Scientists make water-free liquid from blood protein

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By using a chemical procedure in which surfactant molecules, a form of wetting agent, are attached to the protein surface, the researchers remove the water by freeze-drying at low temperature to produce a solid powder. When warmed to room temperature, the powder melts to produce a viscous liquid that contains a very high concentration of myoglobin molecules, while the protein structure remains unchanged even though no water is present.

The experiments, carried out by Professor Stephen Mann, Dr Adam Perriman and Alex Brogan and colleagues in the School of Chemistry at the University of Bristol, and reported in the prestigious journal *Nature Chemistry*, found that the ability of the liquid protein to reversibly bind oxygen remains unchanged, which means that the potency of the oxygen molecules can be varied in response to the pressure applied.

The resulting liquid is a simplified form of "artificial blood" that might be used as a smart solvent-less fluid of highly concentrated protein for oxygen storage and delivery. For example, it might find uses in medical dressings and barrier films applied to wounds.

"To make a liquid myoglobin without adding water or any other solvent is really exciting, to find that the protein is still active in binding oxygen was astounding", said Professor Mann.

The findings represent a significant scientific breakthrough given that it has been previously thought that the structure and properties of proteins require water molecules to operate correctly. The discovery of a water-less liquid protein with high chemical potency could therefore lead to a re-evaluation of the importance of water molecules in protein folding in general.

More information: 'Reversible dioxygen binding in solvent-free liquid myoglobin', published in Nature Chemistry online on 6 June 2010. www.nature.com/nchem/index.html

Provided by University of Bristol