Hydrogen-Ion Concentrations.

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The hydrogen-ion concentrations of joint exudates in acute arthritis.

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The hydrogen-ion concentrations of exudates aspirated from joints of patients ill with acute rheumatic fever and other forms of arthritis were determined. This was done: (I) to compare the reactions of the exudates of the various forms of arthritis; (2) to determine if an acidity existed in inflamed joints of acute rheumatic fever patients sufficient to permit the liberation of free salicylic acid following salicylate therapy.

Salicylic acid can not exist as such in alkaline solutions; and its salts have not been shown to have bactericidal power in low concentrations. Although the acid can not exist in normal blood and tissues, their reactions being slightly alkaline, it has been suggested for a number of years that its liberation might occur in the inflamed tissues of patients with acute rheumatic fever; these tissues were supposed to have been under considerably increased CO_2 tension. The bactericidal action of this liberated salicylic acid could explain the seemingly specific action of the salicylates on the arthritis of acute rheumatic fever.

Hanzlik¹ examined exudates from inflamed joints of acute rheumatic fever patients directly for the presence of salicylic acid. The results showed none to be present; but the author offers the criticism that no precaution was taken to prevent the escape of CO_2 .

In our work, the hydrogen-ion concentrations of all of the exudates were determined colorimetrically at room temperature and corrected to 38° C. by a method recently described by Cullen.² If sufficient fluid was obtained from a joint, the determination was also made electrometrically. With both methods, in order

¹ Jour. Pharm. and Exp. Therapeutics, 1917, ix, 217.

² Jour. Biol. Chem., 1922, 1, 17.

to prevent the escape of CO_2 , the fluid was not allowed to come into contact with the air.

Results.—The reactions of 16 joint exudates from patients with acute rheumatic fever were all slightly alkaline; their hydrogenion concentration varied from $P_{\rm H}$ 7.2 to 7.38. Seven exudates from patients with chronic arthritis varied in $P_{\rm H}$ from 7.27 to 7.4. An exudate aspirated from a knee infected with *Staphylococcus aureus* had a $P_{\rm H}$ of 6.63 and that from a knee infected with *Streptococcus hæmolyticus* was also acid, having a $P_{\rm H}$ of 6.14.

Since a definitely acid medium is necessary for the liberation of salicylic acid, and since all of the joint exudates from acute rheumatic fever patients were slightly alkaline, no free salicylic acid can exist in these joint fluids following the administration of salicylates.

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The selective bactericidal effect of acid fuchsin and sodium chloride.

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In 1912 it was found that if bacteria be stained with gentian violet and planted on plain agar a sharp selective activity of the dye could be readily demonstrated. All the commoner gramnegative organisms survived even long exposure to the stain, while all the commoner gram-positive spore-bearing aërobes were "killed," even by a relatively short exposure. Even the spores though not deeply, if at all, stained by gentian violet—were "killed" by exposure to the dye. What was true of gentian violet was found to be true also of other *basic* dyes of the triphenyl-methane group.

It is now found that a cleavage in exactly the opposite sense occurs if organisms be exposed to acid fuchsin—an *acid* dye of the tri-phenyl-methane series. Whereas gentian violet kills the gram-positive spore-bearing aërobes and spares the commoner gram-negative bacteria, acid fuchsin spares the former and kills

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