of the development from normal liver metabolism of "The type of metabolic activity characteristic of malignant tissue generally, that is, active glycolysis with a relatively high value for the aerobic glycolysis"[15]. This important result does not seem to favour the view that cancer tissue arises in general from normal tissue with a cancer-like metabolism.

Normal skin glycolyses aerobically and undergoes relatively little alteration of metabolism when it becomes papillomatous[16], but when muscle is replaced by malignant sarcoma a great increase of glycolysis occurs[16]. In observations of which details are not yet published, Berenblum, Chain and Heatley[17] found with isolated epithelium of skin and of Shope papilloma little difference of metabolism or of *R.Q.*, the latter being low in both. Thus their results on skin epithelium appear to resemble those of Bywaters[5] on synovial membrane. If we exclude retina, of which the *R.Q.* is controversial, these two examples represent the present exceptions among normal tissues to both our generalizations. Although both are tissues of low metabolic activity, it is likely that similar characteristics will be found in more active tissues as the search proceeds. It is clear that neither of our generalizations, nor both in combination, is in the strictest sense specific for tumours. Nevertheless, the association in tumour metabolism of relatively high aerobic and anaerobic glycolysis with the lowered *R.Q.* is such a constant one that to dismiss it is to discard as unimportant the most characteristic of established biochemical peculiarities of tumour tissue.

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Feb. 23.

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THE above letter contains two conflicting statements.

(1) "Aerobic glycolysis is not specific for tumours, though practically all tumours have strong aerobic glycolysis." This from Dr. Dickens's report of 1936 seems to be a fair and true statement of the position and not consistent with the following statement from the 1939 report, which I consider "rather misleading".

(2) "There appear at the present time to be two main points in which the metabolism of cancer differs from that of most normal tissues. Firstly the ability of cancer cells to form lactic acid persists even when the tissue is respiring."

Benign growths and most body tissues (with some exceptions, such as kidney cortex, spleen, ovary and lung) which have been carefully examined appear to have some aerobic glycolysis (for example, testis $Q_L^{O_2}$ 2·8–5·5, liver 0·9–4·3, uterus 3·0–6·9). Some of these non-malignant tissues, in addition to the three mentioned by Dr. Dickens, also have a lowered *R.Q.* A few malignant tumours, particularly some human carcinomata[1] and some spontaneous carcinomata in mice[2], have lower aerobic glycolysis than many 'normal' tissues.

There can be no doubt that the British Empire Cancer Campaign has in this, as in so many other problems connected with cancer, given most valuable help by securing the thorough investigation of the question in several different laboratories.

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Feb. 29.

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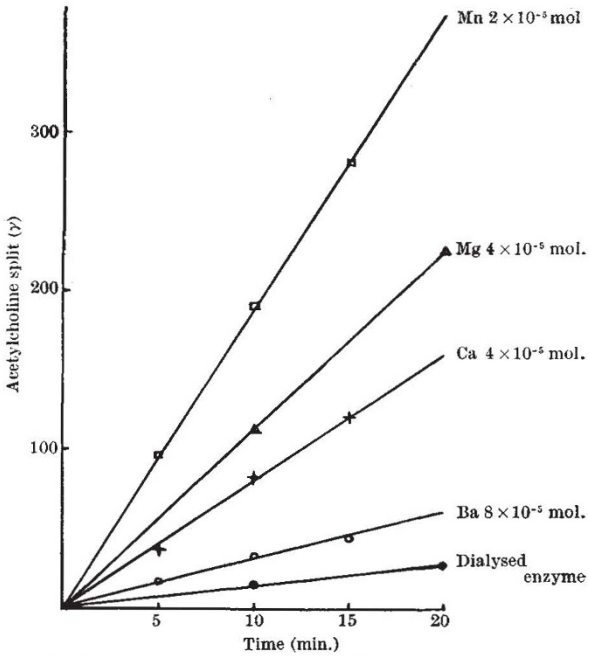
Action of Ions on Choline Esterase

THE physiological significance of choline esterase suggested by its high concentration at muscle end plates and at synapses of the central nervous system[1] makes it desirable to investigate the properties of the enzyme. The electric organ of Torpedo, which is considered as an accumulation of muscle end plates, has by far the highest content of choline esterase ever found in a tissue of fluid. An organ of 100–200 gm. weight splits about 200–400 gm. acetylcholine in 60 min., which is a hydrolytic power of the



ACTION OF DIVALENT IONS ON CHOLINE ESTERASE