chikungunya epidemic was in Tanzania in 1952-3, and the virus has been isolated in East Africa, Zaire, Rhodesia, Senegal, Nigeria, and the Far East. Serological surveys have disclosed its presence in many parts of West Africa.² Thus the detection of antibodies in two travellers to Britain from Sierra Leone and Liberia respectively is consistent with the known distribution of this virus.

O'nyong-nyong virus is known particularly for having caused an epidemic in East Africa beginning in 1959 and affecting some two million people. From virus isolations it is known to have occurred in Senegal as well as East Africa, but it has not been reported from Ghana, Sierra Leone, or Nigeria, from which countries three travellers came and in whose serum only *O'nyong-nyong virus* antibodies were present. Apparently, therefore, sporadic transmission is occurring at widely disseminated points in West Africa in addition to Senegal, where it has been isolated.

Dengue virus is associated more with Asia than with Africa, although it is well known to be endemic in Africa. Our findings indicate that transmission of the virus occurred in Nigeria in January 1977. In the Seychelles an epidemic of dengue fever occurred in the early part of 1977, and two of our patients who had been to Africa and to the Seychelles had developed dengue fever in the Seychelles (cases 7 and 8).

Ntaya virus—Three patients had only *Ntaya* antibodies in their serum and had contracted definable illnesses in north-eastern Nigeria, Kenya, or Zambia. The known distribution from virus isolation of this infection is in Uganda, Cameroon, and the Central African Republic. Serological surveys have disclosed antibodies to *Ntaya virus* in Tanzania, Egypt, and the Far East. Our results indicate that in addition to these regions the infection is endemic in Nigeria, Kenya, and Zambia.

Zinga virus has been isolated only in the Central African Republic, and serological surveys have indicated its presence in Zaire.² It is of particular interest, therefore, that the patient in whose serum *Zinga virus* antibodies were detected had lived in south-eastern Nigeria for most of his life, a region not far distant from the known distribution of *Zinga virus*.

CLINICAL AND DIAGNOSTIC RESULTS

Chikungunya infection—Several hundreds of patients have been observed with chikungunya infection, and the predominant clinical picture has been of myalgia with fever, headache, conjunctival injection, and sometimes haemorrhagic signs. Both patients in this series who had had unmistakable chikungunya infection not only came from contiguous countries but had an alimentary presentation of their disease, one with vomiting and fever, and the other with fever, anorexia, and jaundice. Thus it would probably be worth while to investigate the possibility of chikungunya infection among patients in that part of the world

who have such alimentary symptoms associated with fever and other known symptoms of the infection.

O'nyong-nyong fever—The outstanding clinical picture in this illness is of severe joint pains, backache, headache, and anorexia, symptoms that to a greater or less degree were encountered in our patients.

Ntaya infection—The three patients in whose serum only *Ntaya virus* antibodies were present were of particular interest, for no human cases of infection with this virus have previously been recorded. In one patient the presumed *Ntaya virus* illness had been with severe malaise, fever, headache, and myalgia. In a second case there had been bizarre neurological manifestations, with dizziness and numbness and weakness of the left leg and arm. In the third patient a fever presumed to have been caused by malaria was associated with severe amblyopia and restriction of the peripheral visual fields. During the six months after this illness the visual acuity and restriction of the visual field were reported to have vastly improved. Although there can be no certainty, it appears to be worth while to consider *Ntaya virus* infection as a possible cause of fever associated with bizarre neurological manifestations in tropical Africa.

Zinga infection—The one patient who had only *Zinga* antibodies in his serum had lived in south-eastern Nigeria for most of his life and had had several episodes of abdominal pain and of ill-defined fever but distinctive features suggestive of *Zinga virus* infection could not be identified.

Lassa fever—Keane and Gilles³ suggested that mild infections with *Lassa virus* may not be uncommon in Africa. In our series of 86 patients, however, all of whom had had one or more feverish illnesses while in Africa, some of them severe, there was no evidence of *Lassa fever* having occurred. Probably, therefore, *Lassa fever* occurs in limited outbreaks and at infrequent intervals, as is indeed suggested by reports of this infection. With the exception of the focus in Sierra Leone, where transmission appears to have been proceeding for several years, known outbreaks of *Lassa fever* have all been explosive and circumscribed both in time and place, an observation of considerable epidemiological, public health, and clinical importance.

