with an insert of males carrying the heterozygote translocation, and to recover the interchange in progeny collected in the field. Quality control tests of release mosquitoes indicated that 99.4 percent of the males released were carrying the translocation. The number needed for a successful release was again ascertained by computer simulations based on previous population estimates. Male adults instead of pupae were released in the field to ensure against unwanted introductions of females.

In 1978, 180,000 translocated males were released. The progeny of females collected in the field were genetically tested to determine male parentage. In 22 cases tests confirmed that released translocated males had mated with native females. Unfortunately, parallel tests in outdoor cages revealed that the release stock had become less competitive with time; thus again, the release did not have sufficient impact to cause a continuing population reduction in the field. The data, however, did show a four-week delay before the population reached a peak, when compared with that of previous years, and the insert may have contributed toward keeping the population down during the release period. The population increased considerably once the release ended, and the peak population was twice that of the previous year.

A new method for rapidly identifying homozygote translocations was perfected. Currently, simulated field releases of various combinations of homozygous lines are being conducted in large outdoor cages. The advantages of homozygotes over heterozygotes would allow use of a field-replacement mechanism in addition to a self-destruction scheme.

One desirable genotype to be carried into field populations is decreased competence of *Culex tarsalis* as a vector of encephalitis viruses. A strain that rejects infection with western equine encephalitis (WEE) has been isolated by selection techniques. Although we lack conclusive genetic data on this resistance to WEE, the strain is a candidate for induction of translocations that might carry resistance to viral infection into field populations. Attempts are in progress to isolate a gene that acts as a lethal at low temperatures only. Such a conditional lethal would be a desirable "time bomb" for insertion in the summer to kill overwintering populations.

In studies on the feasibility of using the sterile male technique to control *Cx. tarsalis*, radiation sterility curves were established, mating competition tests were performed in the laboratory, and extended tests were conducted in walk-in cages outdoors. Egg hatch was reduced to 43 percent when irradiated males and nonirradiated males competed in a 1:1 ratio as compared with a 92 percent hatch in the nonirradiated control cage, and a 3 percent hatch in the irradiated control cage. In August 1979, a small-scale field release of sterile males reared from field-collected pupae was made in an isolated area outside Bakersfield. Only 1 of 50 egg rafts from females collected before the release had hatch rates lower than 70 percent, while 22 of 112 females collected during the first four days after the release laid rafts with low or medium hatch rates. Such results warrant further research with this method.

The behavior and ecology of *Cx. tarsalis* in the field, primarily in relation to reproduction, have been investigated continuously. Studies on reproductive vigor of laboratory-adapted and field-collected populations indicated that laboratory populations were more successful in insemination, oviposition, and the production of hatching egg rafts in small cage tests. The results also documented a substantial reproductive disadvantage of newly colonized populations during the initial colonizing process.

Current priorities are to keep field populations that are captured and colonized for genetic studies biologically and genetically close to the original stock and to improve the fitness of genetically altered strains to withstand field releases. A strict quality-control program has been established to ensure that specific attributes essential for normal behavior in the field are not lost during or after colonization. Representatives of translocated stocks and wild-type populations are being reared as continuously as possible in large outdoor cages under overwintering conditions.

Studies have been initiated to identify genetic selection factors that reduce competitive fitness. Study of genetic markers for several enzymes in *Cx. tarsalis* strains are under way. Analysis of the wild-type populations as they become colonized or become less competitive because of other selection factors will be made. The enzyme markers can also contribute to our formal genetic information, to release experiments where we can follow these "fingerprinted" strains, and to the study of reproductive behavior.

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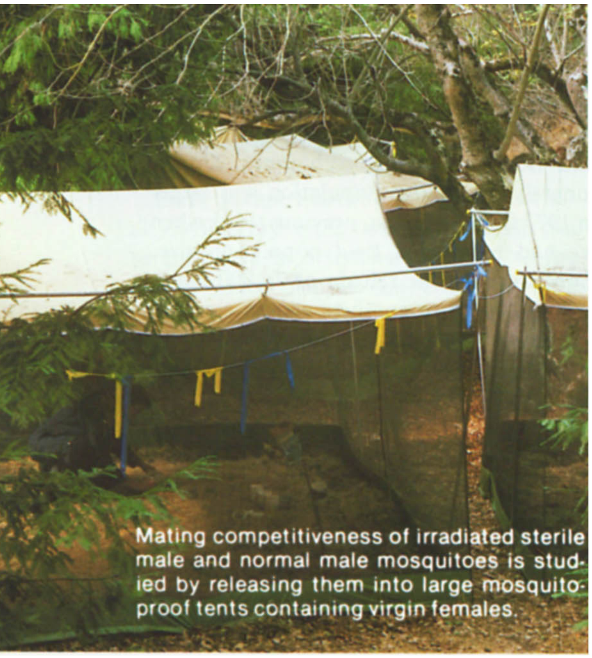
Using sterile males to reduce mosquito numbers

John R. Anderson □ Sister Monica Asman

Control of the treehole mosquito, *Aedes sierrensis*, is difficult, because it develops in hard-to-find treeholes. For this reason, the release of sterilized males is being researched as one possible component of an integrated management program. Initial laboratory experiments determined the most effective sterilization doses, and established that Gamma-irradiated, sterilized males competed equally with normal males in all mating experiments. Since females mate only once, regardless of whether mating with a fertile or sterilized male, sterilized males could be released and used to help reduce populations of this common pest.

In experiments at the University of California Russell Tree Farm Field Station (near Briones Regional Park, Contra Costa County), laboratory-reared mosquitoes were released into large tents having screened sides and natural turf floors. For these experiments, males mass-produced in the laboratory were sterilized by exposure to 7 kR of Gamma irradiation when less than a day old. The tents were set up in a


Mating competitiveness of irradiated sterile male and normal male mosquitoes is studied by releasing them into large mosquito-proof tents containing virgin females.