

organisms. In a bacteriological analysis of 308 cases of gaseous gangrene, of which 91 were derived from Weinberg's series and 217 from wounded American soldiers, the percentage of incidence of the various pathogenic anaërobes is as follows:

	Per Cent.
<i>B. welchii</i>	85
<i>B. sporogenes</i>	35.4
<i>B. œdematiens</i>	12.6
<i>Vibrio septique</i>	17.2
<i>B. fallax</i>	6.4

This is not the true incidence of the *B. œdematiens*, *fallax*, *histolyticus* or *aërofœtidus* as the difficulties in the isolation of these organisms in pure culture is great, but it does serve to emphasize the fact that infectious gaseous gangrene is usually a mixed infection.

In this group of 308 cases of infectious gaseous gangrene only 79 were infected with a single pathogenic anaërobe, the remaining 229 having from two to six anaërobes in the local lesion, and nearly always at least two pathogenic anaërobes.

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Hydration effects of amino-compounds.

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The chief interest in the results presented in this brief paper depends upon the following facts and conditions:

A. The amino-compounds furnish the only known solutions in which agar and other pentosans or mucilages undergo a greater hydration than in distilled water. Tentative conclusions to this effect have been confirmed by all of the results obtained during the past year.¹

B. The pentosans, or anhydrides of the 5-carbon sugars are universally and abundantly present in plant cells, originating by transformations of wall-material, starch, etc., in any part of

¹ MacDougal, D. T. and H. A. Spoehr, "The effect of organic acids and their amino-compounds on the hydration of agar and on a biocolloid," PROC. SOC. FOR EXPER. BIOL. AND MED., 1918, xvi: 33-35.

the protoplast, and presumably intimately interwoven into its colloidal mesh. In animals the pentosans seem to be confined to the nucleo-proteins, and the manner of their origin is not so clear in this case.

C. The mucilages, gums and slimes in which form these substances appear in definite masses in syneretic cavities and in layers in the plant cell have a hydration capacity enormously greater than that of the sugars from which they are derived, and show a wide range of solubility and other qualities.

D. The pentosans are subject to digestion in animals to an extent variously assigned by different authors. These substances undergo metabolic changes in the plant but slowly. Wherever they occur they must show changes in volume and form according to the colloidal structure in which they occur and to the nature of the solutions penetrating them.

Our own experimentation has been made principally with agar and some of the common plant gums, separately and in mixtures with albumins. The revised generalizations which we are prepared to support may be briefly stated in the following summary:

1. The pentosans are weak acids which dissociate so slightly that 1 per cent. solutions of agar, acacia and cherry gum showed pH values of 5.1 as determined by the indicator method. The mucilage of *Opuntia* showed a value of 5.8. The swelling of these substances in the amino-acids which dissociate strongly, as aspartic acid which shows a pH of 3 at 0.01 *M* is less than in water.

2. Such acids and other amino compounds as asparagin, pH = 6.2, alanin pH = 7.0, phenyl-alanin pH = 4.8, glycocoll pH = 6.2 at 0.01 *M* as tested by the indicator method, ammonium hydroxide and ethylamine facilitated the hydration of agar so that it showed swellings greater than in distilled water.

3. Other factors than the hydrogen ion concentration are determinative in this action as illustrated by the fact that swellings in phenyl-alanin and glycocoll are fairly equal. The total swelling of agar as compared with that in water as unity was 1.26 in asparagin, 1.52 in alanine, 1.65 in glycocoll and in phenyl-alanin, in ammonium hydroxide and in ethylamine, all in 0.01 *M* solutions. Propionamide the only amide tested did not exert any marked effect on swelling except to retard it slightly at 0.01 *M* and in stronger solutions.

4. Glycocoll was used in extending these experiments, and it was found to exert an accelerating effect on agar when mixed with soy bean albumin, gelatine and similar increases were also shown when the agar was partly replaced by such mucilages as that from *Opuntia*, acacia and cherry gum.

5. Living and dried sections of tomato fruits, growing cell-masses of stems of *Phytolacca*, and joints of *Opuntia*, the cell-sap of which has varying acidity, showed the greatest swellings in alanin, phenyl-alanin, glycocoll and ammonium hydroxide as compared with results in water and organic acids, with but few exceptions. Taking water as unity living sections of *Opuntia discata* showed swellings of 1. in alanin, 1.5 in phenyl-alanin, and an equal increase in glycocoll. Dried sections of the same material showed swellings of 1.3 in alanin, 1 in phenyl-alanin, and 1.4 in glycocoll solutions. Living sections of *Opuntia leptocaulis* swelled 1.4 in alanin, 1.2 in phenyl-alanin, 1.55 in ethylamine, while dried sections of this species gave increases of 2 in alanin and 1.5 in ammonium hydroxide and 2.2 in phenyl-alanin as compared with water.

6. The swellings or increases due to hydration were determined by the use of the auxograph. It has been found that the hydration of dried sections of such pentosans as agar causes changes which are the reverse of those which ensue during desiccation. Plates of this substance poured from a warm 2.5 per cent. solution, which were fastened at the margin in such manner as to prevent shrinkage in area and to allow decrease in thickness only, when swelled showed increases of not more than 4 and generally as little as 2 per cent. laterally, while swelling 4,000 per cent. in thickness.

7. Sections of gelatine from plates cast in the above manner may show a lateral expansion of 8 to 40 per cent. while swelling 500 to 2,000 per cent. in thickness, in water and in acid solutions with a pH value of 2.

8. The swelling of gelatine which showed a pH value of 5.2 in an 8 per cent. solution in nitric and hydrochloric acid at a pH value of 2, in succinic acid (0.01N) at a pH value of 3.05 and in amino-succinic acid (aspartic acid) at a pH value of 3 was much greater than water, but the swelling in alanin, phenyl-alanin and glycocoll was less than that in water.

9. The pentosans on the one hand and the albuminous compounds on the other are intimately intermixed or interwoven in the protoplast of the plant and in the nucleus of the animal cell. The conditions which accelerate the hydration of the first may not affect the volume of the other except to cause a slight shrinkage. The effect of the hydrogen ion is to increase the hydration capacity of albumin and its derivatives, while lessening the hydration of the carbohydrates.

10. In addition to these differential effects of the solutions upon the principal components of the plasmatic colloids, the changes in volume are not isotropic but may be determined by the manner in which the mesh, masses of colloidal material or organs of the protoplast are laid down or fall into place. These two classes of variables may well be considered as prolific sources of differentiation in the procedure of the cell.

20 (1480)

Profound effects of digitalis on the vagus producing severe detrimental subjective symptoms, as shown by simultaneous electro-cardiograms and pneumograms.

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In a case of syphilis, chronic interstitial nephritis, dilatation and hypertrophy of the heart, auricular fibrillation, arteriosclerosis, periodic breathing, Cheyne-Stokes type, in which because the auricle was fibrillating, digitalis had been given for the purpose of showing the ventricular rate. Counts of the pulse showed the ventricle to be contracting at a rate approximating 100 during apnea and slowing to about half this rate as soon as hyperpnea began. That is, the heart rate was highest while there was no lung ventilation (apnea) and the heart beat less frequently during the period the lung ventilation was greatest (hyperpnea).

As the digitalis was continued the man complained of increasing distress, most severe during his hyperpnea. The ventricle rate did not become slower and evidently the patient was much more uncomfortable. The thought occurred that releasing the heart