

Abstract

Buffalo Flies Receptive to *Wolbachia* Infection: An Opportunity for Population Control? †

Mukund Madhav ¹, Geoff Brown ², Jess A. T. Morgan ², Sassan Asgari ³, Elizabeth McGraw ⁴ and Peter James ^{1,*}

¹ QAAFI, The University of Queensland, Brisbane 4072, Australia; m.madhav@uq.edu.au

² Department of Agriculture and Fisheries, Brisbane 4102, Australia; Geoff.brown@daf.qld.gov.au (G.B.); jessica.morgan@daf.qld.gov.au (J.A.T.M.)

³ Australian Infectious Disease Research Centre, The University of Queensland, Brisbane 4072, Australia; s.asagri@uq.edu.au

⁴ The Centre for Infectious Disease Dynamics (CIDD), The Pennsylvania State University, PA 16802, USA; bethanmcmgraw@gmail.com

* Correspondence: p.james1@uq.edu.au

† Presented at the third International Tropical Agriculture Conference (TROPAG 2019), Brisbane, Australia, 11–13 November 2019.

Published: 21 January 2020

Abstract: Buffalo flies, *Haematobia (irritans) exigua* (BF), are obligate haematophagous ectoparasites of cattle that cause significant economic and welfare impacts in northern Australian cattle. With climate change and the development of resistance to commonly used chemicals, BF are rapidly spreading southwards. *Wolbachia* is a maternally transmitted bacterial endosymbiont of insects that induces a range of effects on its host, including cytoplasmic incompatibility (male sterility), reduced fitness, and inhibition of pathogen transmission. We are examining the potential for use of *Wolbachia* in area-wide control of BF. Following a survey of Australian BF populations that showed *Wolbachia* was not present, we have tested embryonic microinjection, pupal injection and injection of adults as a first step towards the development of a *Wolbachia* infected BF line. Here we report distribution and growth of *Wolbachia* in somatic and germline tissue of BF injected with the three *Wolbachia* strains; *wAlbB*, *wMel* and *wMelPop*. Our results to date suggest that pupal or adult injection may be a more suitable method for transfecting BF than embryonic microinjection. We also demonstrate *Wolbachia* induced fitness effects in injected BF including shortened lifespan, decreased pupal emergence, and reduced egg production. Future work will focus on establishing a stably infected BF strain, towards the design of *Wolbachia*-based control programs for BF.

Keywords: haematobia; buffalo fly; *Wolbachia*; biocontrol

Author Contributions: M.M. designed and performed the experiment, analyzed data and drafted the manuscript. G.B. performed the experiment and edited the manuscript. J.A.T.M., S.A., E.B.M.G. and P.J. conceived and designed experiments, interpreted the data and critically revised the manuscript.

Funding: This research was funded by Meat Livestock Australia.

Acknowledgments: We thank Prof. Scott O’Neill (Monash University, Melbourne) and the Eliminate Dengue program for the donation of the two *Wolbachia* strains *wMel* and *wMelPop* used for this study. We also thank Dalton Baker, Dr Akila Prabhakaran, and Dr Mona Moradi Vajargah for helping with microinjection of the buffalo flies.

Conflicts of Interest: The authors declare no conflict of interest.



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).