$$\frac{V}{S} \cdot \frac{dM_i^*}{dt} = P_o M_o^* - P_i M_i^*$$

for the rate of change of internal M^*, where V is cell volume, S is cell surface, and the suffixes i and o distinguish internal and external concentrations of the ion M, and an asterisk denotes labelled M. The P's are the two permeability constants.

Krogh[1] discussed P_i; but Conway[4] pointed out that P_o is the figure which measures the amount of M entering the cell per unit time and area, when the external concentration of M is unity. As the concentration can be measured in arbitrary units per unit volume, the result is that P_o expresses the amount entering the cell in terms of the quantity of M per unit volume in the solution; and if P_o is a true constant, the quantity entering the cell per unit time and area will be linearly related to the concentration of M in the external solution. We have found that this is the case in the physiological range of potassium and sodium concentrations, and P_o for sodium is about 0·0004 cm. hr.$^{-1}$ and for potassium about 0·0038 cm. hr.$^{-1}$.

A full description of the methods and results will appear later.

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[1] Krogh, *Proc. Roy. Soc.*, B, **133**, 140 (1948).
[2] Ussing, *Nature*, **160**, 262 (1947).
[3] Hill, A. V., *Proc. Roy. Soc.*, B, **104**, 73 (1928).
[4] Conway, *Irish J. Med. Sci.* (Oct.–Nov., 1947).

In vitro Effect of Penicillin on Prothrombin Activity of Bovine Plasma

Moldavsky, Hasselbrock and Caterno[1,2] have recently reported that both oral and intramuscular injections of penicillin consistently shorten the coagulation time of normal blood and produce a non-retractile clot. They also observed decreased bleeding-times in patients receiving penicillin. J. H. Lewis[3] investigated more thoroughly the effect of penicillin on blood coagulation in both normal and hæmophiliac subjects. *In vitro* tests indicated that oral and intramuscular administration of penicillin did not have any effect on the blood-coagulating mechanism in either, in spite of high plasma penicillin levels. His *in vitro* tests to determine the effect of penicillin at various concentrations on the coagulation time of normal and hæmophiliac blood showed no change on the coagulation time.

In view of the contradictory nature of such results and the clinical application of Moldavsky, Hasselbrock and Caterno's[1] finding ("the possible use of penicillin as a hæmostat and the danger of intramuscular clotting"), the influence of penicillin on prothrombin activity was investigated.

In vitro experiments conducted in this laboratory have shown that penicillin at a concentration of 3,400 units and more increases the prothrombin time of bovine blood plasma, while concentrations lower than this appear to decrease the prothrombin time. The effect of penicillin at lower concentrations is not, however, very significant. Further work is in progress. The result of a typical experiment is given in the accompanying table.

Incubation at 37° C. for 2 hours

Final concentration of penicillin (Oxford units) in the total volume of the mixture (1·4 c.c.) containing 0·4 c.c. of bovine plasma	Prothrombin time (in sec.) of 0·5 c.c. of resultant mixture
19,500	120
10,200	70
3,400	42
1,700	34
425	30
106	30
Control	
0·4 c.c. plasma plus 1·0 c.c. distilled water	37

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[1] *Science*, **102** (1945).
[2] *Lancet* (Oct. 27, 1945).
[3] *Proc. Soc. Exp. Biol. and Med.*, **63**, 538 (Dec. 1946).

Symbiotic Micro-organisms of Aphids and Fixation of Atmospheric Nitrogen

Many insects have associated with them specific micro-organisms, often present in special organs, which are passed on from generation to generation. Their function is in most cases unknown. In many instances where it has been possible to rear sterile insects lacking their symbionts, these have been stunted in growth and deformed, in other cases such insects have been found to develop in an apparently perfectly normal manner[1]. Fraenkel and Blewett[2] have shown that the poor growth of sterile larvæ of certain beetles, without their usual symbionts, may be restored to normal by the addition of certain factors of the vitamin B complex. In this case the role of the symbionts appears to be to provide the insect with these substances. It has been suggested from time to time, and more recently by Toth, that the symbionts are in many cases capable of assimilating gaseous nitrogen from the atmosphere. In his monograph[3], Toth concludes that a large number of insect species, including aphids, are able to fix nitrogen with the aid of their symbionts.

The direct experimental evidence for this conclusion rests on what is called 'the surviving system technique'. In this technique, aphids are ground up in a nutrient solution containing glucose and oxaloacetate, incubated at a suitable temperature and *p*H, and the increase in nitrogen content of the system (assumed to be due to fixation by the symbionts) measured by micro-Kjeldahl analysis. Following Toth's procedure exactly, I have measured the changes in total nitrogen content of such 'surviving systems' produced by grinding young individuals from actively multiplying colonies of either *Myzus persicæ* or *Doralis fabæ* in a nutrient medium ($MgSO_4$, 1 gm.; Na_2CO_3, 1 gm.; glucose, 5 gm.; oxaloacetic acid, 1·3 gm.; $CaCO_3$, 2 gm.; in *M*/20 phosphate buffer, *p*H 7, to 1 litre). These cultures were incubated, with shaking, either at 15° C. or 24° C. In all cases no increase in nitrogen content was observed—occasionally nitrogen was lost. Such