

What is NMR and What Can It Do For Me?

Nuclear Magnetic Resonance (NMR) is a technique for determining the structure of organic molecules and biomolecules in solution. Both the covalent structure (what atoms are bonded to what) and the conformation (secondary and tertiary structure) are available by techniques that measure direct distances (between hydrogens) and bond dihedral angles. Specific NMR signals can be identified and assigned to each hydrogen (and/or carbon, nitrogen) in the molecule.

NMR takes advantage of the magnetic properties of the nucleus to sense the proximity of electronegative atoms, double bonds, and nearby magnetic nuclei in the structure. About one-half of a micromole of a pure molecule in 0.5 mL of solvent is required for the non-destructive test. Precise structural information down to each atom and bond in the molecule can be obtained, information rivaled only by X-ray crystallography. Because the measurement can be made in aqueous solution, we can also study the effects of temperature, pH and interactions with ligands and other biomolecules. Expression with uniform labeling (^{13}C , ^{15}N) permits the study of large proteins and nucleic acids (up to 30 kD).