The avidity of the cells of the growth zone may therefore be suspected of being increased when dinitrophenol is administered.

Conclusions. Dinitrophenol did not affect macroscopically the growth of an experimental sarcoma in rats, but microscopically there were evidences of increased vascularity and destructive cellular changes, whose significance remains undetermined.

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Effect of Agitation Upon Bacterial Growth.

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The course of population growth in a bacterial culture is known to depend upon many environmental factors, such as temperature, food supply, reactions, etc. We wish to suggest another factor which, from our studies, seems to be of importance—shaking.

The apparatus used in the shaking consists of a motor-driven shaft to which clamps can be attached. The motion of the shaft is reciprocal. The clamps are used for securing culture flasks to the machine. We have generally used about 275 shakes per minute. The extreme agitation is attained in flasks having an up and down excursion of 2.5 inches. For the minimum shaking, the center of mass of the medium was placed at the center of motion of the shaft, thus obtaining little more than a rippling of the surface of the medium.

Flasks inoculated with similar amounts of *E. coli* culture have been studied. Plates were prepared at intervals; smears at the time plates were made. Control flasks unshaken were also studied.

The results indicated in the accompanying figure: (a) The agitated culture reaches a higher population level compared to the unagitated. (b) The growth rate is virtually the same (generation time agitated 26 minutes, unagitated 30 minutes). (c) Log phase lengthened (in some instances 100% longer). (d) Cell size greatest at beginning of log phase, least at end. (e) Cell size 1/3 less in agitated culture.

The observation was also made that (a) Agitated cells (less in size) much more motile than the non-agitated cells. This appeared to be a Brownian movement. (b) Degree of agitation not a factor in phenomenon.

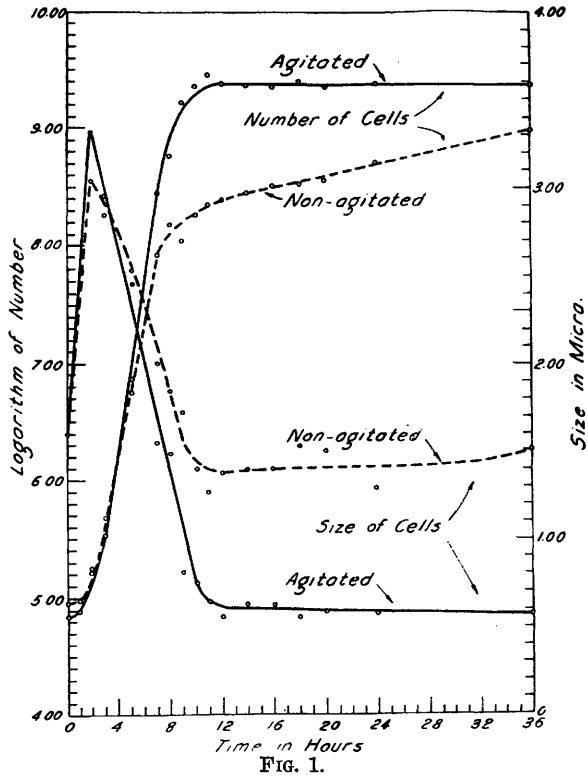

FIG. 1.

Showing the effect of agitation upon the population growth of a culture of *E. coli*, together with the size of the organisms in the agitated and unagitated cultures.

Our results are similar to those reported by Winslow, Walker and Sutermeister,[1] for their studies on aeration. It might seem in the light of their work that our results reflect the aeration due to the agitation.

Doubtless aeration does play a part in these observations. That it is not the whole story must be admitted when it is known that we have observed this phenomenon (but to a lesser degree it is true) when flasks were agitated under a vacuum as well as under oil. We have not as yet studied the effect of replacement of air by nitrogen. We have no explanation for what we have observed. Whether it is due to the fact that the agitated cells are prevented from adsorbing end products or not we do not know. It would appear to be a possibility.

[1] Winslow, C.-E. A., Walker, H. H., and Sutermeister, Margaret, *J. Bacteriol.*, 1933, **24**, 185.