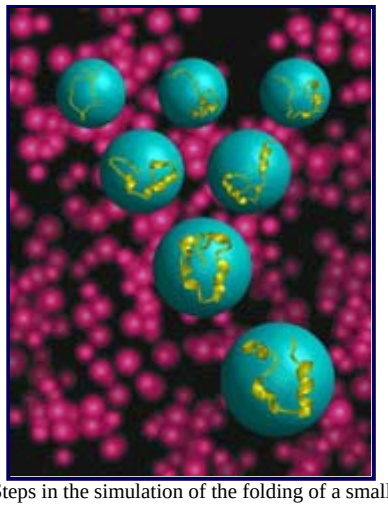
THIS WEEK ON SCIENCE FRIDAY...

Hour Two: Protein Folding

The problem of predicting the three-dimensional structure of proteins is a knotty one. Protein shape is extremely important - it determines to a large extent the function of the molecule, and how it interacts with other molecules in biological systems. It's very difficult to predict protein structure, however. A protein may have dozens, even hundreds of amino acids along its length. Each one attracts or repels parts of other acids, and kinks and folds into shapes that are extremely difficult to predict.

Two basic units that proteins fold into are called the alpha-helix (a spiral shape) and the beta-sheet (a planar structure in which strands of amino acids parallel each other.) Those basic structures can be modified in many ways, however, or combined with each other in increasingly complex arrangements.

This week in the Journal Science, Y. Duan and P.A. Kollman at U.C. San Francisco report on efforts to model the folding of proteins on computers. After two months of computing time on a Cray T3E supercomputer, the group reports a reasonable simulation of how one small protein, only 36 amino acids long, folds in real life. The motion that took two months to simulate takes one microsecond in reality.



Steps in the simulation of the folding of a small protein. Image courtesy Y. Duan and P. Kollman, UCSF.

Other groups are tackling the problem from a more physical side. Lynne Regan and colleagues at Yale have been working on taking the knowledge that can be gained from computer simulations and trying it out in the test tube. They have been studying how subtle changes in the amino acid contents of molecules can affect its final conformation. Those changes can be very important - a genetic mutation can easily change one amino acid into another - and if those changes shift the end shape of the molecule significantly, they can lead to disease. Researchers suspect shifts in protein shape in both Alzheimer's and in Creutzfeldt-Jakob disease. On this hour of Science Friday, we'll look at what we know now - and at what that knowledge might do for us in the future.

Listen to this program in RealAudio!

Guests:

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Books/Articles Discussed:

"Pathways to a protein folding intermediate observed in a a 1-microsecond simulation in aqueous solution." Yong Duan and Peter A. Kollman. Science, 23 October 1998, p. 740.

Check out Nature Structural Biology as well!

Related Links:
IMB Jena Image Library of Biological Macromolecules
Prions, Proteins, and Creutzfeld-Jakob Disease
Alzheimer's Association

This segment produced by:
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