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RECENT INTRODUCTION OF *AEDES AEGYPTI* IN BERMUDA

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Bermuda is an archipelago of approximately 21 square miles (59 km²) located between 32° 15′ and 32° 23′ N and 64° 38′ and 64° 53′ W in the Atlantic Ocean. The nearest point of land, due west, is Cape Hatteras, North Carolina about 600 miles (965 km) away. The 'island' consists of a series of limestone deposits covering the top of an ancient volcano. There are no fresh water streams although a number of marshes and ponds (fresh and brackish water) exist in various parts of the island. The climate is subtropical with an annual average temperature of 70.3°F (21.3°C). The average annual rainfall is approximately 58″ (147 cm) and fairly uniform throughout the year. In a typical year relative humidity ranges from a minimum of 74% in December to 81% in June.

Mosquito control is a function of the Department of Health which uses an integrated approach involving sanitation inspections, elimination of breeding sites, larviciding, larvivorous fish and source reduction in the marshes and ponds where possible. Space spraying or fogging are infrequent procedures.

Species of mosquitoes which occur in Bermuda are *Aedes sollicitans* (Walker), *Aedes taeniorhynchus* (Wied.), *Culex quinquefasciatus* Say and *Culex salinarius* Coq. Bermuda has been considered free of *Aedes aegypti* (Linn.) for 30 years[2] and the last reported major outbreaks of disease associated with this vector were the dengue fever epidemic in 1941 (Tucker 1982, Wilkinson 1943), and yellow fever in 1864 (Hughes-Hallett 1954). Two minor outbreaks of yellow fever were also recorded in 1867 and 1879 (Hughes-Hallett 1954).

Aedes aegypti reinfestation and upsurge in certain Caribbean and Central American regions, as reported by the Pan American Health Organization and the Caribbean Epidemiology Centre (CAREC) in their news bulletins, prompted the Health Department to monitor for the possible reintroduction of the species by aircraft landing in Bermuda from infested countries. This commenced in May 1980 when 15 ovitraps were placed at various locations in and around the Civil Airport buildings. Each trap was numbered and its location marked on a map of the airport environs.

A Department of Health mosquito control operator was assigned the responsibility of making weekly inspections of the traps, collecting paddles for microscopic examination, cleaning and adding water and new paddles to the jars, providing new jars if needed and submitting an ovitrap report form detailing conditions and problems associated with the traps.

In May 1982, Dr. Bruce Knudsen of the Pan American Health Organization undertook a review of the Department's mosquito control activities. On his advice several ovitraps at the airport were moved to more favorable locations. Additional ovitraps were set up at the airport catering complex (some distance from the terminal buildings) and at St. George's Harbour some 2½ miles (4 km) from the airport.

Out of a batch of paddles microscopically examined on September 7, 1982, two were positive with light infestations of *Ae. aegypti* eggs. Both paddles were from traps located inside the airport freight shed which is adjacent to the runways. One paddle was forwarded to CAREC for their confirmation of *Ae. aegypti* eggs and the other paddle was submitted to Dr. I. W. Hughes, Department of Agriculture, Bermuda. Both authorities confirmed *Ae. aegypti* after rearing the eggs to adults.

Following the finding of the positive paddles, a detailed search of the interior of the freight shed and surrounding area was instituted. A small container of water was discovered which contained mosquito larvae. These were identified as *Ae. aegypti* and subsequent adult rearing confirmed this. It was surmised that the reintroduction of *Ae. aegypti* had occurred from infested Caribbean or Central American air freight containers which are taken inside the freight shed for unpacking.

Eradication and control measures were put into force by the Health Department immediately following discovery of the positive paddles on September 7. These measures included:

a) Government departments having airport responsibilities, the U.S. Navy and airline oper-

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ators were notified of *Ae. aegypti* reinfestation. Their cooperation was solicited in any action taken by the Health Department with eradication procedures.

b) Statutory requirements relating to aircraft disinsectization were relayed to those concerned; however, the difficulties encountered with the practical application of aircraft disinsectization in a thorough manner precluded this as an effective control measure.

c) At the earliest opportunity the freight shed was closed and the interior fogged with ULV-applied pyrethrum. The interior walls were also sprayed with a residual insecticide (Diazinon).

d) Instructions were given to the Customs Department to ensure that the interiors of all freight containers arriving from south of Bermuda were treated by Customs Officers with an aerosol pyrethrum spray prior to unpacking.

e) The waste metal dump (land reclamation project) adjacent to the airport was treated as soon as weather conditions were satisfactory with malathion from a thermal fogger.

f) A general cleanup and elimination of possible breeding sites at the airport was undertaken. The results of this operation were not entirely satisfactory despite the importance attached to this aspect of mosquito control.

g) Information was released to the news media concerning the *Ae. aegypti* reappearance at the airport. This resulted in the publication of much general and specific information on the need for effective mosquito control and public awareness of the health and nuisance problems associated with these insects.

No further evidence of *Ae. aegypti* was found until one positive paddle was identified with a light infestation of *Ae. aegypti* eggs on October 6, 1982. This paddle was taken from an ovitrap set in ornamental shrubbery in a partially enclosed passengers walkway facing the runways. A search of the area revealed no further evidence of infestation and the area was fogged several times with pyrethrum from the ULV equipment.

Aedes aegypti has not been found since October 6, 1982. Surveillance activities against reinfestation have been strengthened in view of the permanent threat of the accidental importation of this disease vector from infested countries to the south of Bermuda. The reestablishment of *Ae. aegypti* in Bermuda with a high index infestation would undoubtedly pose a serious threat to public health and Bermuda's reputation as a healthy and popular tourist resort.

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VISUAL QUANTIFICATION OF SUGAR IN MOSQUITOES USING ANTHRONE REAGENT

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The cold anthrone test for fructose (Van Handel 1967, 1968) was developed by Van Handel (1972) for detecting the presence of nectar in the crops of mosquitoes. It is able to detect recent sugar feeding because fructose is invariably present in nectars and fruits, either by itself (in approximately equal proportions with glucose) or in the disaccharide sucrose (Percival 1961, Van Handel et al. 1972). Furthermore, fructose is not present in unfed mosquitoes and is rapidly broken down during nectar meal digestion. Other workers have used anthrone to test for the presence or absence of nectar in mosquitoes (for example, Bidlingmayer and Hem 1973, Magnarelli 1980), but there appear to have been no studies in which the amount of fructose in field-caught mosquitoes was quantified. During an investigation of nectar feeding by *Aedes triseriatus* (Say) we wanted to roughly measure the amount of nectar present in the mosquitoes, yet avoid the time consuming use of a spectrophotometer. Consequently, we followed the suggestion of Van Handel (1972) of comparing the color reaction of unknowns (field-collected mosquitoes) to a series of standards prepared with known amounts of fructose. However, there appeared to be no published data on the efficacy of the anthrone test, i.e., the precision with which the observed color (or absorbance) indicated the actual amount of fructose present. The primary objective of this experiment was to test the reliability of visual quantification of nectar sugars when using anthrone, by feeding

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