How proteins evolved the capacity for movement within cells

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The process behind how the molecular components of living organisms start to move has been explained for the first time in new research published by *Science* and it is an intricate set of dance steps where the tempo is set by temperature.

Led Dr Józef Lewandowski, of the University of Warwick's Department of Chemistry, the collaborative group of researchers used a method called Magic Angle Spinning Solid-State NMR Spectroscopy to determine the order in which the components of a protein, called Protein G and commonly found in Streptococcal bacteria, acquired the motion necessary for it function.

The researchers argue that this new understanding could potentially play a role in developing cures for diseases and producing new useful compounds from antibiotics to pesticides.

"In order to carry out their functions, proteins need to move and they bustle constantly inside a cell" explained Dr Lewandowski. "In addition, groups of atoms that make proteins have individual patterns of motion, making the entire protein a system of ceaseless complex movement.

"With this new research we have been able to determine the hierarchy for the complex network of motions of proteins. This provides us with a key for understanding these biological molecular machines and how they function".

Dr Lewandowski explains:

"Proteins are in essence tiny machines that perform different jobs in living organisms. These machines require that their parts move in a specific way to accomplish specific tasks, like for example, a drum of a washing machine needs to be able to rotate with a specific speed to wash the clothes properly.

"If the moving parts of proteins do not acquire the appropriate patterns of motions they may either not be able to do what they supposed to or do it incorrectly".

The collaborative group of researchers, who included Prof. L. Emsley, of EPFL, Lausanne, Switzerland, Dr M. Blackledge, of IBS, Grenoble, France, and Dr M. Halse, of University of York, UK argue that by understanding the order in which motion occurs it is possible to understand what has to happen at a molecular level for a living organism to function.

Whilst the work focused on Protein G, Dr Lewandowski argues that the research potentially provides a universal model that can be applied to the analogous component parts of all organisms.

More information: "Direct observation of hierarchical protein dynamics." *Science* 01 May 2015. 348(6234): 578-581. DOI: 10.1126/science.aaa6111

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