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INSTITUTE OF MICROBIOLOGY

Biennial Report

Submitted by: Dr. Michael Heidelberger

Period: July 1, 1956-June 30, 1958

Specific polysaccharide of Type VI pneumococcus. This substance is being studied with Dr. Paul A. Rebers as part of a project, undertaken with Prof. M. Stacey and Dr. S. A. Barker, of the University of Birmingham, England, to elucidate the fine structures of the specific capsular polysaccharides of Types II, V, and VI pneumococcus. This knowledge is required in order to correlate the immunological cross reactivity of these serological types with the chemical structures of their type-specific antigens. By initial cleavage of one of the phosphate linkages of the Type VI substance with dilute alkali, followed by splitting of the other on mild acid hydrolysis, it has now apparently been possible to isolate, in crystalline form, the phosphate-free repeating unit, which consists of D-galactose, D-glucose, L-rhamnose, and an as yet unidentified polyol. Isolation of the repeating unit of a complex polysaccharide is most unusual.

Cross reactions of antipneumococcal sera. The prediction could be made that if the cross reactions of glycogen in Type II antipneumococcal sera are actually due to reaction with antibody at the multiple α -1, 4, 6-branch points, partial removal of the large mass of outer α -1, 4-glucose chains of glycogen by means of phosphorylase and, better, more complete removal by β -amylase, would progressively increase the amount of antibody precipitated. Partly with the help of samples furnished by Dr. Joseph Larner, of the University of Illinois, these predictions were completely verified. Rabbit antisera to pneumococcal Types IX and XII were also studied in addition to horse sera, and it was concluded that

glycogen and amylopectin precipitate Type XII antisera also at their α -1, 4, 6-branch points. The linkage concerned in the cross reaction in Type IX antisera is probably α -1, 4-, since the amount of antibody precipitated is unaffected by changes in outer chain length.

The recent elucidation of the fine structure of the specific polysaccharide of Type VIII pneumococcus by Jones and Perry, who worked with material sent from the Institute, permitted the prediction that all polysaccharides which contain multiple units of cellobiose (D-glucose β 1 \rightarrow 4 D-glucose), part of the repeating unit of the Type VIII substance, would precipitate Type VIII antipneumococcal serum. This was tested with Iles mannan, a glucomannan yielding cellobiose on partial hydrolysis, and verified in this instance. Moreover, oat and barley β -glucans, in which cellobiose units had been suspected because of their behavior on enzymatic degradation, also precipitated Type VIII antiserum, in confirmation of the studies with enzymes. More recently cellobiose has actually been isolated by partial hydrolysis of the glucans, so that the serological test has again proven a powerful aid to the organic chemist and of potential use to the enzymologist.

Numerous other cross reactions are under investigation.

Professor Heidelberger has been in Europe for six months, giving seminars and lectures in Sweden, Norway, Scotland, England and France, and carrying on research at the Faculté de Pharmacie of the University of Paris, where the cross reactions of agar and of the polysaccharides of six different strains of Aerobacter aerogenes in antipneumococcal sera were studied. Dr. Heidelberger also received the degree of Dr., honoris causa, from the University of Aix-Marseille.

Dr. Rhozia will submit a separate report.

March 12, 1958