Of a total of five dogs, on whom similar observations have been made, four have shown similar sudden rise of temperature, while the fifth apparently had a very efficient collateral circulation already in existence, so that there was only a small drop in temperature after tying the vessel.

From the rapidity of the rise in temperature it must be concluded that the first step in the establishment of a collateral circulation is a surprisingly abrupt vasomoter reaction. Further work is being carried out in an effort to analyze and determine the exact mechanism of this reaction.

182 (2705)

The effect of immersing and tearing Amoebae in salt solutions.

By PAUL REZNIKOFF and ROBERT CHAMBERS.

[*From the Department of Anatomy, Cornell University Medical College, New York City.*]

In a previous publication[1] the effect of the injection of salts into Amœbæ was described by us. The results of those experiments afford criteria for judging the action of the substances directly on the protoplasm within the cell. From those studies a fuller conception may be obtained of the permeability to the salts when Amœbæ are immersed in solutions, and also some idea of surface reformation when the Amœbæ are torn in the same salt solutions.

Immersion of Amœbæ in different salt solutions shows that in order of increasing toxicity the salts range as follows: $MgCl_2$, $CaCl_2$, NaCl, KCl. Thus Amœbæ will live for 24 hours in M/6.5 $MgCl_2$; for about 5 hours in M/6.5 $CaCl_2$; for less than 1 hour in M/6.5 NaCl; and for less than 1 hour in as dilute a solution of KCl as M/104. Amœbæ will live for three days or more in M/13 $MgCl_2$, M/26 $CaCl_2$, M/52 NaCl and M/832 KCl. The Amœbæ which die in NaCl and KCl show a sinking and clumping of the

[1] Chambers, R., and Reznikoff, P., PROC. SOC. EXP. BIOL. AND MED., 1925, xxii, 320.

granules, and resemble in this respect the Amœbæ into which the salts have been introduced by injection. Another interesting feature of the immersion experiments is that the Amœbæ dead in NaCl have a loss in the integrity of the pellicle. This does not occur with the other salts.

Comparing these results with those obtained by injection, it is evident that NaCl and KCl are much more toxic to Amœbæ when in contact with their external surface than when injected. With $CaCl_2$ and $MgCl_2$ the reverse is true (injection toxicity: $MgCl_2$ and $CaCl_2 >$ NaCl and KCl). Furthermore from the appearance of the dying Amœbæ there is evidence that Na and K can penetrate fairly easily, while Ca and Mg cannot.

If Amœbæ are immersed in mixtures of NaCl and $CaCl_2$, or of KCl and $CaCl_2$, the toxic effects of the NaCl and KCl are antagonized by the $CaCl_2$. There is a considerable range in the lethal doses of NaCl and KCl when mixed with $CaCl_2$. This variation decreases as the strength of the solutions of NaCl and KCl increases. The amount of $CaCl_2$ necessary to antagonize the toxic action of NaCl and KCl is as follows:

Strength of NaCl	No. of Mols. of NaCl antagonized by 1 Mol. of $CaCl_2$		
	Min.	Max.	Mean
M/13	60	80	70
M/26	120	160	140
M/52	180	240	210
M/104	380	540	460

Strength of KCl	No. of Mols. of KCl antagonized by 1 Mol. of $CaCl_2$		
	Min.	Max.	Mean
M/26	40	60	50
M/52	60	80	70
M/104	60	80	70
M/208	80	160	120
M/416	80	160	460

From the injection and immersion experiments it was seen that the effect of Na and K upon the protoplasm was to cause a sinking of the heavier granules. These granules tend to clump

at the lower surface of the Amœbæ, and persist in this condition until the Amœbæ die or recover. Although $CaCl_2$ is able to antagonize the lethal effect of NaCl and KCl, nevertheless some clumping occurs. Since we believe the penetrating power of Ca into Amœbæ is negligible, it is suggested that the antagonism of Ca to the lethal action of Na or K occurs on the surface of the Amœbæ.

Amœbæ torn in water rapidly repair their surfaces after the outflow of some of their contents. This debris is soon pinched-off. When Amœbæ are torn even slightly in solutions of NaCl in concentrations of M/13 and stronger, no repair occurs. The contents pour out, the pellicle disintegrates, and the Amœbæ is rapidly dissipated. With solutions weaker than M/13 repair from tears takes place with increasing ease as the concentration diminishes. In a M/104 solution the Amœba can recover from a very extensive tear as easily as in water. In M/13 KCl the Amœbæ cannot recover from the slightest tears, and can recover from extensive tears only in a M/312 solution. In M/6.5 $CaCl_2$ there is no repair after even the slightest tears. The part of the Amœbæ near the tear sets, and this setting proceeds into the Amœbæ, the living part of which attempts to pinch off the coagulated portion. The Amœba is thus converted into a gradually lengthening column of coagulated material with a part still living at one end. This, in its turn, finally succumbs. The solidified column shows a series of constrictions which indicate the unsuccessful attempts of the Amœba to pinch off. As the strength of $CaCl_2$ is decreased, the Amœba succeeds in pinching off the solidified region; and in a M/104 solution quite extensive tears can be repaired. $MgCl_2$ is the most toxic of all the salts which are torn in the solutions. No repair occurs in a M/52 solution from even a very slight tear, and recovery from extensive tears cannot take place until the solutions are diluted to M/832.

The antagonistic action of $CaCl_2$ to M/13 NaCl with respect to the repair of the torn surface is most efficient in dilutions of $CaCl_2$, M/52 to M/208. Solutions of $CaCl_2$ outside this range are not effective. $CaCl_2$ antagonizes the action of M/13 KCl in its prevention of repair of the torn surface only in dilutions of M/208 to M/416.

CONCLUSIONS.

(1) These experiments emphasize the liquefying action of NaCl and the solidifying effect of $CaCl_2$ brought out previously.[1]

(2) They also indicate that Na and K can penetrate the Amœba much more effectively than Ca or Mg.

(3) Of the four salts studied, only NaCl has a disintegrative action upon the surface.

(4) The tearing experiments indicate that Ca and Mg, which have very little effect on the intact Amœba, enter the cell easily through a tear. The action of Ca is localized, and the Amœba rids itself of the dead portion by an active "pinching-off" process. Mg, on the other hand, tends to diffuse throughout the cell, and is therefore extremely toxic. These findings substantiate the results obtained in the injection experiments.

(5) To antagonize toxic effects of NaCl or KCl, $CaCl_2$ must be present in a non-lethal dose.

183 (2706)

The sex ratio in litters of mice classified by the total amount of prenatal mortality.

By E. CARLETON MacDOWELL and ELIZABETH M. LORD.

[*From the Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor, Long Island, N. Y.*]

From studies of the normal sex ratio of living young and of abortions and still-births in man and the rat, King[1] and others have concluded that the male fœtus is less viable than the female. If this is true for the entire period of gestation there should be a negative correlation between the amount of prenatal mortality and the sex ratio. From counts of the corpora lutea of pregnancy of about 20 mice (sectioned material) Parkes[2] concludes that this is the case.

[1] King, H. D., *Anat. Record*, 1921, xx, 321.

[2] Parkes, A. S., *Proc. Roy. Soc.*, 1923, xcv, 551.