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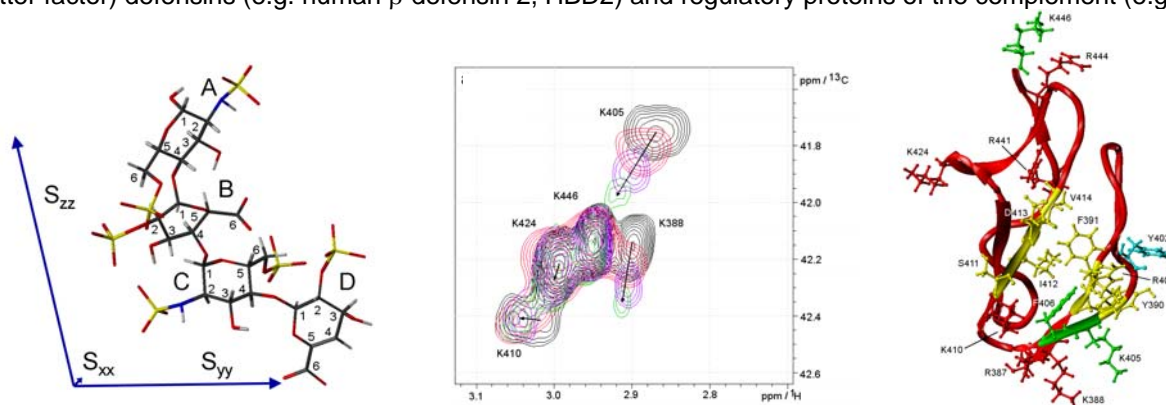
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Research Interests: NMR spectroscopy, molecular structure and dynamics, protein-carbohydrate complexes, pulse sequence development



High-resolution NMR spectroscopy is a powerful technique widely used in many branches of chemistry, biology and medicine. NMR spectroscopy provides information about the structure and dynamics of small organic molecules, oligo- and polysaccharides, proteins, DNAs and biomolecular complexes. My research focuses on the application of NMR to interesting biological problems as well as on the development of new techniques of NMR spectroscopy.

Protein-carbohydrate interactions. The class of carbohydrates we are interested in are glycosaminoglycans (GAGs) such as heparin, heparan sulfate, dermatan sulfate and chondroitin sulfate. We study their conformation using scalar and residual dipolar coupling constants and their interaction with proteins such as growth factors (e.g. hepatocyte growth factor/scatter factor) defensins (e.g. human β -defensin 2, HBD2) and regulatory proteins of the complement (e.g. factor H).



Structure determination of glycosaminoglycans. Glycosaminoglycans are complex, heterogeneous polysaccharides that represent a considerable challenge for NMR structure determination. In collaboration with GlycoMar, an Oban based biotechnology company, we study the structure of marine GAGs with potential anti-inflammatory applications.

NMR methodology. We are developing new approaches for studies of protein-GAG complexes, conformational analysis of carbohydrates and NMR methods for analysis of complex mixtures and heterogeneous polysaccharides such as GAGs. Our NMR facility is superbly equipped; we have two cryoprobes operating at 600 and 800 MHz.

SELECTED RECENT PUBLICATIONS

1. Blaum, B.S., Deakin, J.A., Johansson, C.M., Herbert, A.P., Barlow, P.N., Lyon, M., Uhrín, D., Lysine and arginine side-chains in glycosaminoglycan-protein complexes investigated by NMR, cross-linking and mass spectrometry. A case study of the Factor H : heparin interaction. *J. Am. Chem. Soc.* **132**, 6374-6381 (2010).
2. Serfiotis-Mitsa, D., Herbert, A.P., Roberts, G.A., Soares, D.C., White, J.H., Blakely G.W., Uhrín, D., Dryden, D.T. The structure of the Klca and ArdB proteins reveals a novel fold and antirestriction activity against Type I DNA restriction systems in vivo but not in vitro. *Nucleic Acids Res.* 2010 **38**, 1723-37 (2010).
3. Uhrín, D., Recent Developments in Liquid-State INADEQUATE Studies, In Ed. Webb, A., Annual Reports on NMR Spectroscopy, Volume 70, Elsevier 2010, pp. 2-34.
4. Jin, L., Hricovíni, M., Deakin, J. A., Lyon, M., Uhrín, D. Residual dipolar coupling investigation of a heparin tetrasaccharide confirms the limited effect of flexibility of the iduronic acid on the molecular shape of heparin. *Glycobiology.* **11**, 1185-1196 (2009).