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ANSTO's National Deuteration Facility: facility overview, diversity of capabilities, user program and impact.

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Molecular deuteration of organic compounds and biomolecules significantly increases options available in characterisation and complex structure function investigations using neutron scattering and reflectometry, nuclear magnetic resonance (NMR), mass spectrometry (MS) and other techniques by providing contrast and improved data resolution and creates functional materials with superior properties in life sciences, pharmaceutical and advanced technology applications.

The National Deuteration Facility (NDF) at the Australian Nuclear Science and Technology Organisation (ANSTO), the only facility of its type in the Southern Hemisphere, provides a broad range of deuterated molecules for research and industry through both chemical and *in vivo* biological deuteration techniques. Deuterated organic molecules produced using tailored deuteration approaches provides bespoke deuterated molecules generally unavailable commercially. These include a range of lipids, unsaturated phospholipids (e.g. POPC and DOPC), heterocyclics, aromatics, surfactants, ionic liquids, saturated and unsaturated fatty acids, sugars and detergents. Isotopically labelled proteins (variably deuterated, multiply-labelled - ^2H , ^{13}C , ^{15}N) and cholesterol-*d*45 are produced through bacterial recombinant expression and bio-engineered yeast growth respectively.

An overview and update on the NDF will be provided including details on the NDF User Program and modes of access, capabilities and selected examples of research impact.

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