Controlled release of nicotine from novel poly(ethylene oxide) silicone elastomers in vitro

Carly Moore, Michael Hyrynk, Ryan Lall & Kenneth Ng
Honours Biology & Pharmacology Program, McMaster University, Hamilton

1. The objective of this study was to synthesize a poly(ethylene oxide) (PEO) silicone elastomer formulation that could be used as a stable drug delivery system to achieve controlled release over an extended period of time in vitro. The study focused on incorporation of hydrophilic drugs into silicone elastomers, using nicotine as a model drug.

2. Various silicone elastomer formulations were prepared and their nicotine release profiles were analyzed. PEO concentration and drug content were varied to determine their effects on nicotine release.

3. In a period of 25 days, elastomer formulations with 0%, 5% and 10% w w⁻¹ PEO released 42%, 70% and 71% of their total drug content, respectively. The 20% w w⁻¹ PEO formulation achieved maximum release after 9 days. All formulations exhibited a large initial burst, followed by a near-zero order rate of release.

4. By increasing PEO concentration from 5% to 10% w w⁻¹ while maintaining drug load constant (50 mg g⁻¹), the rate of nicotine release increased from 0.006 mg h⁻¹ to 0.009 mg h⁻¹. By increasing drug content from 12 mg g⁻¹ to 50 mg g⁻¹ and maintaining PEO concentration constant (5% w w⁻¹), the rate of nicotine release increased from 0.003 mg h⁻¹ to 0.006 mg h⁻¹.

5. These findings suggest that drug delivery can be controlled by manipulation of the formulations.