

Enhancing Animal Protection: Topical RNAi with Polymer Carriers for Sustainable Animal Health in Australian Sheep Flystrike

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Abstract : Sheep flystrike is one of the most economically important diseases affecting the Australian sheep and wool industry (>356M/annually). Currently, control of *Lucillia cuprina* relies almost exclusively on chemical controls and the parasite has developed resistance to nearly all control chemicals used in the past. It is therefore critical to develop an alternative solution for the sustainable control and management of flystrike. RNA interference (RNAi) technologies have been successfully explored in multiple animal industries for developing parasite controls. This research project aims to develop a RNAi based biological control for sheep blowfly. Double-stranded RNA (dsRNA) has already proven successful against viruses, fungi and insects. However, the environmental instability of dsRNA is a major bottleneck with a protection window only lasting 5-7 days. Bentonite polymer (BenPol) technology can overcome this problem, as it can be tuned for controlled release of the dsRNA in the gut challenging pH environment of the blowfly larvae, prolonging its exposure time to and uptake by target cells. We have investigated four different BenPol carriers for their dsRNA loading capabilities of which three of them were able to afford dsRNA stability under multiple temperatures (4°C, 22°C, 40°C, 55°C) in the sheep serum. Based on stability results, we further tested dsRNA from potential targeted genes loaded with BenPol carrier in larvae feeding assay, and get three knockdowns. Our results, establish that the dsRNA when loaded on BenPol particles is stable unlike naked dsRNA which is rapidly degraded in the sheep serum. A stable nanoparticles delivery system that can protect and increase the inherent stability of the dsRNA molecules at higher temperatures in a complex biological fluid like serum, offers a great deal of promise for the future use of this approach for enhancing animal protection.

Keywords : RNA interference, *Lucillia cuprina*, polymer carriers, polymer stability

Conference Title : ICAHMP 2023 : International Conference on Animal Health Management and Production

Conference Location : Beijing, China

Conference Dates : October 02-03, 2023