SCIENTIFIC PROCEEDINGS

ABSTRACTS OF COMMUNICATIONS.

Ninety-fifth meeting.

Rockefeller Institute for Medical Research, December 18, 1918.
President Gies in the chair.

21 (1396)

The effect of organic acids and their amido-compounds on the hydration of agar and on a biocolloid.

By D. T. MACDOUGAL and H. A. SPOEHR.

[*From the Desert Laboratory, Tucson, Arizona.*]

Earlier researches on hydration effects were concerned chiefly with gelatine as taken to represent the action of living matter. The effort to obtain results directly applicable to plant protoplasm, led to a consideration of chemical composition, solubility and other properties as a consequence of which mixtures of agar and protein were found to give hydration reactions so nearly comparable to those of living cell-masses that their study yields extremely useful facts and numerous stimulating suggestions.

The importance of the acids or of the hydrogen ion concentration in swelling had become apparent very early in the brief history of this subject. Workers using botanical material have dealt with this matter chiefly by the use of hydrochloric, and with acetic, citric and malic acids, and with salts of biological occurrence and concentrations. Although much careful work has been done some doubt still exists as to the part which the acid radicle may play in the complex system of substances always present in the protoplasmic colloid. A study of the action of these acids and of organic acids and of their amido compounds promised comparisons that might be of importance in this matter, and a series of measurements were carried out in the equable temperature chambers of the Coastal Laboratory August to November, 1918.

Three groups of substances were selected for these tests; (1) succinic acid and its amido-compound, *a* amino-succinic or aspartic, which are dibasic, and its amide, asparagin, which is monobasic; (2) acetic acid and *a* amino-acetic acid or glycocoll, which are monobasic; (3) propionic acid and *a* amino-propionic acid or alanin, also monobasic.

The swellings of sections of agar and a mixture of 8 parts agar and 2 parts oat-protein are selected for discussion at the present time. The measurements were made with the type of auxograph which has been previously described. The principal end results are given in the following table.

Hydration of agar and agar-oat-protein in organic acids and their amido-compounds at 16°–17° C. Trios of sections .10–.23 mm. in thickness from plates cast from 2.5 per cent. solutions were used. Such plates were shrunken in thickness by dehydration in 48–60 hours at 18°–22° C. Duration of swelling 20–60 hours. Expansion in percentages of dried thickness.

Concentration.	Water Dis.	Succinic Acid Mol.	Aspartic Acid Mol.	Asparagin Mol.	Acetic Acid Normal.	Glycocoll Mol.	Propionic Acid Normal.	Alanin Mol.
			Agar.					
	2413% 2739							
0.05		1091	827	2308	1433		1200	1474
0.01		1273	1270	2365	1560	2965	1300	2421
0.002		1600	1400	2440	1790	3166	1625	2790
0.0004		1750	1788	2720	1955	2605	1800	
0.00008		2528	2080	3250	2640			
			Agar 8, *Oat-Protein* 2 *Parts*					
	2100% 2630							
0.05		700	855	1867	1090	1938	800	2046
0.01		864	900	2455	1255	2340	1000	2317
0.002		909	1670	2523	1738	3050	1250	2410
0.0004		1136	2600	2675	2238	3000	1591	2273
0.00008		2330	3050	2600	2480		1864	

The deductions to be drawn from these figures, all being averages of 3 to 9 measurements, are numerous, but attention must be confined to a few pertinent cases.

1. It is to be seen that equimolecular concentrations of the three organic acids present small divergence of effect on agar and more positive differences in agar-protein.

2. Agar swells more in succinic acid than in its amido-com-

pound but reverses this relation notably in the acetic-glycocoll couple and in the propionic-alanin pair.

3. The agar-protein biocolloid shows notably greater hydration in the amino-acids than in the related organic acids, and greater even than the hydration in distilled water.

4. Equimolecular concentrations of amino-acids produce notably greater swellings of the biocolloids in comparison with related organic acids implying the positive action of factors other than the hydrogen ion concentration.

5. Glycocoll facilitates hydration in all concentrations above .01 M. in both agar and agar-proteins, and also in agar-gelatine, the data of which are not given in this paper. This fact goes far in explanation of the scattered results obtained by various workers in which accelerated growth or increased total growth has been seen to result from the addition of glycocoll to nutrient solutions. Such increases have been attributed to catalytic action by Dakin and others.

6. The amide, asparagin, induces a maximum hydration, greater even than that possible in agar in distilled water, and very high at all concentrations. Similar action was exerted on agar-gelatine and agar-protein plates. The positive action of both glycocoll and asparagin is indicated by the fact that the maximum effect is reached at certain concentrations above the minimum.

The destruction of our supply of phenyl-alanin in transit prevented an examination of the effects of this substance, but it will be possible to extend this work to this and other amides in the next few months.

22 (1397)

The carbon dioxide of injury and of respiration in nervous tissue.

By A. R. MOORE.

[*From the Physiological Laboratory of Rutgers College, New Brunswick, N. J.*]

It has been shown that injured nervous tissue gives an acid reaction with phenolsulphonephthalein as indicator and that the acid measured by Haas[1] method is carbon dioxide.[2] If the rate

[1] Haas, A. R. C., *Science*, N.S., vol. 44, pp. 105–108, 1916.

[2] Moore, A. R., PROC. SOC. EXP. BIOL. AND MED., vol. 15, pp. 18–19, 1917.