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Medical Entomology

POSSIBLE VECTORS OF MALARIA AND DENGUE AT TOWNSVILLE, QUEENSLAND

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A biting collection on the banks of Ross River included Anopheles farauti, Aedes imprimens and Ae. alboscuteletus, indicating a recolon population of rain-forest mosquitoes and confirming two earlier records of An. farauti from Townsville. Aedes aegypti was collected at Townsville airport. Significance of these findings is discussed in relation to changing urban conditions and a proposed international airport.

In view of the proposed establishment of an international airport at Townsville, attention is drawn to the presence of efficient mosquito vectors of malaria and dengue, diseases commonly introduced by international travellers. The results of two of our recent mosquito collections, and the possibility of increased arbovirus activity after the planned expansion of the Ross River dam, indicate that a reappraisal of the mosquito fauna of Townsville, recently suggested by the city’s Chief Health Surveyor, would be prudent.

MALARIA

Anopheles farauti (Laveran), recorded in Northern Territory in 1926,1 was first recognized in Queensland in 1942, at Cairns,2 where Heydon established it as the primary vector in a malaria epidemic.3 During the following two years, careful and extensive searches for this species and surveys and routine collections by army personnel failed to find it in the Townsville area.3 4 although, in 1943, Taylor reported it from Townsville.8

Roberts found that the distribution of An. farauti in northern Queensland appeared to be associated with two factors, presence or absence of a rain forest, and altitude.6 Presence of a rain forest apparently indicated the existence of the conditions of humidity, temperature, and shelter that the insect required, but it was not found at altitudes above 400 m. Roberts did not find it south of Ingham and, because of the high humidity said to be required for its survival and the failure of his and other surveys to detect it, he considered Taylor’s Townsville record to be erroneous. Lee et alii likewise failed to find it during a survey of Townsville in May and June, 1950.7

Two specimens of An. farauti were identified among over 42,300 mosquitoes (including over 4300 anophelines) collected for arbovirus research at Townsville during April 7, to May 2, 1952.8 9 None was taken in a collection of 3069 mosquitoes (51 anophelines) during November 16, to December 7, 1954,10 nor in collections by O’Gower in 1959,11 and by E.N.M. in May, 1966, and May, 1973.

It was surprising, therefore, when seven specimens of An. farauti were taken by B.H.K. in a biting catch of 142 mosquitoes between 5.47 p.m. and 7.30 p.m. on June 23, 1980. The site, in the suburb of Murray, was amongst mango trees and remnant forest on the right bank of Ross River, 300 m downstream from Charles Barton Bridge and approximately 2 km northwest of Lavarack Army Barracks. The collection was also exceptional in that it included two species not previously recorded from Townsville, Aedes imprimens (Walker) (only the fourth Australian record) and Ae. alboscuteletus (Theobald). Larvae of these two Aedes species have been found together by E.N.M. and M.M.E.H. at Mount Molloy, and by E.N.M. at Samford and (associated with An. farauti) at Lockhart River Mission. Breeding places were shaded, rain-filled pools either fringed by remnant vine forest or where vine forest had recently been cleared.

Collection at Townsville of the adults of these three species together suggests breeding sites where vestiges of fringing vine forest remain, or recently existed, along the banks of Ross River and its tributary gullies, with an associated recol population of rain-forest mosquitoes. The area has only recently become suburban, and probably was not visited by earlier collectors. The population of An. farauti may be small and static or declining. On the other hand, it is possible that a plentiful water supply will promote continually humid conditions in parks and gardens, providing an increasingly favourable habitat for An. farauti. The situation bears watching.

DENGUE

Up until 1955, Queensland was subject to periodic epidemics of dengue, which, in 1954, involved almost 40% of Townsville’s population.12 By 1966, incidence in Townsville of the vector, Ae. aegypti (Linnaeus), a container-breeder, was greatly reduced, due probably to the destruction of domestic rain-water tanks associated with a reticulated water supply,13 and also to surveillance by health authorities. In 1973, larvae were found in tyres, a drum, and a flower vase, and a heavy infestation was traced by City Council health surveyors to water in the cellars of a burnt-out hotel.14

In May, 1979, City Council health surveyors found larvae in tyres, and in a glass pot holding a water-cultured Chinese good-luck plant. The latter was in the office of a caravan park, which suggests a modern means of dispersal for Ae. aegypti, which has not been found in other states of Australia since 1974.15 On April 26, 1980, E.N.M and M.M.E.H. collected Ae. aegypti biting in Townsville Airport passenger lounge, which was decorated with tropical plants growing in pots standing in 10-cm deep water in large metal-lined boxes. This water, shaded and protected by dense foliage, would be a very favourable breeding site (since eliminated). It may be that the current popularity of indoor plants is providing for increased infestations of Ae. aegypti in Townsville and elsewhere.

Although populations of An. farauti, and probably of Ae. aegypti, would be too small to sustain epidemics, local transmission of malaria or dengue could occur if infectious persons are exposed to these mosquitoes at Townsville.

