BIOMEDICINE

Liposomes versus cancer

If a drug is incorporated into liposomes (membrane packages of water) before it is injected into a subject, it is more likely to be accepted into the subject's cells. Thus, liposomes have emerged during the past several years as a promising new means of increasing drugs' effectiveness (SN: 3/29/75, p. 21; 7/22/78, p. 60; 2/18/78, p. 104). Now an injection of an immune activator within liposomes appears to be superior to an injection of the activator alone in treating metastatic cancer, according to a report in the June 27 SCIENCE by Isaiah J. Fidler of the Frederick Cancer Research Center in Frederick, Md.

Metastasis (the spreading of cancer) is responsible for most failures in cancer treatment. But if immune cells known as macrophages are first stimulated with a body chemical called macrophage-activating factor and then are injected into animals with metastatic cancer, the macrophages counter the metastasis. However, the transfusion of a large number of macrophages is not a practical means of treating metastasis in humans.

Fidler and his colleagues found in experiments with mice that although macrophage-activating factor can prime macrophages against metastasis in tissue culture, the factor is even more efficient at this task if it is first encapsulated within liposomes. The results also showed that whereas 73 percent of mice injected with the factor encapsulated within liposomes became free of their metastases, only 10 percent of mice treated with liposomes containing control material were. These experiments, he concludes, suggest that injection of the factor within liposomes "may provide a valuable addition to the more conventional approaches to the eradication of cancer metastases."

Intestinal gas: Explosion in research?

Intestinal gas — still a source of acute embarrassment in contemporary society — is beginning to receive more attention from medical researchers, Michael D. Levitt, a Minneapolis Veterans Administration Medical Center physician, writes in the June 26 NEW ENGLAND JOURNAL OF MEDICINE.

For instance, investigators have already determined that three gases produced in copious amounts in the human gut — hydrogen, methane and carbon dioxide — are not the gaseous products guilty of giving intestinal gas its offensive aroma and unsavory reputation. (Researchers have yet to determine, however, what those malodoriferous offenders are.) Scientists have also found that the reason beans produce especially offensive intestinal gas is that they contain raffinose, stachyose and other indigestible sugars, and attempts are now being made to breed an edible bean lacking those sugars.

In fact, as research into intestinal gas progresses, Levitt predicts, it may become a new subspecialty of medicine, perhaps going by the name of "flatology" or something equally respectable.

More insights into Lyme disease

Since Lyme disease, the United States' first known form of infectious arthritis, was discovered in 1976, medical researchers have been studying it with interest. And now still more information about the disease is reported in the July ANNALS OF INTERNAL MEDICINE by Allen C. Steere and his colleagues at Yale University School of Medicine: Penicillin therapy shortens the first signs of the disease and may also prevent or attenuate subsequent arthritis caused by it, and whereas the cardiac abnormalities of Lyme disease are similar to those of acute rheumatic fever, there are some differences. For instance, complete heart block may be more common in Lyme disease.

PHYSICAL SCIENCES

Gravity very precisely

Experimental physics in the modern sense started out with investigations of the force of gravity. Such observations not only continue from time to time 300 years after Newton, they are currently enjoying an increase in interest. This is attested in the June 23 PHYSICAL REVIEW LETTERS by R. Spero, J. K. Hoskins, R. Newman, J. Pellam and J. Schultz of the University of California at Irvine, who report an experiment accurate to a part in a hundred thousand.

Over the last three centuries interest in such experiments has been sustained by the question whether the force is inversely proportional to precisely the square of the distance (this is Newton's law, but it has always seemed just a little too neat). Or is the exponent some fraction near two, which would be messy but might seem more empirical? Interest is now increased by the modern unified field theories and others that either predict a different force of gravity or predict other kinds of forces that might contribute part of the total force between two bodies a few centimeters apart.

The experiment was done in the classical manner with a torsion balance. A metal rod was suspended by a tungsten wire at its middle. From one end of the rod hung a 20-gram test mass; the other end was counterweighted. The test mass hung inside a stainless steel cylinder weighing 10.44 kilograms. The force between the test mass and the cylinder was measured by the torsion in the tungsten suspension as the cylinder was moved small distances on a track.

This experiment was inspired by one done by D. R. Long, who reported an anomaly (SN: 4/17/76, p. 244). Spero and colleagues write: " ... with sensitivity greater than Long's we find no anomaly."

New superlattices: Dissimilar metals

Producing laboratory-made solids, combinations of substances that nature never made, is something of a growth industry nowadays. These superlattices often have physical properties that are useful in technology but are not found in natural materials.

These substances are produced by sequentially depositing extremely thin layers of the natural substances they are made of and trying to get the layers to bind themselves into a superlattice. An example of a semiconductor superlattice is gallium arsenide and aluminum arsenide.

That example illustrates the usual way of trying to make superlattices, writes Ivan K. Schuller of Argonne National Laboratory in the June 16 PHYSICAL REVIEW LETTERS. They are similar materials, with the same crystal structure, and quite similar crystal dimension. When you lay down alternate layers of them, they go together with a high degree of epitaxy — that is, each succeeding layer grows according to the orientation set by the one below.

Schuller reports that, contrary to the usual opinion, he has been able to make superlattices or as he calls them "layered ultrathin coherent structures" out of metals with dissimilar crystal types and fairly different crystal dimensions. He cites the example of niobium, a body centered cubic crystal, and copper, a face centered cubic. They were layered together in layers a few tens of angstroms thick. The resulting samples were examined by a number of standard crystallographic techniques and the data evaluated according to mathematical models of superlattice structure. Schuller claims the results show that the layers grow epitaxially on one another and the structure has long-range coherence. This particular example happens to be superconducting, and Schuller says, "...for the first time a superconducting LUCS has been manufactured."