

paper with its mass of experimental evidence may be considered as very valuable. Chemical cytologists *will in the future have no excuse* for using paraphenylenediamine and benzidine tests with their innumerable variants, except in conditions which are very accurately understood.

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Studies on oxidation-reduction. X. Reduction potentials in cell-suspensions.

By R. K. CANNAN, BARNETT COHEN and MANSFIELD CLARK. Supplement no. 55 to the Public Health Reports of the United States Public Health Service. From the Hygienic Laboratory, Washington 1926.

This is the first paper of the series to embark definitely on the experimental solution of biological problems, though in one at least of the previous ones there were accounts of experiments with plant juices and bacteria. Most of the work was carried out on suspensions of bacteria and yeast cells, and with the aid of unattackable electrodes immersed in the culture. A practically continuous record of potential could thus be got, as would hardly have been the case if the experiments had been confined to the observation of indicator colour-changes.

The change of potential with time in suspensions of cells is discussed and many experiments are described. The effect of adding THUNBERG'S "metabolites" is investigated and also that of adding glutathione. Interesting curves obtained with rapidly growing bacterial cultures are also given and the significance of the time: potential relation is appraised. One of the principal conclusions of the whole paper is that aerated cell suspensions have an oxidation-reduction potential within the indophenol zone. Again, "Deprived of free access of oxygen, the cell-suspension develops a progressively more negative potential. It traverses in order the zones characteristic of the reversible indicators. If one of these indicators is present, the potentials pass smoothly into the equilibrium potentials of the dye system, the dye is progressively reduced, and the potentials then pass smoothly out of the zone characteristic of the indicator and take up their normal course. Successive small doses of oxidant produce temporary checks or reversals upon the course of potential-change followed by a very decided recovery of the negative drift. The suspension therefore acts as if there were present very small quantities of active poisoning material fed from a large reserve which is slowly but decidedly mobilised".

In the aerobic cell, there is probably some kind of balance between its reducing tendencies and the entering oxygen, leading to a "more or less permanent stabilization of its oxidation-reduction chemistry".

The authors consider that the data they have accumulated and the further advance of other workers along the same lines will in all likelihood reconcile the views of WIELAND and WARBURG on biological oxidations. They believe that the discrepancies arise from the fact that the prevalent use of methylene blue illuminates only a small part of the whole field of potential actually capable of being occupied by living processes. The entire memoir is a most important contribution to our knowledge of intracellular oxidation-reduction potential.

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