cuit E, which resets hold-circuit F; (b) the positive centre output of F closing gate C and switching off the "change" indicator lamp via the output stage D; (c) output stage G being allowed to conduct, indicating "full"; and (d) reversing the audio-inhibit voltage, thus switching off the alarm signal.

In the original completely automatic circuits the switching action depended entirely on cylinder pressure. If, however, a high flow of oxygen was being utilized at the time of switching, the exhausted cylinder reclaimed enough pressure to again indicate "full," giving false information to maintenance staff who change the cylinders. This situation was corrected by including an empty-hold circuit on each of the cylinder modules individually reset by a push button after replacing an exhausted cylinder. Alternatively, large differential pressure switches could have been used.

Discussion

The automatic oxygen system described has been in continuous use in a four-bedded intensive care unit for the past six months. Its performance has been found satisfactory. Within

the unit there is one oxygen outlet per bed, with detachable flow-meters. Oxygen has been supplied direct (via a face-mask) to patients breathing spontaneously. It has also been used to drive the Cyclator and Bird ventilators and to feed a gas inlet on the Barnet and Blease ventilators. An oxygen pressure of 45 lb/in² (3.2 kg/cm²) was chosen for the intensive care unit because the gas-powered ventilators in use (Bird Mk 14 and Cyclator Mk 2) are adequately driven at this pressure. Previously in this unit oxygen was supplied from a number of cylinders inconveniently placed at the head of each bed. Since the installation of this system the nurses have been spared anxiety over detecting an empty oxygen cylinder and the inconvenience of replacing it with a full cylinder in a small working area. The system can be cheaply and simply fitted into any hospital ward where a supply of piped oxygen is thought desirable. It was constructed in the physics department at a cost of £180. Patents have been applied for.

We should like to acknowledge our debt to the British Oxygen Company for their information on the oxygen supply regulations, pipelines, and regulators. We should also like to thank Sister M. Small for her help in this project.

Outside Europe

United States Naval Medical Research Units in Africa

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The work of the United States Naval Medical Research Units in Africa (NAMRU III) deserves to be better known. Firstly, because it is good work and is related to practical problems of great importance in the tropics; secondly, because of the help the unit gives to governments in Africa; thirdly, because of the stimulus and example the units afford to other developed countries to help in this way; and fourthly, because of the opportunities provided for affording local nationals and persons from other countries to participate in this important research.

The parent NAMRU III Unit has been established in Cairo for 22 years. It occupies a complex of laboratories, offices and ward accommodation adjacent to the Abbassia Fever Hospital. Members of the unit act in close collaboration with the staff of this hospital, and a number of patients being studied by members of the unit are also housed there. The clinical unit within the NAMRU compound is of about 40 beds and an outpatient clinic is run. Patients in fact come to the unit from considerable distances. The laboratories are very well equipped and in Cairo there are some 25 graduate staff of American and Egyptian nationality.

At Addis Ababa, Ethiopia, a field facility, or subunit of

NAMRU III, was established some five years ago and is now fully operational. This like its parent organization in Cairo is situated adjacent to a hospital, the St. Paul's Hospital, in which the organization has a 22-bedded clinical research unit. Also like the parent organization it is extremely well equipped and with full animal facilities. There are 14 graduate staff.

NAMRU III Unit in Cairo

In the Cairo part of the organization there are departments of bacteriology, haematology, medicine, medical zoology, nutrition and biochemistry, parasitology, pathology, rickettsiology, tropical medicine, veterinary medicine, and virology with the Virus Vector Research Laboratory. The general approach followed is to seek out those conditions causing the greatest problems locally, to describe and record these conditions accurately, and to seek the most effective means of diagnosing and managing them. Much effort goes into the study of zoological and ecological factors relating to endemic and epidemic disease. Thus in Cairo Dr. Harry Hoogstraal has made what is probably the world's finest collection of ticks of medical importance. The programme of the medical zoology department, of which he is head, concerns interrelationships between blood-sucking arthropods, vertebrate hosts, and disease-causing agents in the epidemiology of animal and human diseases. Through the years many correlated studies have developed, including the incidence, biology, and epidemiology of tick-borne viruses, and the biochemistry, physiology, and water balance of ticks in relation to pathogen infections. A great

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bibliography and collection of literature on ticks and tick-borne diseases has been made. In the near future a bibliography of tick and tick-borne diseases will be published by the U.S. National Library of Medicine in co-operation with NAMRU III.

