Presented at the Royal Society of Chemistry Biomaterials Meeting, 2017

Saving neonates' lives by preventing umbilical cord infection: A cheap and effective sustained efficacy biocide solution

Sara Correia Carreira[1], Holly M Watkin[1], James Spencer[2], Jeroen van Duijneveldt[3], Michele E Barbour[1,4]

[1]School of Oral and Dental Sciences, University of Bristol, Bristol BS1 2LY
[2]School of Cellular and Molecular Medicine, University of Bristol, Bristol BS8 1TD
[3]School of Chemistry, University of Bristol, Bristol BS8 1TS
[4]Pertinax Pharma Ltd, Future Space, UWE, Bristol BS34 8RB

Infection is a leading cause of neonatal mortality. Globally, it accounts for approximately 450000 newborn deaths each year; 99% of these are in the developing world. Ensuring optimal umbilical cord care during the first week of life, especially in settings having poor hygiene, is crucial to prevent life-threatening sepsis. The WHO recommended application of 7.1% chlorhexidine digluconate to the cord daily for the first week of life in countries with high neonatal mortality. While this does reduce incidence of infection, the drawback is the necessity for repeated applications, which is difficult to achieve in remote or traditional communities. A single application topical chlorhexidine formulation which protects against infection for at least seven days without the need for further treatment would be advantageous. Here, we investigate the use of a novel sustained efficacy chlorhexidine material, chlorhexidine hexametaphosphate (CHX-HMP) for this purpose. CHX-HMP was incorporated into a pump-action spray, and the effect of various film-forming and surfactant polymers on retention of the sprayed material was compared at baseline and after mechanical challenge. Polyvinylacetate and polyvinylpyrrolidone were superior to Poloxamer 407 or no polymer in forming a film containing CHX-HMP that withstood mechanical challenge. CHX-HMP was also formulated with a simple aqueous carboxymethylcellulose gel and applied to glass coverslips, which were aged by a daily water challenge for 7 days then tested with respect to ability to reduce growth of *Staphylcoccus aureus*. The CHX-HMP gel was effective after 7 days in reducing *S. aureus* growth with respect to gel only and a chlorhexidine digluconate control. These data justify further exploration of both spray and gel CHX-HMP formulations for sustained chlorhexidine delivery for healthcare applications in low resource settings.

Funded by EPSRC Bridging-the-Gaps, EPSRC Global Challenges and the Wellcome Trust