spread of diseases. According to experts, with the origin of Covid-19 we can say that there have been some changes, including the health-disease process in politics, economy, culture, among others.

In short and taking into account all the research, we can see that, unlike developing countries, in developed countries, combined with better living conditions, people have a greater life expectancy.

Keywords: health; disease; developing, developed countries;

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 154

Edition 16/21

EPIDEMIOLOGICAL SURVEILLANCE IN ENVIRONMENTAL HEALTH

André Rodrigues, Alexandre Carvalho, Diogo Craveiro, Ricardo Anjos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The objective of this work is to relate the area of Epidemiological Surveillance with the area of Environmental Health and verify how they influence and relate, as well as the importance of both today.

Epidemiology and environmental health are two areas that have been complemented towards the prevention and control of diseases and possible injuries in the population, in this case caused by environmental factors, as well as the factors that influence their distribution. Epidemiological surveillance is important in the various areas of study today because it is the process that covers the collection, analysis, interpretation and exposure of the results regarding the incidence of deaths, diseases, and injuries and this knowledge is important to promote the health of the population. One of the biggest problems today is climate change (global warming), which is the object of environmental health study and which has been having increasing repercussions on the health of pollution as new diseases arise, which can be avoided or reduced through epidemiological surveillance. Another problem associated with the environment is contagious diseases that often come from living beings due to their food chains have caused pandemics such as covid-19. Currently this virus has already caused more than 5 million deaths worldwide among more than 250 million infections, data taken by the taken by the disease surveillance system. All the analysis and verification of these data is important for the study of prevention of a future pandemic in order to ensure the well-being of the population.

In conclusion, epidemiological surveillance in environmental health is important because it presents criteria to define notifiable cases or conditions and develops standardized notification forms and procedures related to environmental diseases or conditions, which consequently are reflected in the population.

Keywords: Health, Surveillance, Epidemiology, Population, Environment,

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 155

Edition 16/21

EPIDEMIOLOGY AS A CONTRIBUTION TO THE ENVIRONMENTAL HEALTH INTERVENTION AREA

Ana Cardoso, Ana Rolo, Beatriz Mesquita, Daniela Alves, Mara Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Increasingly, more and more diseases and epidemics arise that have been putting the health status of the world population at risk.

Epidemiology is the area that studies the various variants that intervene in the spread of diseases, such as their frequency, the mode of distribution and the determinants of problems that can affect the health status of populations.

Environmental Health works with aspects of human health and quality of life determined by environmental factors.

With this study, we aim to understand the importance of Epidemiology in its intervention in Environmental Health.

After reviewing different databases, it was decided to base the study on “Surto de Doença dos Legionários em Vila Franca De Xira” by the Ministry of Health and also on a news item from “RTP Notícias”.

To obtain the results, the cooling towers of the manufacturing units were suspended from operation, as they were considered to be sources of contamination and for having presented positive results for Legionella, in the samples collected by the health authorities on November 8, 2014.

To summarize epidemiology has a great contribution to environmental health, since the application of its studies contributes to a better control of the evolution of diseases. Thus, environmental health technicians are present, whose objective is to assess, prevent, and control factors that, present in the environment, can adversely affect human health.

Keywords: epidemiology,environmental health, *Legionella pneumophila*

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 156

Edition 16/21

HISTORY OF EPIDEMIOLOGY

Gonçalo Pires, Maria Macedo, Maria Silva, Miguel Pires, Tomás Ladeiras

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Epidemiology, a term used initially by Hippocrates (known as the father of epidemiology) to describe diseases, relating them only to personal and environmental factors excluding divine factors altogether (when at the time only these were considered) is the science that studies the distribution and the determinant factors of diseases in order to be able to measures, control, prevent and even sometimes to eradicate the diseases. Epidemiology also seeks to answer why there are differences in health from individual to individual, which are usually due to genetic and environmental factors. Through the presentation of the historical evolution of the concept of epidemiology, we aim to show the importance of this science and the main people responsible for its evolution. The methodology used was articles and documents that report the history of the evolution of epidemiology.

We can conclude that epidemiology is the study of the health-disease process and that begins with the study of an occurrence, in other words, the disease, followed by the evaluation of the population, proceeds with the determination of the time of persistence of that disease and ends with the elaboration of prevention, control or eradication measures.

Keywords: Epidemiology , diseases, factors, prevention, control

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 157

Edition 16/21

EPIDEMIOLOGY: OBJECT OF STUDY

Joana Santos, Guilherme Macide, Simão Silva, Pedro Dias, Rodrigo Silva

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Epidemiology may be defined as the science that studies the health/sickness process in human collectivity, analyzing the distribution and the determining factors of illnesses, health damages and events associated with collective health. It means to come up with specific measures of prevention, control, or eradication of diseases, supplying indicators that will serve as support to planning, administration and evaluation of health actions.

