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Genetic Research on Screwworm at Lincoln, Nebraska, USA

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Interpretive Summary: The following interpretive summary refers to the 1st seminar given by Dr. Skoda at the IAEA-FAO 1st RCM Research Coordination Meeting for the CRP Coordinated Research Project, Jan-Feb 2002. Screwwoms, Cochliomyia hominivorax (Coquerel), are devastating pests of animals. They have been eradicated from mainland North America, with the exception of portions of eastern Panama, using the Sterile Insect Technique (SIT), a form of gtenetic control. Research at Lincoln, Nebraska has been in support of the international effort of SIT against screwworms. Successful cryopreservation of the screwworm has been achieved, is to be optimized, and will be a tool for preserving genetic stocks of screwworms. The molecular genetic techniques of random amplified polymorphic DNA - polymerase chain reaction and the amplified fragment length polymorphism have been shown useful as techniques for species identification when samples of 'unknowns' are collected by eradication preogram personnel; each technique has shown promise and they are being further explored for their utility in determining the geographic origin of screwworm samples. After one year of using a common organophosphate insecticide, Coumaphos, in an effort to develop an insecticide resistant strain of screwworm for use in developing a genetic-sexing strain, little progress has been made in developing a selection mechanism for eliminating female screwworms during the mass rearing process (<10-fold resistance has been achieved). Future research into developing a genetic-sexing system will concentrate in two areas: 1) developing a temperature sensitive lethality (TSL) mutation in screwworms, preferably with lethality occurring very early in development, and 2) developing transgenic techniques useful in screwworms. On successful development of TSL,

research will continue toward developing translocations of the responsible gene(s) to the Y-chromosome, as well as cytognetic characterization of the mutation and/or translocation, and characterizing the resultant genetic-sexing strain. Concurrently, as transgenic techniques become available work will aim to isolate existing TSL genes, or other lethal genes (perhaps from other species), so that transgenic techniques may be developed whereby these lethal genes are inserted in such a manner that genetic selection can be done.

Technical Abstract: The following technical abstract refers to the 1st seminar given by Dr. Skoda at the IAEA-FAO 1st RCM Research Coordination Meeting for the CRP Coordinated Research Project, Jan-Feb 2002. Screwwoms, Cochliomyia hominivorax (Coquerel), are devastating pests of animals. They have been eradicated from mainland North America, with the exception of portions of eastern Panama, using the Sterile Insect Technique (SIT), a form of gtenetic control. Research at Lincoln, Nebraska has been in support of the international effort of SIT against screwworms. Successful cryopreservation of the screwworm has been achieved, is to be optimized, and will be a tool for preserving genetic stocks of screwworms. The molecular genetic techniques of random amplified polymorphic DNA - polymerase chain reaction and the amplified fragment length polymorphism have been shown useful as techniques for species identification when samples of 'unknowns' are collected by eradication preogram personnel; each technique has shown promise and they are being further explored for their utility in determining the geographic origin of screwworm samples. After one year of using a common organophosphate insecticide, Coumaphos, in an effort to develop an insecticide resistant strain of screwworm for use in developing a genetic-sexing strain, little progress has been made in developing a selection mechanism for eliminating female screwworms during the mass rearing process (<10-fold resistance has been achieved). Future research into developing a genetic-sexing system will concentrate in two areas: 1) developing a temperature sensitive lethality (TSL) mutation in screwworms, preferably with lethality occurring very early in development, and 2) developing transgenic techniques useful in screwworms. On successful development of TSL, research will continue toward developing translocations of the responsible gene(s) to the Y-chromosome, as well as cytognetic characterization of the mutation and/or translocation, and characterizing the resultant genetic-sexing strain. Concurrently, as transgenic techniques become available work will aim to isolate existing TSL genes, or other lethal genes (perhaps from other species), so that transgenic techniques may be developed whereby these lethal genes are inserted in such a manner that genetic selection can be done.