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SHORT REPORTS

Reliable prediction of coronary disease using treadmill exercise testing

Coronary arteriography is the only method of selecting patients with coronary artery disease suitable for bypass surgery. The large numbers of patients with chest pain necessitates an accurate non-invasive test which will identify those with significant coronary artery disease. Conventional treadmill exercise testing using ST segment displacement gives few false-positive results but fails to detect about 20% of

patients with important coronary artery disease.^{1 2} Using a modification of an exercise index described by Papazoglou,³ we have reduced substantially this high incidence of false-negative results.

Patients, methods, and results

Altogether 57 men and 13 women aged between 35 and 66 (average 50) were studied by subjective maximal treadmill testing using the Bruce protocol.⁴ All had been selected on clinical grounds, and treadmill tests were performed without knowledge of the arteriographic findings. All drugs were discontinued before testing. By using a modified ECG V5 bipolar lead system (CM5)⁴ the heart rate and ST segment displacement were measured by computer during exercise and recovery. The normal range of ST segment dis-

placement lay between $+0.9$ mm and -1.0 mm, inclusive. The arterial blood pressure was measured after 5 minutes' rest in the supine position, every third minute in exercise, during the last 30 seconds of exercise, and every minute in recovery.

Seventeen patients had normal coronary arteries and in all of these the ST segment displacement fell within the normal range. A total of 53 patients had abnormal arteriograms ($>50\%$ obstruction) and in 43 the ST segment displacement was abnormal. All patients without appreciable coronary artery obstruction had normal treadmill test results but 10 patients with appreciable coronary artery obstruction failed to show abnormal ST segment displacement. The exercise index was calculated using the formula

$$EI = \frac{\text{Exercise change in heart rate} \times 100}{\text{basal heart rate}} \times \frac{\text{Exercise change in mean arterial BP} \times 100}{\text{basal mean arterial BP}}$$

$$\text{where mean arterial BP} = \frac{\text{systolic BP} + 2 \text{ diastolic BP}}{3}$$

The results shown in the figure were correlated with the arteriographic findings, and the lowest value for patients with normal coronary arteries was 2500 units. This was taken arbitrarily as the lower limit of normal. Fifty out of 53 patients with coronary artery disease had exercise index values of less than 2500 units, giving a false-negative incidence of 6%. Two of the three patients with coronary artery disease and with a normal exercise index had abnormal ST segment displacement. Only one patient had false-negative results when both criteria were used. The difference between normal and abnormal groups was statistically highly significant ($P < 0.001$).

Comment

Our results confirm that treadmill testing analysing ST segments alone gives an unacceptably high number of false-negative results. This is a serious limitation of the conventional technique. In an effort to overcome this problem we have modified an exercise index

as described by Papazoglou.³ We emphasise that the lower limit of normal for the index is arbitrary, being the lowest value observed in our arteriographically normal patients. We recognise that a small error in recording cuff pressure can produce a large error in calculated index, and therefore values in an intermediate zone between 2500 and 3500 units should be interpreted with caution. At present we are working to refine the index and believe that accuracy can be improved further.

Fifty out of 53 patients with coronary artery disease were identified by abnormal exercise index values, compared with only 43 identified by abnormal ST segment displacement. When ST segment displacement was combined with the exercise index only one patient with proved coronary artery disease gave normal values for both (see

figure). We suggest that using this combination the treadmill exercise test is the most reliable non-invasive test available to detect appreciable coronary artery disease.

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Anal neurofibrosarcoma treated with fast neutron irradiation

We report a case of anal neurofibrosarcoma, an exceedingly rare tumour, which responded to fast neutron irradiation.

Case report

A 58-year-old man presented in 1972 with a hard perianal lump, which had been present since 1965. The lump had grown slowly during this period and was painless. It was locally excised in April 1972. In March 1973 it recurred at the medial end of the pre-existing scar; it was now soft and moderately tender. The lump was excised in May 1973 and histological examination showed that the tumour extended to the limits of excision. A temporary colostomy was established in July as a prelude to further treatment. The patient then received a course of irradiation with fast neutrons produced by the MRC cyclotron at Hammersmith Hospital.¹ He was given 1673 rads in 18 fractions, by a single direct anal field, between 1 August and 12 September. The colostomy was closed in October 1973 and the patient has had normal anal function since then. He has been seen at regular intervals and there has been no evidence since of either local recurrence or distant metastases.

Microscopically the original specimen showed a sarcoma composed of plump spindle-shaped cells arranged in interlacing bundles and whorls (fig). There was nuclear pleomorphism and a high mitotic rate. At one point the tumour was in continuity with a typical neurofibroma arising from a medium sized nerve. It was thought that this was a neurofibrosarcoma (malignant schwannoma) because the morphology of the tumour was

A cellular area of the neurofibrosarcoma showing interlacing bundles of plump spindle cells. (H and E. $\times 233$.)