Gas Gangrene and Hyperbaric Oxygen

The early report on the value of hyperbaric oxygen in the treatment of gas gangrene by I. Boerema and W. H. Brummelkamp\(^1\) from Amsterdam was promising. It has now been confirmed by B. Roding and colleagues,\(^2\) who describe their experiences over the last twelve years of treating 130 patients with clostridial gas-producing infections. Twenty-nine patients (22%) died, 15 from causes other than gas gangrene. Of the 14 deaths (11%) due to gas gangrene, none occurred after five treatments of 2 hours with oxygen at 3 times atmospheric pressure given in the first 48 hours. As well as reducing the mortality from gas gangrene, hyperbaric oxygen lessens the incidence and extent of the amputations which are required. These authors have discontinued the use of antitoxin since 1964, and out of the 130 patients 29 were not given any antibiotics at all, yet they all survived.

The rationale for this treatment rests on sound experimental evidence. A. J. M. van Unnik\(^3\) and E. H. Lambèr\(^4\) and I. W. Brown\(^5\) showed that hyperbaric oxygen prevents the production of the alpha toxin. W. I. Hopkinson and A. G. Towers\(^6\) showed that it inhibits the growth of clostridia in surface culture. And P. F. Nora and colleagues\(^7\) have shown that it almost entirely opposes the effect of a median LD\(_0\) of live clostridia injected into animals intramuscularly. T. T. Irvin and colleagues\(^8\) could not duplicate in animal experiments the results obtained by clinicians, but since the disease in man is not identical to that in animals the results of treatment could well be different. Roding and colleagues\(^9\) stress the importance of using 3 atmospheric pressures to attain adequate levels of oxygen in tissues with a poor blood supply. G. Smith and colleagues\(^10\) described a case treated with oxygen at twice atmospheric pressure which did not improve until after amputation was performed, whereas Roding and colleagues\(^11\) amputate only when the line of demarcation has become clear after treatment with hyperbaric oxygen.

Gas gangrene is a rare condition. Indeed the 130 patients of Roding and colleagues represent nearly the whole incidence of the disease in Holland, with a population of 15 million, over ten to twelve years. They use a large pressure chamber which is filled with compressed air. Only the patient breathes 100% oxygen via a facepiece. The staff in the chamber are therefore exposed to the hazards of working in a hyperbaric environment—aseptic bone necrosis and decompression sickness. The incidence of the former in non-manual workers is not known, and the latter can be avoided by rigid attention to correct decompression schedules. The advantages of the large chamber are that its use allows continuous nursing of the patient during treatment, with easier maintenance of intravenous therapy and above all the ability to deal rapidly with unexpected complications such as clearing the airway after vomiting. The disadvantage is the high capital cost and relatively higher running costs, but it is safer for the patient than the single-person chamber.

The only large chamber attached to a hospital in the British Isles is in Glasgow. There is thus a need for another large hyperbaric facility to be provided. It should be sited centrally so that access is easy either off a motorway or by helicopter.

\(^{1}\) Boerema, I., and Brummelkamp, W. H., Nederlandsch Tijdschrift voor Geneeskunde, 1960, 104, 2548.

Unquiet Rest

As man's numbers have grown, so his peace and quiet have diminished. Though wealthier, he finds he has destroyed wildlife, scenic beauty, and solitude. The jet aircraft brought convenience to a privileged few but many people who have to live near airports prefer the older and quieter turboprops. Heavier lorries and more powerful planes can find support in economic statistics but it is less easy to quantify the damage they do to the quality of life. A recent study, however, has done this for some ill-effects of aircraft noise.
At the University of North Carolina a team of investigators measured how much the sounds of jet aircraft would disturb sleep and impair alertness and efficiency next morning. While volunteers slept in a laboratory sounds of jets flying overhead lasting 20 seconds were played at irregular intervals for a total of nine times per night and at a loudness of 80 decibels. Continuous monitoring of the electrical brain rhythms showed that, compared with control periods, the rhythms after the noises were faster, and remained so for over five minutes, indicating that sleep was lighter.

In the morning the volunteers were required to perform a task in which they had to press one of four buttons to distinguish one of four lights that kept flashing on and off, in which they had to remember which button corresponded to which light in a relationship that changed at intervals. After nights of aircraft noise the performance of this task was much poorer that after an ordinary night’s sleep. Moreover, while the task was being carried out the electrical brain rhythms contained many more slow-wave components, suggesting that the brain was still tired and sleepy.

