multicriteria decision-making tool. Optimisation of formulation and prediction of drug release, permeability and drug entrapment etc. from the dosage form are performed using DoE (Design of Experiments). *In vitro* diffusion studies and kinetic modelling were also performed.

Results: The alternative with the highest score of 0.49 was obtained for nail patches using AHP.The data obtained from the spectra of FTIR, XRD and SEM of all formulations shows that there is no interaction between the drug and polymers. The total amount of drugs released for the formulations (F01 to F12) was about 77.5% to 93%, observed at different time intervals for a period of 9 hrs, and the optimised formulations containing ethyl cellulose nanosponge are F03, F07 and F11. The in vitro release data obtained were fitted into various kinetic models. Correlation coefficients of controlled release tablets showed a higher correlation with zero order plots than Higuchi and first order with the mechanism of controlled release. The *in vitro* release profiles were expressed most fitly by zero-order release kinetics (R2= 0.9077).

Conclusions: The developed formulation is used as a promising tool for the treatment of Onychomycosis, and helps to avoid the surgical removal of nails with deeper drug release and drug retention in the nail cuticle. Patients who are suffered from onychomycosis are facing embarrassment and disfigurement in society and thereby designed patches can improve the quality of life. The manufacturing method employed is simple and easily adaptable to achieve safe levels of drugs in fragile populations.

Evaluating mechanical properties of paroxetine-loaded filaments to enable printability by fused deposition modelling

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Background: Three-dimensional printing (3DP) has been recently identified as an opportunity to make a significant technological leap over traditional pharmaceutical manufacturing processes, namely regarding the customisation of medicines. Fused deposition modelling (FDM), the most commonly used 3DP technique, involves the production of a drug-loaded filament, obtained previously by hot-melt extrusion (HME), which is then melted and continuously deposited on a surface, layer by layer, building the 3D-printed dosage form.

The successful integration of HME and FDM requires that both extrudability of the raw materials and printability of the HME filaments fabricated are attained, properties which are influenced by the mechanical, rheological and thermal properties of materials. Since the filament is pulled by the printer feeding gears towards the heated nozzle where it softens to allow the accurate deposition on the building plate, evaluation of their mechanical properties is of the utmost importance. These properties are influenced not only by the polymeric formulation composition and the processing parameters used but also by the storage conditions of the filaments.

Objectives: This work aims to evaluate the impact of the environmental conditions on the quality and printability of paroxetine-loaded polymeric formulations for integrated HME-FDM, by assessing the mechanical properties of the filaments.

Methods: PRX (30% w/w), HPC (54% w/w) and other excipients (16% w/w of a mixture made of CaP, MS and TEC in a 10:1:5 ratio). Filaments containing polymeric formulation were prepared by HME (Notzek Pro single screw extruder, Notzek). Filaments were stored in stability chambers (Fitoclima D1200PH, Aralab) and desiccator inside open plastic bags, and re-examined at pre-defined times. Mechanical properties, moisture content and feeding/printing performance of filaments were evaluated for the different time points and conditions of storage. Whenever possible, FDM 3D Printed tablets were manufactured (3D printer Delta WASP 20 40 Turbo 2, Wasp, Italy) with printing temperatures of 200ºC (extrusion) /50ºC (plate).

Results: Under high humidity conditions (>60%RH), filaments became successively more ductile due to moisture absorption. The increment of water content promoted a plasticisation of the filaments, which suffered significant deformation and were unable to feed the printer.

Under low humidity conditions (11% RH), filaments became stiffer allowing adequate feeding of the 3D printer head. These changes are the consequence of the water loss during storage, and they are more prominent after one week of the HME process.

Conclusion: This study corroborates that the successful integration of HME and FDM technologies is highly dependent on the mechanical properties of the filaments used in the production of 3D printed dosage forms, since they affect processability. In turn, it proves that these characteristics are greatly influenced by storage conditions which must be carefully controlled during the continuous manufacturing process. Complementary studies to speed up the printability of filaments should be explored.