高分子学会九州支部外国人講演会

Glycosaminoglycans as Polyelectrolytes

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日 時 ： 10 月17 日(金) 10:30 - 12:00

ABSTRACT

Glycosaminoglycans, heavily sulfated and carboxylated polysaccharides, are the most highly charged macromolecules in vertebrates. They are found coupled to proteins at cell surfaces and in the extracellular matrix where they are now understood to modulate the action of a wide variety of extracellular and transmembrane signaling protein, playing a central role in embryogenesis, angiogenesis, cell differentiation and cell prolification. The most familiar (and paradigmatic) GAG is heparin, an anticoagulant drug; but derivatives and analogs of heparin are being pursued in the context of anti-metastasis and anti-inflammatoty therapy as well.

The extraordinary range of activity of heparin and its near cousin heparan sulfate arises from their ability to bind an astonishing array of proteins. Beyond this understanding, structure-property relations for these and other GAGs are at a stage reminiscent of protein chemistry 50 years ago. Two unusual features of GAGs confound the approaches of classical biochemistry: not made on a template, they exhibit enormous intrachain and interchain heterogeneity; consequently, sequencing – even if possible – would be meaningless, as are conventional purity. Secondly, GAGs probably have no secondary and tertiary structure. In this regard, they resemble many synthetic polyelectrolytes. Nevertheless, the role of electrostatics are commonly considered irrelevant with regard to specific interactions. For this reason, poluelectrolyte scientists – working in conjunction with biochemists and glycobiologists – should make contributions as essential those to the biophysics of DNA.

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