Social Determinants of Health can be defined as the life and work conditions of individuals and groups, which are related to their health condition. It's up to the descriptive epidemiology the evaluation of frequency and distribution of illnesses and to analytic epidemiology the study of factors which explain such distribution. Their job is to find a connection between a determined health situation, this is, the inequalities of health levels between populational groups with the efficacy of interventions conducted under public health or even identifying their causes in the way such differences are produced in the way society organizes itself and develops.

This project was written to the subject of Epidemiology with the purpose of approaching what does Epidemiology mean and knowing more about the study object it is related with.

Keywords: Epidemiology, Object, Science

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 158

Edition 16/21

CAUSALITY OF EPIDEMIOLOGY

Inês Buco, Laura Moreira, Leonardo Soares, Mariana Couto, Mariana Regala

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

INTRODUCTION: The study of causality concerns the cause and effect relationships between phenomena. Causality is the observation of the invariability of the succession of a natural fact to another that preceded it, without necessarily knowing the genetic or producing mechanism of the fact. Probabilistic determination - the occurrence of coincidences with such frequency that chance cannot explain them.

OBJECTIVES: verify that the study of causality aids in more precise epidemiological knowledge; verify that the transmission of a disease can be accomplished by various types of contact.

METHODOLOGY: To carry out this work we resorted to consulting an article from the Epidemiology UC, "Causality and Epidemiology", and the news.

RESULTS: Causal determination has four aspects: the formal cause (its essence), the material cause (its appearance), the final cause (its purpose) and the efficient cause (what determines the expression of the essence in appearance).

The application of all the concepts mentioned above, of the theory of probabilities, of the measurement of diseases in populations boosts epidemiological knowledge, allowing the calculation of differentiated risks for populations exposed to different situations. For this reason, the observation of the causes of some event plays a very important role in the study of epidemiology.

CONCLUSION: We conclude that causality and epidemiology are two interrelated concepts, for by contributing to the study of each other, they allow for a broader view of our surroundings.

Keywords: Causality and Epidemiology, transmission

Discipline: Epidemiology

Professor: Ana Catarina Lança

Degree: Environmental Health

A 159

Edition 16/21

PUBLIC HEALTH AND EPIDEMIOLOGY - CONVERGENCES

Ana Rita Rosa, Gustavo Enxuga, Maria Mano, Mariana Duarte

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Public health is defined by the set of measures that guarantee the population's physical, mental and social well-being. Addressing the prevention and treatment of illnesses through the analysis of healthindicators. At an international level, this management is carried out by the World Health Organization (WHO), being composed by 194 countries. WHO works simultaneously with the respective governments of each country so that it is possible not only the improvement of the prevention and treatment of diseases, but also the improvement of living conditions. In another perspective, epidemiology is a public health subject focused on understanding the health/disease process, as well as studying its conditioning and determining factors in human populations. In science, epidemiology is based on casual reasoning, worrying about the progress of strategies for actions related to the protection and promotion of health in a community.

Thus, these two strands of science develop and evolve together, making possible explanations, on the part of epidemiology, for the several health problems in populations, but also a response with greater efficacy and valence, on the part of public health.

Objectives: The goal is to relate the concepts epidemiology and public health, showing their convergences and their current implication.

Methodology: As methodology we will resort to the use of data graphs, text, images, among other methods related to the theme in question. A literature review was carried out on the subject.

Keywords: epidemiology; public health; convergence; health; illness; population

Discipline: Habitat Management

Professor: Ana Catarina Lança, Susana Paixão

Degree: Environmental Health

A 160

Edition 16/21

ARCHITECTURE AND SUSTAINABILITY

Jéssica Oliveira, Rute Costa, Vanessa Cardoso, Bruno Santos, João Maurício, Nuno Correia

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Architecture is the art of designing buildings based on a set of principles and rules. To define Sustainable Architecture, it is necessary to understand that the concept of sustainability is based on three pillars: environmental, social and economic.

The concept of sustainable architecture represents all the proposals that allow the reduction of a non-renewable energy consumption and thus reduce as much as possible the intervention in existing ecosystems.

The aim of the study was to relate the importance of architecture in the construction of a more sustainable planet.

The preparation of this work went through the analysis of several articles related to this theme.

During the history of architecture, there has been an evolution that has sought only prominence and comfort, forgetting environmental impacts in general. Architecture is also guilty of this environmental negligence.

Sustainable Architecture relates to practices that consider all stages of the construction process, from the choice of materials to how the project will be used after construction.

However, more than that, sustainability in architecture also considers buildings as living organisms that directly affect the environment where they are inserted. After all, this idea is thought of based not only on environmental impacts, but also on social and economic ones.