It is no new thing to discover that loud noises disturb sleep and that after a bad night one is not at one’s best, but it is valuable to have actual specific data on aircraft noise. The volunteers were healthy young men, who often had no subsequent recollection of the nocturnal noises. Young men tend to be heavy sleepers and it is older people, especially women, who sleep badly, hence for them the effects of aircraft noise might be expected to be worse. Sleep is, moreover, disturbed to a greater degree by sounds that have some personal significance or that have been thought about as important just before sleep. The sleep disturbance would therefore be greater still in those who felt aggrieved or angry about aircraft noise—a justifiable anger as the results of the experiments showed.

Flying personnel too are liable to disorganized sleep and the 1948 Berlin airlift became jeopardized by aircrew fatigue until resolute action was taken to provide them with quiet surroundings for rest and undisturbed sleep. In industry, too, shift workers find that they cannot get to sleep so easily when they depart from ordinary times of rest and they are frequently troubled by family and neighbourhood noises when trying to sleep by day. Under these conditions absence from work on account of minor sickness increases. A recent study found that absence for minor, uncertified sickness was highest on a rapidly rotating (“continental”) shift rota, even though this system is one with a reputation for popularity among employees because it avoids long periods during which social customs cannot be followed.

Hospital junior doctors form another group who traditionally may not get enough sleep. In a recent study 14 New York interns were checked for their accuracy and speed in detecting arrhythmias in electro-cardiograms and were offered prizes for good performance. After nights when they had averaged under two hours of sleep they made twice as many errors and were much slower than after a night of seven hours, as well as feeling more depressed, irritable, and lacking in confidence. Doctors who work in intensive care units know the importance of their own sleep, but sometimes have neglected to provide adequate amounts of it for their patients, even though rest has long been suspected to help healing. Modern knowledge about sleep suggests that it has a role in fostering synthetic processes for tissue repair.

The brain has an imperative need for rest and sleep, and those who live around airports may suffer in unsuspected ways. Doctors have always been concerned with life and death, but now can join in the growing concern for life’s quality, including the provision of peace and quiet.

1 LeVere, T. E., Bartus, R. T., and Hart, F. D., Aerospace Medicine, 1972, 43, 384.
4 Stanbridge, R. H., Lancet, 1951, 2, 1.

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To Nibble or Gorge?

The pattern of ingestion of food has a considerable effect on the metabolism and body composition of experimental animals. Some of the experimental observations may apply to man, and the pattern of food intake has been suggested as a possible factor in the pathogenesis of atherosclerosis and coronary heart disease. While carnivorous animals may eat very infrequently ("gorging"), the normal feeding pattern of most herbivorous animals is "nibbling." If animals which are by nature nibblers are trained to ingest large amounts of food at a time, metabolic adaptations occur in adipose tissue and liver which favour the rapid storage of ingested food as glycogen or fat. When an isocaloric intake is ensured, infrequent feeding results in a net increase of total body fat over that in controls fed ad libitum; and it has also been observed to induce hypercholesterolaemia in a variety of animal species.

The findings in man are less clear-cut, but there are some indications that we may fare better on a nibbling than on a gorging or conventional meal pattern. Though some investigators have been unable to find any effect of meal frequency on weight reduction during caloric restriction or on serum lipids, others have reported short-term reductions in levels of serum lipid when the diet, otherwise unchanged, was divided into a greater number of equal portions. Some studies have shown an increase of serum lipid levels as well as decreased glucose tolerance in response to a single daily meal, with reversal of these changes on a nibbling regimen in which the same foods were divided into 10 identical meals per 24 hours. Several epidemiological investigations have tended to corroborate these findings. A study of the height/weight ratio of children in schools that served three, five, or seven meals showed a tendency to excess weight in the children aged 10 to 16 who were eating three meals. The same workers studying the normal dietary habits of Czechoslovakian men found that the incidence of obesity, hypercholesterolaemia, and diminished glucose tolerance decreased as meal frequency increased. A subsequent population study was reported to show that the percentage of people in whom ischaemic heart disease was diagnosed decreased with increasing frequency of meals.

But there have been few reports about the influence of food intake patterns on the metabolism of human adipose tissue, and a recently published study by G. A. Bray is therefore of interest. Biopsy specimens of adipose tissue were obtained from obese persons on a high-calorie diet during both gorging and nibbling regimens, and their...