Chiral selection in metabolism studied by NMR of anisotropic media

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L-amino acids are used almost exclusively in ribosomal protein synthesis; this is a well-known example of the 'chiral bias' of living systems. The reason for this is the 'three-point attachment' phenomenon that is expressed in enzymes (*e.g.*, Kuchel & Ralston, 1998). A subtle situation involving chirality exists in human red blood cells (RBCs) whereby L-lactate is produced *via* glycolysis using NAD/NADH as the redox pair, and D-lactate is produced via the glyoxalase pathway using the reductant glutathione (Rae *et al.*, 1990).

NMR spectra of racemic mixtures of many solutes can be resolved if they are constituted in chiral media, and more structural information can be obtained if the medium is aligned with the magnetic filed of the NMR spectrometer as well (Emsley, 1996). Gelatin, which is chiral, can be set inside a silicone-rubber tube (Kuchel *et al.*, 2006; Naumann *et al.*, 2007) and variably stretched. Thus we can elicit, in NMR spectra, a range of residual dipolar splittings of spin = ½ nuclides, and residual quadrupolar splittings of spin > ½ nuclides. RBCs set and stretched in the device can be studied with respect to transmembrane exchange and metabolism of chiral solutes. D- and L-lactate give clearly resolved spectra; hence the simultaneous measurement of parallel fluxes in glycolysis and the glyoxalase pathway has been made possible.

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