REFERENCES

Short Papers

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APRAAL OF A NEW GLUCOSE ENZYME STRIP

The accuracy and reliability of new blood glucose measurement strips, BM Test-Glycemie 20-800, were assessed in 99 consecutive patients attending the diabetic clinic and seven subjects at home. The BM Test-Glycemie 20-800 strip technique was compared with the automated hexokinase method and the Reftostest-Glucose test strip technique employing the Boehringer Reftomat. The mean of the blood glucose values was 12.6 ± 0.8 mmol/L for the hexokinase method and 12.5 ± 0.6 mmol/L for the 20-800 strip technique, with a mean difference between the hexokinase and the 20-800 strip methods of 1.9 ± 0.2 mmol/L. In the range 4 mmol/L to 12 mmol/L, the 20-800 strips were found to be extremely accurate, but for blood glucose levels less than 3.5 mmol/L and greater than 12 mmol/L, they were less reliable. Importantly, the strips were often misleading in indicating hypoglycaemia. It is concluded that the BM Test-Glycemie 20-800 strips have a practical and valuable role when used by suitably instructed staff members, or by patients, in the management of diabetes, and represent a major advance over urine testing on previously available direct reading enzyme strip methods.

Over the past 10 years, it has become clear that the assessment of diabetic control using unalysis alone is inadequate and often misleading.1-4 The practice of home monitoring has enabled more precise assessment, and greatly improved control, of the diabetic.5-8 However, in some instances, a glucose monitoring meter either is not available, or is not appropriate for a particular patient. Therefore, the development of a direct reading enzyme strip, said to be more accurate than those currently available,9-16 represents a further advance, both methodologically and in the assessment and management of the diabetic patient. We report here the usefulness and accuracy of this new enzyme strip method (BM Test-Glycemie 20-800) in two clinical settings: (i) in the diabetic clinic where it is used by experienced trained nurses; and (ii) in the home where it is used by patients skilled in the use of home glucose monitoring machines.

MATERIALS AND METHODS

Diabetic Clinic

Venous blood samples were drawn from 99 consecutive patients attending the diabetic outpatients clinic at St Vincent's Hospital. Glucose levels were determined by: (i) a hexokinase whole blood technique using the automated Centrifichem (taken as "the reference value"); (ii) the Reftostest-Glucose test strip (Boehringer) technique, employing a Boehringer Reftomat and staff members experienced in the meter's use; and (iii) the BM Test-Glycemie 20-800 (Boehringer). Independent observers performed methods (ii) and (iii). The accuracy of the staff members in reading the BM Test-Glycemie 20-800 colours was also assessed.

Home Monitoring

Seven patients, skilled in the home use of the Boehringer Reflectometer meter16-17 further assessed the BM Test-Glycemie 20-800 by performing simultaneous capillary blood glucose estimations using methods (ii) and (iii) above. The Reflectometer meter glucose value was determined as the "reference value". The standard deviation, standard error, and correlation coefficient were determined by standard statistical analyses for each group and subgroup, divided according to blood glucose range.

RESULTS

The range of venous blood glucose levels obtained for the 99 clinic subjects was 0.9 mmol/L to 32.7 mmol/L, with a mean glucose level of 12.6 ± 0.6 mmol/L (SEM) and 12.9 ± 0.6 mmol/L for the hexokinase and BM Test-Glycemie 20-800 methods, respectively. The mean of the individual differences between the hexokinase and 20-800 strip methods was 1.9 ± 0.2 mmol/L. The comparison between the blood glucose levels obtained by the 20-800 strip and the automated hexokinase methods is shown in Figure 1. The blood glucose readings have been divided into subgroups according to the glucose levels (0 mmol/L to 3.5 mmol/L; 3.5 mmol/L to 6 mmol/L; 6 mmol/L to 12 mmol/L; 12 mmol/L to 16 mmol/L; and 16 mmol/L to 20 mmol/L), and the number of values correctly assigned by the 20-800 strip method is shown in the heavily marked squares. The BM 20-800 strips correctly placed values in 67% of readings, though there was a tendency to incorrectly place values into a higher blood glucose group. Of importance is the fact that in the hypoglycaemic range (less than 3.5 mmol/L), four out of five cases were incorrectly assigned into the normoglycaemic group by the 20-800 strips (Figure 1). The BM 20-800 values were also compared with Reftomat readings, and as expected, there was a similar trend for the 20-800 strip to overestimate the blood glucose level. Finally, the BM 20-800 results were compared with the hexokinase values, by correlation analysis for each of the subgroups defined by blood glucose levels. Good correlation was

![Blood Glucose (mmol/L) BIOCHEMISTRY](image)

Figure 1: Display of individual glucose values in 99 subjects. Figure in squares shows correlation to glucose group by both techniques. Figure above the corresponding square indicate placement too high (cf. hexokinase method) and figures below indicate values estimated too low.