We conclude then, that architecture has a preponderant role in the strategy for a more sustainable world. If this is not yet an individual concern, it will become one in the future, as our planet will not be able to withstand the impact of our current actions.

Keywords: Architecture, sustainability, ecosystems, environmental impacts, individual concern.

HABITAT MANAGEMENT AND MARITIME HEALTH

Elisa, Cordones, Joana Carvalho, Lara Sofia, Mariana Serralheiro, Tatiana Dias

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

In addition to adopting and maintaining basic capacities in ports, which are essential for surveillance and response to situations of potential risk to public health at international level, maritime health and habitat management promotes the existence of standardized procedures at national level in order to allow the effective and harmonized intervention of these Services.
After a bibliographic research on the subject, the method that we found most effective was the analysis of the manual of maritime health procedures.
With this Manual we intend to streamline procedures of a technical-administrative nature and the progressive debureaucratization of the Services, in order to ensure greater efficiency and speed of activities of Maritime Health and greater coordination with port entities.
Our work aims to better understand this issue, in relation to the prevention, protection and control, of the international spread of diseases, with regard to public health, avoiding unnecessary interference with international traffic and trade, applies to vessels, water supply systems, catering establishments and waste management system.
In our country the international ports, which have minimum requirements in place are: Aveiro; Figueira da Foz; Lisbon; Sines; Setúbal; Leixões; Viana do Castelo; Portimão; Funchal; Ponta Delgada.
As environmental health technicians, we have the role of confirming the sanitary status of the ship and authorizing the free movement of people and goods to and from the ship upon its arrival at a port, this is called the Free Practice which is proven through the document used by the Maritime Health Service, called Sanitary Clearance.

Keywords: habitat management; maritime health; surveillance; ports

Discipline: Habitat Management

Professor: Ana Catarina Lança, Susana Paixão

Degree: Environmental Health

A 162

Edition 16/21

HABITAT MANAGEMENT IN CATERING ESTABLISHMENTS

Ana Sofia Cruz, Carolina Tavares, Iris Milheiro, Joana Teixeira, Mariana Machado, Mariana Santos

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

Habitat Management is an area that aims to identify, evaluate and intervene in the promotion of hygiene/health of the various types of human artificial habitat. It aims to understand the application of the ecosystem approach in the field of artificial human habitat and identify the principles of habitat sustainability and relate to human health.

In our study, through a literature review, we intend to highlight the importance that habitat management has in restoration establishments. They are restoration establishments, whatever their denomination, the estabalishments intended to provide, upon remuneration, food and beverage services on or off premises.

A daily place frequented by people must presente hygiene conditions, as well as conditions to receive people with special needs among other parameters that we will address in our work. These conditions must comply with the decrees of law applied to restoration establishments.

Keywords: Habitat Management, Establishments, Restoration, Hygiene, Intervention

Discipline: Habitat Management

Professor: Ana Catarina Lança, Susana Paixão

Degree: Environmental Health

A 163

Edition 16/21

IMPLEMENTATION OF THE ECO SCHOOLS IN HIGHER EDUCATION PROGRAM - CONTRIBUTION TO SUSTAINABILITY

Beatriz Fonseca, Bernardo Fontinha, Bianca Fontes, Daniela Leitão, Mafalda Póvoa, Renato Palricas

Instituto Politécnico de Coimbra, ESTeSC-Coimbra Health School, Saúde Ambiental, Coimbra, Portugal

The Eco Schools Program is an international program of the Environmental Education Foundation developed in Portugal since 1996 by the Blue Flag Association of Europe wich works with three aspects of sustainability (environmental, economic and social) and pretends to encourage the development of contributing activities to change the behavior and the impact of environmental concerns on diferente generations, recognizing and rewarding the work developed.

This project aims to integrate and the commitment to making the school a healthy and sustainable place, the application of concepts of education and environmental management in the daily life of schools, reinforcing the importance of the importance of the participation of all students, having, based on a literature review on the subject.

The Program involves a series of initiatives, such as the competitions*: Brigada Verde, Escola da Energia, Geração Depositrão*, and others.

The Higher School of Health Technology of Coimbra was the first Higher School to implement the Eco School Program and, in 2008, it achieved the much-desired Award. In the 2018/2019 academic year, the prize was awarded to all Organic Teaching Units of the Polytechnic of Coimbra and is considered the largest Eco Polytechnic in the country. According to the Polytechnic of Coimbra, belonging to the Eco School Program is to be integrative and assume responsibility and commitment, even if shared, for a future that is intended to be inclusive, healthy and sustainable. It is to make a difference and believe that Higher Education Institutions play a fundamental role in environmental education for sustainability.

Keywords: Eco Schools, Higher School, Sustainability, Students, Environment