microbial cause of any disease. These methods have been followed and have fulfilled desired requirements designed to show the relationship of a microbe to the disease in question. That hidden factors may still exist is admitted frankly, only because our present methods of attack upon a problem of this type may be inadequate for bringing to light such concealed factors. However, only those facts which have come out of this research have been utilized in drawing justifiable conclusions warranted by the facts, and these must be based upon the only available methods of approach that are known at the present time.

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THE RELATIONSHIP BETWEEN THE WATER CONTENT AND OXYGEN CONSUMPTION OF THE ORGANISM

THE rôle of water as a medium of reaction within the cell has not yet been fully comprehended. This is not surprising in view of the fact that the conditions that control the distribution of water from free to bound states have been elusive. At the suggestion of Dr. J. W. Buchanan, the experiments[1] summarized here were undertaken as an attempt to disclose a possible relation between free water, *i.e.*, water that may be added or abstracted by changed osmotic conditions, and the rate of oxidative reactions in the organism. Such a relation would rest fundamentally on the law of mass action, that is, the relative concentrations of oxidizable substrates and oxidative enzymes.

Previous observations are apparently conflicting. Certain investigators[2] have measured increases in respiratory metabolism in dehydrated tissues, while, conversely, others[3] have showed water uptake to be associated with decreased metabolism. On the other hand, there is some evidence that the opposite relationship may hold true.[4]

The writer used *Planaria dorotocephala* and early embryos of *Amblystoma punctatum*. Water content was controlled by immersing the animals in solutions of differing osmotic pressures, and oxygen consumption was measured in two ways, with the Winkler method and by a microrespirometer.

As far as possible the same individuals were tested under different conditions over three-hour periods. Each period in a test solution was preceded by one in tap water to establish a norm and a control for successive measurements.

The averaged results of the Winkler tests are grouped into the following table.

PER CENT. CHANGES IN RATE OF OXYGEN CONSUMPTION

	Planaria dorotocephala	*Amblystoma punctatum*
Distilled water	−54	−21
Ringer's solution	+43	+62

These observations were checked by numerous experiments with the respirometer. It was found excellent for use with amphibian embryos but unsatisfactory for Planaria due to necessary shaking which prevented the animals from coming to rest. In the case of the former dehydration yielded an average increase of 39 per cent. above the normal in tap water, while treatment with distilled water lowered the rate of oxygen consumption about 42 per cent.

Early *Amblystoma* embryos, when immersed in distilled water, half tap- half distilled water, half Ringer's, and full Ringer's, reached and maintained their maximum swelling or shrinkage within sixty minutes, while planarians show water content changes over a period of one half to six hours in Ringer's and one half to more than sixteen hours in distilled water.[3] Sections of animals so treated indicate that water changes are both inter- and intracellular. At present no rules generally applicable to all animals can be drawn.

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[1] The work was carried out at the Osborn Zoological Laboratory, Yale University.

[2] E. Kreps, Pfluger's Arch., 222, 215–233, 1929; G. T. Caldwell, *Physiol. Zool.*, IV, 2, 324–359, 1931; J. W. Buchanan, *Jour. Exp. Zool.*, 57, 3, 455–472, 1930.

[3] J. W. Buchanan, *Jour. Exp. Zool.*, 57, 2, 307–330, 1930; *Biol. Bul.* LX, 3, 309–326, 1931.

[4] L. C. Beadle, *Jour. Exp. Biol.*, VIII, 3, 211–227, 1931.

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