

Unfolding 'nature's origami'

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Sometimes known as "nature's origami", the way that proteins fold is vital to ensuring they function correctly. But researchers at the University of Leeds have discovered this is a 'hit and miss' process, with proteins potentially folding wrongly many times before they form the correct structure for their intended purpose.

The body's proteins carry out numerous functions and play a crucial role in the growth, repair and workings of cells. Sheena Radford, Professor of Structural Molecular Biology at the University of Leeds, says:

"There's a fine balance between a protein folding into the correct shape so that it can carry out its job efficiently and it folding incorrectly, which can lead to disease. Just one wrong step can tip that balance."

Proteins are made of amino acids arranged in a linear chain and the sequence of these amino acids is determined by the gene producing them. How these chains of amino acids are preprogrammed to fold into their correct protein structure is one of the mysteries of life.

The culmination of many years' work, the collaborative study looked at the Im7 protein, a simple protein which is present in bacteria and has a crucial role to play in ensuring that bacteria do not kill themselves with the toxins they produce.

"Im7 is like an anti-suicide agent," says Professor Radford. "We studied it partly because of its simplicity and partly because of the known evolutionary pressure on the protein to fold correctly to enable the bacteria to survive."

The study has revealed that these proteins misfold en route to their intended structure, and importantly, has shown the forces at work during the folding process. While the chain of amino acids determines which shape a protein needs to take, the researchers discovered that it was the very amino acids central to the protein's function that were causing the misfolding.

"This breakthrough could have huge implications for understanding the evolution of today's protein sequences and in determining the balance between health and disease," says Professor Radford. "It's fundamental science, but significant for our understanding of the mechanisms at work in the human body."

Source: University of Leeds

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