Release and activity of rifampicin from biodegradable polymer formulations

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ABSTRACT

Implantation of an indwelling medical device is often required in order to successfully treat a serious medical issue. However, infection of such devices is an ongoing problem, and can occur when microorganisms, predominantly *Staphylococcus* species, adhere to the device surface[1]. Biodegradable polymer drug delivery technology may be of use in some devices as a means of delivering a high local dose of antimicrobial in order to help prevent infection pathogenesis. In this study the broad spectrum antibiotic rifampicin has been formulated with the polymers PLA (Poly(L-Lactide)) and PLGA (Poly(D,L-lactic-co-glycolic acid(65:35)) and the *in vitro* drug release over 1 week analysed. Based on the release data (Fig. 1A), the PLGA:rifampicin formulations of 50:50 and 60:40 were selected for further analysis. A 4 week drug release study showed that over the examined period >95% of the rifampicin load was released from both formulations, however increasing the ratio of polymer to drug significantly changed the percentage release profile (Fig. 1B). Investigation of antimicrobial activity revealed that both formulations were able to produce consistently large zones of inhibition in disk diffusion assays over the 4 weeks examined, indicating successful bacterial inhibition (Fig. 1C). What this preliminary study has revealed is that rifampicin can be readily released from PLA and PLGA, and that release can be controlled by adjusting the ratio of polymer to drug. It has also shown that the antimicrobial activity of the rifampicin can be retained for at least 4 weeks. Therefore biodegradable polymers may represent a promising material for use in implanted medical devices as a means of delivering a high local concentration of antimicrobial to help prevent infection pathogenesis.

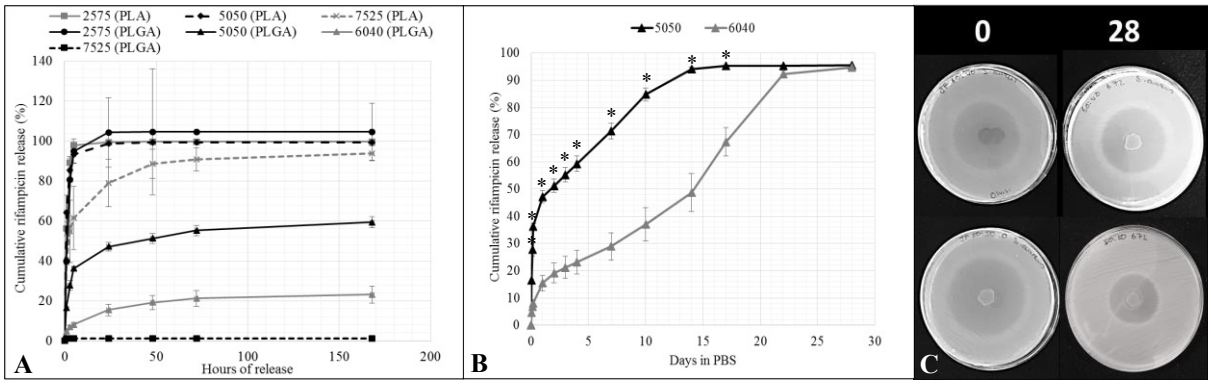

Fig.1: **A** shows the release of rifampicin from a variety of biodegradable polymer formulations into PBS (37°C; 120rpm) over 1 week. **B** shows release of rifampicin from PLGA formulations over 4 weeks under the same conditions (Statistical analysis by one-way Anova and Tukeys post hoc test, $*p \leq 0.05$; for all data n=3 ± SEM). **C** shows zones of inhibition produced by the formulations against *Staphylococcus aureus* after 0 hours/28 days in PBS (top = 60:40; bottom = 50:50 PLGA:rifampicin)

REFERENCES

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