New York Meeting.

New York Academy of Medicine, February 20, 1929.

4303

Comparison of Resistance Changes in Collodion Membranes and Cells.

L. R. BLINKS.

From the Laboratories of The Rockefeller Institute for Medical Research.

Most conductors, both metallic and electrolytic, follow Ohm's law, the current being proportional to the applied potential, and the resistance a constant (with exceptions in the case of temperature rise or dielectric breakdown). In the large cells of *Valonia* and *Nitella,* however, the resistance becomes higher with increase of potential from 25 to 150 millivolts, under some conditions.[1]

This discovery led to a search for a non-living model of this phenomenon and such has been found in dry collodion films, thinner than those used by Michaelis,[2] and Northrop;[3] thicker membranes show the effect in smaller degree. When direct current is passed across such thin films separating 2 solutions of good conductivity, the resistance is found to vary with the applied potential. With sea water on both sides, the resistance is a minimum below 100 millivolts, and may rise as much as 100% when the potential is increased to 3 or 4 volts. Above this voltage irregular results are obtained.

The course of the resistance rise is very regular and reproducible, resembling the exponential curve of a condenser charging-current. There is, however, no E.M.F. of polarization, detected on breaking the current, which could account for more than a few per cent of the increase of resistance. The lower value is regained apparently as soon as the return to a lower measuring potential is made; although some effect persists, since the second and third applications of high potential in quick succession cause more rapid rise of resistance than the first.

---

1 Blinks, L. R., *Am. J. Physiol.*, 1928, lxxxv, 351.

2 Green, A. A., Weech, A. A., and Michaelis, L., *J. Gen. Physiol.*, 1928-29, xii, 473.

3 Northrop, J. H., *J. Gen. Physiol.*, 1928-29, xii, 435.

When the membrane separates 2 solutions of the same concentration but of different conductivity, such as 0.5 N KCl and HCl, the direction of the current is found to influence the resistance change. Thus when hydrogen ion is moved across the membrane, the resistance falls slightly with increasing potential, while when potassium ions are caused to pass by reversing the current, the resistance rises as much as 100% in changing from 0.1 to 3.0 volts. Somewhat similar differences are found when the membrane separates 2 different concentrations of the same solution.

There seems also to be an effect of the membrane itself when the same solution is used on both sides, causing a lower resistance in one direction than in the other. This may be due to the method of drying one surface in contact with glass.

The cause of the effect is perhaps to be sought in the changes of mobility which ions undergo when in such membranes (*cf.* Northrop and Michaelis). Probably also a concentration gradient is quickly established within the membrane which is disturbed by the application of a potential gradient, causing a new distribution of the electrolyte, even for short distances into the surrounding solution. Movement of water due to electro-endosmosis seems unlikely in view of the concentrations of salt used (0.1 to 1.0 m).

Photographic records of current changes in the measuring bridge show marked resemblances to those taken with *Valonia* and *Nitella* and the causes of the phenomenon may be similar in these cases. On the other hand, variations of resistance in human skin are probably more complex.[4]

4304

The Inverse Relation Between Inorganic and Lipoid Phosphorus in Blood of Rabbits.

ALVIN R. HARNES. (Introduced by Wade H. Brown.)

From the Laboratories of The Rockefeller Institute for Medical Research.

In a recent paper,[1] attention was called to the fact that, among rabbits living out of doors, the inorganic phosphorus of serum and the lipoid phosphorus of whole blood show wide variations with a high negative coefficient of correlation, $-0.794 \pm .09$. The curve

[4] Gildemeister, M., *Handb. norm. u. path. Physiol.*, 1928, viii, pt. 2, 657.

[1] Harnes, A. R., *J. Exp. Med.*, 1928, xlviii, 549.