ter gave me a lot more information about diabetes in that country than what I knew.

I have written below, a short account about diabetes in the Islands of Zanzibar, Tanzania, in East Africa. Because little is known about diabetes in these Islands, it is my hope that the account will provide important information and raise interest in researchers. Our intention to develop a population-based diabetes registry under the auspices of DIAMOND would enable us to determine much more about the disease in this developing African country.

The East African islands of Zanzibar comprise 2 major islands—Unguja, the sister island of Pemba—and 20 other smaller islands with a total population of ~657,800 inhabitants. Diabetes is fast becoming a disease of major public-health importance accounting for ~4% of all hospital disease-specific deaths in these islands (1). Limited data on the occurrence of diabetes in Zanzibar suggest that the disease may be increasing in frequency, particularly NIDDM (2,3). Although obesity does not appear to be strongly associated with NIDDM as in Western countries, a higher proportion of new onset cases are town residents (4), which suggests that urbanization is an etiological factor, as shown elsewhere (5). The estimated crude age 0–19 annual incidence of IDDM of ~2.1/100,000 (4) is higher than might have been expected in a nonwhite African population and may result from admixture with Arab populations, which have traded and settled in these islands for centuries.

Diabetes health care in the Zanzibar islands is generally poor. Although care is provided free of charge at two clinics (one on each island), the prohibitive cost of public transportation makes frequent visits improbable by patients living in the peripheries. The clinics lack sufficiently trained health workers and are only able to run basic investigations such as blood glucose estimation and urinalysis, tests that are frequently unavailable. Despite its problems, the existing primary health-care system is favorable to the development of diabetes research and population-based registries in a manner similar to that prescribed for island populations in the Caribbean (6). The health-care system, confined boundaries, and limited population migration make Zanzibar an ideal place for diabetes research, particularly with respect to IDDM. Because so little is known about the epidemiology of IDDM in black sub-Saharan Africa, these islands could benefit from international collaboration and research (7).

DAZ, founded in 1986, is a nongovernmental organization that caters to diabetic individuals and their families. It has played a major role in promoting diabetes education and in improving diabetes health care in the Islands. In 1988, a 5-yr cooperative project was initiated between DAZ and the Finnish Diabetes Association (8). The project's goal was to improve diabetes health care by training health workers and providing assistance with drugs, equipment, and transportation. These efforts have been important in addressing some of the major problems confronting diabetes care in Zanzibar, including underdiagnosis, ignorance about the cause of diabetes, and poor management. Room for much improvement remains however. This entails decentralization and incorporation of diabetes care into the existing primary health-care system, vigorous health education to increase public awareness of diabetes, and development of a standardized management protocol. The importance of international cooperation and collaboration cannot be overemphasized.

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NIDDM, NON-INSULIN-DEPENDENT DIABETES MELLITUS; IDDM, INSULIN-DEPENDENT DIABETES MELLITUS; DAZ, DIABETES ASSOCIATION OF ZANZIBAR.

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**Micral-Test**

A new semiquantitative test for urinary albumin

Microalbuminuria is an acknowledged prognostic marker for development of diabetic nephropathy (1). To facilitate the estimation of low urinary albumin levels (≤20 mg/L) in nonlaboratory environments, numerous semiquantitative immunochemical tests have been marketed recently (2). We have evaluated the performance of one

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such test, Micral-Test (Boehringer Mannheim Australia, Castle Hill, Australia), which relies on color block changes at albumin threshold concentrations of 0, 10, 20, 50, and 100 mg/L. The actual Micral-Test simply involves dipping the strip into a urine specimen for 5 s, then after a 5-min interval, performing a visual comparison of the reaction color with that of the supplied reference chart.

Of particular importance is the threshold at 20 mg/L, above which a pathological elevation in the albumin concentration may be present, and therefore warrants follow-up measurement of the urinary albumin excretion rate with an accurate laboratory assay. The application of Micral-Test as a screening procedure for microalbuminuria would therefore necessitate both high sensitivity and specificity to discriminate urinary albumin levels ≥20 mg/L.

Overnight timed urine specimens ($n$ = 96) were received over a 10-wk period from diabetic patients regularly attending the outpatients clinic, and the level of urinary albumin determined with a commercial RIA kit (Pharmacia South Seas, Sydney, Australia). The imprecision ($n$ = 28) of the RIA was 5.9, 4.9, and 6.7% at albumin levels of 3.3, 20.4, and 56.6 mg/L, respectively. Concurrently, two laboratory personnel analyzed all the urine specimens, within 4 h of receipt (maintained at room temperature), using the Micral-Test procedure and employing the principle of reading to the nearest color block. Each operator was blind to the other's results throughout the study. All strips had the same batch number.

No statistically significant difference was observed between operators with respect to their assignment of albumin concentration with the Micral-Test method (Wilcoxon's matched-pairs test, $P$ = 0.68). A highly significant difference, however, was found between both operators' results and those for the RIA ($P$ < 0.0001), which reflected the high proportion of misclassification between the 0 and 10 mg/L thresholds. The percentage distribution of values assigned to the 0, 10, 20, 50, and 100 mg/L blocks by the RIA and operators (mean) were 53.1, 18.2; 11.5, 43.6; 16.7, 12; 7.3, 12; and 11.5, 14.1%, respectively.

Choosing a threshold of ≥20 mg/L albumin, the sensitivity and specificity of the Micral-Test were 91.2 and 91.1%, respectively, at a prevalence of 35.4%; the positive predictive value was 84.9%, the negative predictive value was 95%. If only samples with urinary albumin levels <100 mg/L are considered, the prevalence of values ≥20 mg/L is 27.1%, and the respective sensitivity and specificity is 87.0 and 91.1%; the positive predictive value is 78.4%, the negative predictive value is 95%.

The statistical reliability of the above estimates for sensitivity and specificity were evaluated with a computer intensive technique known as the bootstrap procedure (3). Based on 1000 bootstrap samples from the data set, and also the data excluding albumin levels ≥100 mg/L, the 68% range associated with the derived parameter is sensitivity, 87.9–94.6% and 81.6–91.5%; specificity, 88.5–93.8% and 88.5–93.7%.

The findings are in general agreement with preliminary reports for the Micral-Test method (4) and results with the latex agglutination assay, AlbuSure (2). An advantage of Micral-Test, however, is its flexibility to estimate a wide range of discrete albumin levels from 0 to 100 mg/L, whereas AlbuSure is restricted to a positive or negative result at its uniquely defined cut-off (20 mg/L).

The Micral-Test therefore represents a satisfactory procedure for the initial semiquantitative screening of diabetic samples to detect urinary albumin levels ≥20 mg/L. However, if within the particular screening environment, the prevalence is markedly lower than the 26% commonly noted in most clinics, then overall performance will decrease. For example, at a prevalence of 15%, the positive predictive value will be only 63.3%, and the negative predictive value will be 97.5%.

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**Acknowledgments**— I thank M. Parker and D. Harrison of Boehringer Mannheim, Australia for supplying the test strips. The technical assistance of R.K. Farrant and R.G. Frith is gratefully acknowledged.

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# Time for a Change

In October 1986, 1248 nurses, nutritionists, pharmacists, and physicians achieved the title of CDE (1). By 1992, 6200 educators have achieved CDE certification (K. Doyle, unpublished observations).

Certification in diabetes education involves setting a standard of cur-

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