

# **The Manufacture and Characterisation of Microbicide Medical Platforms for Oral Infections**

**By**

**Amal Yousef Mousa Bargash**

**Supervisor**

**Dr. Ola Tarawneh**

**Co-supervisor**

**Dr. Ala Alhusban**

## **Abstract**

Periodontal diseases are common microbial infections that affect 35% of the adult population worldwide. The usual regimen for the management of oral infection revolves mainly around employing systemic and topical antimicrobial agents e.g. oral tablets, capsules, mouthwash, dental gel, and dental paste. The high probability of developing a resistance after exposure to systemic antibiotics besides the poor adhesion and rapid disintegration of gels and pastes has brought the forecourt the need to prepare microbicide impregnated dried films with the ability of eluting an antimicrobial agent over the period of

treatment of different oral infections. The dried films contained a combination of active agent's nystatin (NYS) and metronidazole (MNZ). A microbiological assay showed that the best microbial eradication was when the ratio of 9 NYS to 1 MNZ was used. This ratio was used to fabricate the films in different amounts but keeping the aforementioned ratio. The dried films were fabricated using polyvinyl pyrrolidone (PVP) and hydroxyethyl cellulose (HEC). Accurate amounts of NYS and MNZ were dissolved in a mixture of methanol and water (15% v/v methanol in water). Subsequently, the mixture was transferred to a Petri dish and was left to air-dry over 3 days. The dried films were peeled from the Petri dish and kept in a plastic bag for characterisation. In so doing, the thermal analytical comprised of differential scanning calorimetry (DSC) and a dynamic mechanical thermal analysis (DMTA) was conducted to study the crystalline/amorphous state growth and to determine the glass transition temperature (T<sub>g</sub>). Fourier transmission infra-red (FTIR) study was performed to obtain the conformational stretching and bending vibrations of the films. The FTIR spectrum was studied to elucidate any interactions. Mechanical properties were conducted to compare the strength and flexibility between the films. A microbial evaluation was also conducted to confirm the efficiency of these films in the eradication of microbes. The films were clear, flexible and showed good efficiency in the treatment of oral infection. However, it may be deemed appropriate to make a compromise to decide the best choice of film: a flexible, strong film with good antimicrobial efficacy would prove more useful. Hence employing the highest drug ratio, with a combination of HEC and PVP in a ratio of 3:1 may offer films with better potential for a subsequent in vivo study.