All departments work closely together and complement and supplement each other's activities both within the unit at Cairo and at Addis Ababa and between these two units, and this applies particularly to the departments of medicine, tropical medicine, bacteriology, parasitology, and medical zoology. Currently an important programme of research on meningitis is being undertaken both in Egypt and in Morocco, the latter at the invitation of the Moroccan Government. From among nearly 300 isolates in Cairo, the four major responsible agents have been found to be *Neisseria meningitidis*, *Diplococcus pneumoniae*, *Mycobacterium tuberculosis*, and *Haemophilus influenzae*. Meningococcal meningitis accounts for 40% of all isolates, and in Morocco it was shown that most strains of meningococci isolated were sulphadiazine-resistant during 1966-7. These were serotype A, not the sulpha-resistant sero group B previously reported, and this therefore represented the first such finding in epidemic form in the world.

Non-agglutination El Tor-like vibrios have been isolated from patients with dysentery and from the environment surrounding Cairo. These vibrios are biochemically indistinguishable from the pathogenic El Tor forms, and this is the first demonstration of these organisms in a geographic area free from cholera.

During a two-year period over 250 isolates of *Salmonella typhi* have been made. In the patients concerned a comparison between the efficacy of chloramphenicol and ampicillin administered orally has been carried out.^{1,2} Chloramphenicol has been shown to be the more effective drug but, because of ampicillin's known in-vitro effect against the typhoid bacillus, it was thought that malabsorption from the bowel might be the cause for the lesser effect of ampicillin. Some 80 patients have been treated with oral chloramphenicol, oral ampicillin, or ampicillin administered intramuscularly. Intramuscularly administered ampicillin has been shown to be only minimally more effective than that administered orally, an important conclusion in so far as the management of typhoid fever is concerned, for it emerges that orally administered chloramphenicol still remains the most effective drug. A disproportionately high number of relapses were observed among those patients who were also infected with urinary schistosomiasis, and the interesting possibility that the schistosomes may harbour the typhoid organisms and render them inaccessible to chemotherapy is therefore being studied. This may be another example of the way in which helminths can act as vehicles or synergists of microbial infection, a principle which has been developed elsewhere, particularly in association with toxocariasis. Ampicillin and nalidixic acid have been found to be useless in the treatment of brucellosis, an infec-

tion which is particularly common in the area.

In conjunction with the Egyptian Ministry of Health, the faculty of Medicine of the University of Cairo, and with the American University, Beirut, a detailed study is being carried out on the effect of schistosomiasis on pulmonary function. This has commonly been known to deteriorate after treatment of the schistosomiasis, in a way consistent with that to be expected from lodgement in the lungs of dead worms and of emboli of ova. Ways of preventing this deterioration are being studied and these include steroid therapy, antihistamine therapy, and variation in the antischistosomal regimen. This work is being directed by Dr. Donald Kent, the commanding officer of the unit, and Dr. Farid Fuleinan, of the American University of Beirut.

In the nutritional field interesting work is going on with the anaemia of kwashiorkor, and it has been confirmed that during treatment an absolute increase in the plasma volume occurs after the disappearance of oedema. This point explains the slowness with which anaemia in kwashiorkor responds to therapy with protein replacement, for the apparent improvement in haematological values is less than the real improvement in view of the haemodilution which is coincidentally occurring.

NAMRU III Field Facility in Addis Ababa

Though smaller than the parent organization in Cairo the range and the intensity of activity carried out in Addis are remarkable. In the tropical medicine division louse-borne relapsing fever is being investigated, Ethiopia being one of the few remaining areas in the world in which this fever is endemic and epidemic. A collaborative study between members of the unit and the Department of Medicine of the Haile Selassie I University is being undertaken, with emphasis on the crisis which occurs when the fever remits and on the means of ameliorating severe symptoms and often death which may occur at that time. Onchocerciasis has been found and its distribution has been mapped in the south-west portion of Ethiopia, and for the first time a fluorescent antibody test has been evolved which works satisfactorily in onchocerciasis. Fluorescence in this case occurs on the cuticle of the adult worm sections of which nodules are used as antigens. Dr. David R. Ten Eyck has been responsible for this work.

Human trypanosomiasis was unknown in Ethiopia until March 1967 when cases were detected in the south-west part of the country. By the end of 1969 over 200 cases had been confirmed and it is now apparent that the disease may be firmly established in the western lowlands of Ethiopia.

An Ecology Division was established in October 1969 with the arrival of Dr. John Ash, a British ecologist. His work will mainly be concerned with ecological relationships between arboviruses and lower vertebrates in Ethiopia.

Our American cousins are to be congratulated on seeing the need for applying to tropical medicine a continued programme of research using the most up-to-date techniques and on carrying out investigations with such vigour and thoroughness. Not only are the results of direct and immediate value to the health authorities and people of the countries in which they are working but the training which is being received by many locally recruited scientists is helping very materially to augment the medical services in these countries.

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