STUDIES ON THE STRUCTURE OF POLYSACCHARIDES

Johannes F.G. Vliegenthart

Bijvoet Center, Utrecht University, Utrecht, The Netherlands, j.f.g.vliegenthart@uu.nl

In many organisms polysaccharides have a protective function as to the integrity of the living cell and with respect to the environment. This is seen for example in plants, where cellulose is prominently present, chitin is a main constituent of crustaceans and insects, in yeasts different glucans may be found, in a number of bacteria the exopolysaccharides are important components. In addition numerous polysaccharides occur with various biological functions. Many of the natural polysaccharides have found industrial application. A few examples will be given. For cellulose and starch as well as for their derivatives, this is obvious. Several bacterial exopolysaccharides are applied in industry, because of the effects of these compounds on viscosity and gel forming *e.g.* in mining processes. Polysaccharides produced or excreted by organisms with a GRAS (generally recognized as safe) status are widely used in food industry. The pharmaceutical industry has interest in some polysaccharides as potential anti-cancer agents, as starting material for the preparation of vaccines and as biodegradable scaffolds in regenerating tissues.

The relation between structure and physical properties is an important question to address. With this aim the structure of several polysaccharides was studied in our laboratory. However, so far no clear relation between primary structure and physical properties was disclosed. Probably, knowledge of the three-dimensional structure in solution provides a better tool to make further progress. The understanding of the physical behavior of polysaccharides in complex systems like food or in nature in cell walls requires in addition insight into the interactions with other biopolymers like other polysaccharides and proteins, associations with lipids and binding of metal ions. pH and temperature have influences as well.

Determination of the structure of polysaccharides is rather complicated and usually achieved by a combination of methods. The simplest structures to establish are heteropolysaccharides consisting of repeating units. Irregular heteropolysaccharides pose difficult problems. Homopolysaccharides built up from one type of monosaccharide, but with two or more types of glycosidic linkages are extremely complex to analyze. A few examples will be given of studies carried out in Utrecht.