unscrupulous propaganda, coupled with failure to understand the implications of scientific studies are the main factors which sway the votes.

Fluoridation of water-supplies should forthwith be made a statutory requirement.

Idridgehay, Derby. GERALD F. KEATINGE.

INHIBITORY EFFECTS OF HYPERBARIC OXYGEN ON BACTERIA AND FUNGI

SIR,—Having read the report by Dr. McAllister and his colleagues,[1] we wish to draw attention to our results on the oxygen inhibition of *Mycobacterium tuberculosis*.

We found that continuous or intermittent exposure of *Myco. tuberculosis* to 3 atmospheres (absolute) of oxygen in the presence of 40 mm. Hg CO_2 resulted in marked delay in the onset of growth. This inhibition was greater with newly inoculated cultures than with established colonies. The delay was observed on two different media and was not due to pressure per se or to alteration of the media by oxygen. In addition, the oxygen effect was enhanced by the presence in the medium of *p*-aminosalicylic acid, streptomycin, or isoniazid. The effects of oxygen were shown not only with the standard strain H 37Rv but also with various specimens freshly isolated from sputa. Drug-resistant strains as well as scotochromogenic and Battey-type organisms also were found to be subject to hyperbaric-oxygen inhibition.

Certain pitfalls may be encountered in experimentation such as that described by the Glasgow group.[1]

In an essentially static system—i.e., one in which the gas phase overlying the organisms is not continually being replaced at a rate which would maintain a constant gaseous milieu around the organisms—the organisms may alter the gas tensions in the air-space immediately round the colony. In the Glasgow experiments the oxygen concentration may have been continuously diminished by the fast-growing aerobic organisms in their immediate vicinity. That the growing bacterial culture can significantly decrease the oxygen tension in its immediate environment is exemplified in the common techniques for growing anaerobes, involving simultaneous growth of aerobic bacteria in the same sealed petri dish.

We are aware that " it was necessary to allow a *small* (italics ours) continuous flow of gas to pass through the chamber to maintain a constant *pressure* " (italics ours) but we are doubtful if sufficient movement of gas occurred within the individual petri dishes to provide a uniform environment. If a system had been employed which permitted a continuous change of the gas phase, in all likelihood these investigators would have observed more pronounced effects.

Many aerobic bacteria require CO_2 for growth, or benefit from its presence. In the Glasgow experiments pure oxygen was utilised. Thus the observed effects could possibly be attributed to the lack of CO_2 rather than to the hyperbaric-oxygen environment.

Other possible explanations of their data exist. For example, elevated oxygen tension may have altered some component(s) in the growth medium which would then exert a toxic effect on the bacterial culture. In addition, more than one growth medium might have been employed in order to show the independence of the phenomenon from the nutritional status of the organism. Tests at different stages of the growth curve are also important.

Previous qualitative and quantitative work has shown that high oxygen tensions will inhibit the growth of a wide variety of microorganisms.[2–4] Thus it was not surprising that the Glasgow group obtained qualitative data which tend to support these findings.

1. McAllister, T. A., Stark, J. M., Norman, J. N., Ross, R. M. *Lancet*, 1963, ii, 1040.
2. Moore, B., Williams, R. S. *Biochem. J.* 1909, **4**, 177.
3. Bean, J. W. *Physiol. Rev.* 1945, **25**, 1.
4. Gottlieb, S. F., Jagodzinski, R. V. *Fed. Proc.* 1962, **21**, 226.

We are of the opinion that certain human diseases of aerobic microbial origin may prove amenable to treatment by hyperbaric oxygenation [5 6] either alone or in conjunction with various antimicrobial agents. However, detailed in-vitro and in-vivo experimentation is required to substantiate this opinion.

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HYPERBARIC OXYGEN IN RESUSCITATION OF THE NEWBORN

SIR,—I should like to comment on cutaneous respiration, a subject of discussion between Dr. Barrie (Dec. 7) and Professor Hutchison (Dec. 21).

I have been attempting to utilise cutaneous respiration in the development of a fœtal incubator and newborn resuscitator.[7–10] The phrase " cutaneous respiration " implies to me that the gas exchange which occurs at the skin is available to deeper tissues within the body.

In a recent study of a 240 g. human fœtus, the umbilical cord, trachea, and œsophagus were tied at the time of the " therapeutic " hysterotomy. The infant was then placed in the fœtal incubator with 15 atmospheres of oxygen at a temperature of 30°C, and 24 hours later had a heart-beat of 40 per minute, as viewed through the open chest. This and other observations have been interpreted as indicating that cutaneous respiration can be utilised in the oxygen supply of an apnœic animal.

The utilisation of cutaneous respiration for the removal of carbon dioxide in the treatment of respiratory acidosis of the newborn is also a promising technique. Balneotherapists have previously demonstrated that large amounts of carbon dioxide can pass through the skin.[11] At the present time I am attempting to develop a water-bath apparatus which will promote the exchange of carbon dioxide through the skin by increasing the rate of cutaneous respiration.

Despite the lack of enthusiasm shown by both Dr. Barrie and Professor Hutchison for cutaneous respiration in the treatment of newborns with respiratory distress, I believe that its utilisation is logical in a newborn resuscitator.

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PREVENTION OF CARCINOMA OF THE CERVIX

SIR,—Dr. Elliott's paper (Feb. 1) suggests that early and frequent intercourse and poor personal hygiene of the consort have a causal relation to cancer of the cervix. May I add another possible factor—namely, the timing of intercourse?

During the follicular phase the cervical epithelium is stratified and cornified, and the cells in direct contact with smegma or the ejaculate are no longer capable of division. In the progestational phase the epithelium is thin, consisting of basal and parabasal cells only, and exogenous irritants might well induce abnormal mitoses in some of them.

The vaginas of 53 rats were painted with benzpyrene during the œstrus phase. 53 other rats had identical treatment during the diœstrus phase. In the diœstrus group 2 rats developed

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