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Peptide plus salt makes membrane

Elizabeth A. Thomson, News Office
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In work that could lead to a model of the beta-amyloid plaque linked to Alzheimer's disease, novel drug-delivery systems, and more, MIT scientists have discovered an oligopeptide, or very small part of a protein, that spontaneously assembles into a stable membrane when exposed to salt.

"This [oligopeptide] represents a new class of materials," said Alexander Rich, William Thompson Sedgwick Professor of Biophysics in the Department of Biology. The discovery was made in Dr. Rich's laboratory.

Key to the assembly of the membrane is a special property of the oligopeptide: it is self complementary, meaning the side chains of individual oligopeptides can link together.

"It is the first self-complementary oligopeptide found in nature," said Dr. Shuguang Zhang, the postdoctoral fellow in Professor Rich's lab who discovered this property after isolating a yeast protein in which the oligopeptide was found.

The discovery, which was serendipitous, "is a good example of how basic research can open up new avenues of research that you wouldn't have expected," Professor Rich said.

Dr. Zhang and Professor Rich are two of the authors of a paper on the work published in the April 15, 1993, issue of the Proceedings of the National Academy of Sciences. The other authors are Todd C. Holmes, a graduate student in the Department of Brain and Cognitive Sciences, and Curtis A. Lockshin, a graduate student in the Department of Chemistry.

The membrane that the oligopeptide forms could lead to a variety of applications. For example the structure of the oligopeptide (named EAK16) is the same as that of the protein that makes up the beta-amyloid plaque characteristic of Alzheimer's and other diseases.

As a result, the EAK16 membrane could be used as a model to study the structural properties of the insoluble proteins found in these plaques. Drugs that inhibit the development of the EAK16 membrane might be useful for the treatment of diseases characterized by insoluble proteins.

In addition, because the membrane is stable in acidic environments, can't be easily degraded by digestive enzymes, and appears to be harmless to cells, it could be used to coat a pill that would make its way through the stomach and slowly release its medicine only in the intestine.

The discovery also has implications for research on the origin of life. "Our observation of a macroscopic membrane spontaneously assembled from EAK16 is consistent with the

hypothesis that such simple molecules may form larger and more complex structures, which may have been important in the origin of life," the scientists wrote in the PNAS article.

The work was supported by grants from the National Institutes of Health, the National Science Foundation, the National Aeronautics and Space Administration, the Office of Naval Research, and the American Cancer Society.

MIT has filed a patent application on the discovery.

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