# Biomedicine

*Joanne Silberner reports from Dallas at the American Heart Association Scientific Sessions*

## Herpes and cholesterol buildup

There may be a viral spark to hardening of the arteries in humans, according to David P. Hajjar and Alan J. Grant of Cornell University Medical College in New York City. The researchers infected smooth-muscle cells, one of the cholesterol-laden cell types found in atherosclerotic plaque, with herpes simplex virus type I, most commonly associated with cold sores. The infected cells accumulated a significant amount of cholesterol and produced less of a chemical involved in cholesterol breakdown.

While the results implicate herpesvirus, Hajjar emphasizes that "it's one factor amongst many. I'm not saying that if you have a herpesvirus infection or cold sores due to herpes simplex virus type 1 that you're more susceptible to atherosclerosis." Given that most people are infected with the virus and not all people develop severe atherosclerosis, much remains to be learned about the connection.

There are several theories concerning the cause of atherosclerosis, including one holding that individual plaques arise from unrestrained reproduction of single cells (SN: 11/15/86, p.310). The herpesvirus connection could fit into this monoclonal hypothesis as a trigger for cell proliferation, Hajjar says.

## Salt-sensitive genes

There is currently no simple test for people with high blood pressure that would determine whether they can lower their blood pressure with a strict low-salt diet. Since such a diet would help only about half of them, convincing patients to cut their salt intake is a difficult task for doctors.

However, salt sensitivity can be determined by infusing subjects with high levels of saline and watching what happens, and researchers have used this method to correlate the condition with high levels of a blood protein. The protein may prove to be an easily measured marker, they say.

Judy Z. Miller and her colleagues at the Indiana University School of Medicine in Indianapolis used saline infusion in their study of 570 people, 192 of whom had high blood pressure. They measured various blood proteins, including one called haptoglobin that comes in two possible forms. They found that people who had all haptoglobin-1, meaning they had inherited a haptoglobin-1 gene from each parent, were 2.5 times as likely to be salt sensitive as people with the other type, haptoglobin-2. People with half haptoglobin-1 and half haptoglobin-2 fell in the middle.

What role, if any, haptoglobin-1 plays in hypertension remains to be determined. Both forms of the protein bind to hemoglobin, saving it from destruction by the kidneys. Since the kidneys play a key role in blood pressure maintenance, the proteins may exert an effect there. Or, it could be that their genes just happen to be near a gene that is directly involved.

## Another female/male difference

The amount of blood flow to the hand is greater in men than in women, and the nerves controlling the flow are under tighter control in women, Mayo Clinic researchers in Rochester, Minn., have found. They were comparing blood flow in normal individuals in preparation for a study of people with Raynaud's disease, a benign condition marked by periods of low blood flow to the hands. Raynaud's disease is much more frequent in women than in men.

John P. Cooke and his colleagues measured hand blood flow, corrected for size differences and found that men had higher blood-flow levels. But after mental arithmetic or deep breathing to relax the automatic system that controls blood flow, the levels in women surpassed those in men. A naturally tighter control of the system could be related to the higher incidence of Raynaud's disease in women, Cooke suggests.

# Physics

## Atoms of the mesocosm

Mesoscopic physics is the study of a strange new world intermediate in size between the microscopic realm of atoms and molecules and the macroscopic realm of ordinary visible and touchable objects. It is suddenly popular now that fabrication techniques allow the manufacture of objects that behave according to the laws of quantum mechanics although they are much larger than the atoms and molecules to which such behavior has previously been confined.

One such possibility is the superatom, a structure made of semiconductor materials that behaves as if it were a giant atom. Recently the Japanese physicist N. Watanabe suggested that it should be possible to make such a thing, and now Takeshi Inoshita, Shuhei Ohnishi and Atsushi Oshiyama of the NEC Corporation in Kawasaki, Japan, have calculated the electronic structure of a superatom. Reporting this work in the Nov. 17 PHYSICAL REVIEW LETTERS, they stress the importance of such objects for both pure physics and technology.

A superatom would be a semiconductor heterostructure — that is, a spherical arrangement of two kinds of semiconductor materials, a core containing a large number of electron donors (atoms from which electrons are easily detached) surrounded by a "matrix" made of a material that has a high affinity for electrons. Under the proper conditions, the donors in the core would all be ionized, and the detached electrons would reside in the matrix, where they would form an orbiting cloud bound to the core by its electric attraction, just as the electrons of an actual atom are bound to its nucleus. Of a number of possible combinations of materials, Inoshita, Ohnishi and Oshiyama chose to calculate the structure of one where the core would be an alloy of aluminum, gallium and arsenic ($Al_{0.35}Ga_{0.65}As$) and the matrix gallium arsenide.

Using the Schrödinger equation, which describes the structures of actual atoms, they found that the electron orbits do arrange themselves into a hierarchy of quantized energy levels, although in a configuration somewhat different from that of an actual atom. The structure is well enough bounded so that one can define a "superatomic radius," in this case 355 angstroms, or hundreds of times that of an actual atom. The ground-state or lowest-energy configuration is stable at around 1°K.

All this means that superatoms should exist, and it should be possible to make "molecules," "crystals" and even "metals" out of them. These constructions should be useful for studies of collective behavior of electrons in solids, and they might have unusual magnetic properties.

## Pulsar's companion: A question of age

Binary pulsars, systems in which pulsars orbit around companion stars, permit astrophysicists to gain important information about the nature and evolution of pulsars, which are believed to be neutron stars. In the Nov. 13 NATURE, Gregory A. Wright and Edwin D. Loh of Princeton (N.J.) University report that they have found the companion of the binary pulsar PSR1855+09, one of the "millisecond pulsars" with a pulse period of 5.3621004525 milliseconds.

The companion is a white dwarf star with a temperature of 5,900°K. That temperature implies that the pulsar is more than 2 billion years old. However, according to the "naive" theory, the pulsar's magnetic field, which powers its pulsations, should have decayed away to nothing after about 10 million years, and this pulsar ought no longer to be active.

A possible way out is a suggestion of Shrinivas R. Kulkarni of Caltech in Pasadena that pulsar fields have two components, one that decays and one that remains constant. The field of this pulsar is 340 million gauss, and that, Wright and Loh remark, could be a measure of the strength of the constant component of pulsar fields.