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Research on the Genetics of Screwworms in Lincoln, Nebraska

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Title: Research on the Genetics of Screwworms in Lincoln, Nebraska, USA

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Interpretive Summary: The success of the screwworm eradication program – these pests have been eliminated from the North American continent to Panama – has been facilitated by insightful research. The recent research on screwworms by ARS scientists at Lincoln, NE has concentrated on 1) discovering molecular markers useful in population genetics and population identification; 2) genetic research useful in developing a genetic sexing strain (males–only) in screwworms. Amplified fragment length polymorphisms (AFLP) have been studied in screwworms; this technique shows the potential for use in population identification and population genetics. AFLP's will be further explored to determine their utility: a grant proposal submitted this past year to address this question as well as others, with most the Western Hemisphere's participants in this CRP as collaborators, was not funded but could be resubmitted. Transgenic techniques have been successfully applied to screwworms. In collaboration with Dr. Alfred Handler (ARS, Gainesville, Florida and participant in this CRP), screwworms now express genes for Green Fluorescent Protein that were inserted using the piggyback transposable element construct provided by Dr. Handler. Eight unique strains have been isolated, PCR and Southern Blot analyses have been completed to verify the events, and fitness of the transgenic strains has been shown to be similar to non–transgenic, 'normal' strains. Crosses

have been completed, using the seven mutant phenotype strains and one 'normal' strain, to examine genetic linkage and/or interactions. Several of the crosses resulted in F2 generations that deviated from expected ratios; this indicates either genetic linkage, gene interaction or both. Further crossing studies are needed. We also have designed a study whereby crosses will be done to examine phenotypic ratios and progeny will be saved so that AFLP can be used to begin developing a genetic linkage map based on molecular markers.

Technical Abstract: The success of the screwworm eradication program – these pests have been eliminated from the North American continent to Panama – has been facilitated by insightful research. The recent research on screwworms by ARS scientists at Lincoln, NE has concentrated on 1) discovering molecular markers useful in population genetics and population identification; 2) genetic research useful in developing a genetic sexing strain (males-only) in screwworms. Amplified fragment length polymorphisms (AFLP) have been studied in screwworms; this technique shows the potential for use in population identification and population genetics. AFLP's will be further explored to determine their utility: a grant proposal submitted this past year to address this question as well as others, with most the Western Hemisphere's participants in this CRP as collaborators, was not funded but could be resubmitted. Transgenic techniques have been successfully applied to screwworms. In collaboration with Dr. Alfred Handler (ARS, Gainesville, Florida and participant in this CRP), screwworms now express genes for Green Fluorescent Protein that were inserted using the piggyback transposable element construct provided by Dr. Handler. Eight unique strains have been isolated, PCR and Southern Blot analyses have been completed to verify the events, and fitness of the transgenic strains has been shown to be similar to non-transgenic, 'normal' strains. Crosses have been completed, using the seven mutant phenotype strains and one 'normal' strain, to examine genetic linkage and/or interactions. Several of the crosses resulted in F2 generations that deviated from expected ratios; this indicates either genetic linkage, gene interaction or both. Further crossing studies are needed. We also have designed a study whereby crosses will be done to examine phenotypic ratios and progeny will be saved so that AFLP can be used to begin developing a genetic linkage map based on molecular markers.