

DEVELOPMENT OF EMBRYO TRANSFER TECHNOLOGIES IN THE HONEY BEE FOR SPECIFIC PATHOGEN-FREE QUEEN PRODUCTION AND INTERNATIONAL GENETIC MOVEMENT

Dr. John Pollard^{1,2}, Dr. Claire Plante^{1,2} and Susan Cobey¹

¹Univeristy of California, Davis and ²Genesafe Technologies Ltd., Guelph, Ontario, Canada

The development of embryo transfer technologies was undertaken to create new pathways for the safe and well regulated international exchange of honey bee genetics. Reproductive technologies were developed for the manipulation of honey bee embryos to allow for their isolation, pathogen testing, long distance transport, in vitro hatching and subsequent grafting for specific-pathogen-free queen production. New methodologies were developed for the manipulation of embryos using micro-forceps modified by the application of micro-bore tubing to the forceps distal pincers. The extreme apical end of individual embryos were grasped between apposing segments of tubing and then lifted to separate their glued basal end from the brood cell. Embryos (50-54h post-oviposition) obtained from individual donors (n=10) were transferred in groups (n=100) to sterile culture dishes (glued in a standing position to the dishes bottom surface) and thereafter placed into 35°C incubators (95% humidity, air atmosphere) for 32 hours. Selected in vitro-hatched larva, demonstrating spiracle movement, were grafted to queen cell cups and transferred to cell builder colonies to rear queens. Grafted larvae were assessed for acceptance at 48h and 120h post-grafting and for emergence following transfer to emergence cages. Results demonstrated that 94% (941/998) of transferred honey bee embryos hatched in vitro within 32h of culture. Of the 570 larvae grafted for queen production, 239 grafted larvae (42%) were accepted and emerged as morphologically normal queens. Subsequent instrumental insemination and colony introduction of 107 selected embryo transfer derived queens demonstrated normal acceptance rates (86%), initiation of oviposition (mean day 5.5), brood production and survival overall.