

## Androgens: To the heart of the matter

Researchers have long been struggling to explain why severe coronary artery atherosclerosis and myocardial infarction occur more frequently in Caucasian men, while angina pectoris afflicts more Caucasian women.

In the midst of this struggle to account for the sex differences in heart disease, the female sex hormone estrogen arose as a likely protector against arteriosclerotic disease. Apparently, researchers had noticed that the incidence of heart disease was greater in post-menopausal women—in whom the ovaries have lost their ability to synthesize estrogen—than in premenopausal women. Also, receptors, or targets, for estrogen had been discovered in the cells of the atrium of the heart. But surprisingly, administration of estrogen to men who had experienced one myocardial infarct increased the incidence of mortality. Furthermore, oral contraceptives, which have estrogenic activity, increase the risk of myocardial infarction in women.

Now, the latest stunner in heart disease research is the discovery of receptors for androgen, or male hormone, in the hearts of female rhesus monkeys and baboons, a discovery suggesting that androgens also may affect cardiac function. "It's a shock," says Peter Sheridan, who, with colleagues at the University of Texas Health Science

Center in San Antonio, demonstrated the presence of cardiac androgen receptors. "I've gotten calls from people around the country that are shocked that there are androgen receptors in the heart."

Sheridan and co-workers, whose techniques are described in the Feb. 15 *SCIENCE*, used autoradiographic and biochemical analyses of the monkey and baboon hearts to indicate the presence of androgen receptors in both atrial and ventricular cells. In one experiment, the scientists first removed the ovaries and right adrenal gland from each animal to remove all endogenous sources of androgen. Then the researchers injected the animals with the androgen testosterone, which they had radioactively labeled. Sheridan and colleagues then took tissue samples from the animals. The autoradiographs of the heart muscle from the animals showed "intense concentration of radioactivity" in the atrial and ventricular myocardial cells, indicating the presence of hormone receptor molecules in these cells.

Receptor molecules play an important role in the activity of hormones. The complex formed by the receptor and hormone controls protein synthesis in the cell of the receptor, by acting on the cell's genetic material. Thus far, it is not known which proteins are synthesized because of the presence of androgen-receptor complexes in the heart cells. "It's a whole new area opening up and we're just getting into it," Sheridan explains. "Hopefully, we've stimulated interest and people will begin looking for the specific proteins." □

## Spheromak: How to unwrap a doughnut

A tokamak is a magnetic device that confines a plasma or ionized gas in the shape of a toroid (doughnut) in the hope that it can be heated to the point where a large number of thermonuclear fusions occur among the atomic nuclei in the plasma and power can be gotten out. Many scientists and engineers think that the toroidal shape is ideal for a number of reasons, but the great drawback of the tokamak is that it is surrounded by magnet coils running in two directions (called poloidal or toroidal according to the direction of the magnetic field they generate).

These coils inhibit both science and engineering. People seeking ways to remove those coils and yet maintain the toroidal shape of the plasma came up with the concept called "spheromak." Now the formation of the first spheromak plasma is reported in the Feb. 11 *PHYSICAL REVIEW LETTERS* by G. C. Goldenbaum, J. H. Irby, Y. P. Chong and G. W. Hart of the University of Maryland.

The spheromak idea came down, quite literally, from the sky. It was noticed that toroidal plasmas existed in astrophysical bodies and that they maintained themselves without recourse to outside electric

currents to generate their magnetic fields. On earth this translated especially into a desire to get rid of the coils that produce the "toroidal" field, the field lines that loop around in the length of the toroid. These coils loop through the hole in the toroid, and logistically they are the most annoying. These coils are often alleged as the reason why tokamaks are impractical as power reactors.

The Maryland group did it by starting with a cylindrical deuterium gas column with a radius of 11.4 centimeters and a pressure of 15 thousandths of an atmosphere. A coil makes a magnetic field (up to 4 kilogauss) in the direction of the cylinder axis. Discharging capacitors connected to a pair of electrodes form an annular shell of plasma parallel to the wall of the vacuum chamber that contains the gas. Sudden sharp pulsing of the axial field pinches the middle of the annulus. The annulus comes away from the electrodes and forms a torus with interior toroidal fields apparently produced by currents in the plasma itself. These toroids last about 30 microseconds. The next step is to study longer-term stability and behavior. That will require installing circuitry to make the axial fields last longer. □

## Drug-resistant schizophrenia?

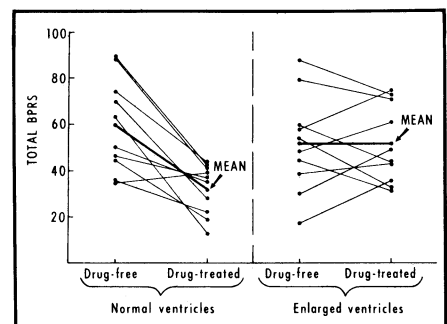
As psychiatric diagnoses grow more sophisticated, it becomes increasingly apparent that schizophrenia may represent a collection of parts from several types of emotional disturbances rather than a single "disease"; labeling some patients as schizophrenic may be equivalent to saying an accident victim with a concussion, fractured spine, broken ribs and a collapsed lung is "severely ill."

Recently, brain scans using computed tomography (CT) indicate that the cerebral ventricles, or cavities, in the brains of certain schizophrenics are abnormally enlarged (SN: 7/14/79, p. 26). Those results suggested to some researchers that at least one type of chronic schizophrenia—that associated with enlarged ventricles—may be distinct from other forms.

Now, a follow-up study strongly indicates this may be the case. National Institute of Mental Health researchers report in the January *ARCHIVES OF GENERAL PSYCHIATRY* that schizophrenics with enlarged ventricles respond more poorly than other schizophrenics to neuroleptic, or antischizophrenic, drugs. Each of the 20 chronic schizophrenic patients in the study, performed at St. Elizabeth's Hospital, was rated before and during treatment with psychiatric drugs.

Although the two patient groups rated comparably on the BPRS (Brief Psychiatric Rating Scale) before therapy, "the group with normal ventricles was significantly less symptomatic after treatment," report the scientists, headed by Daniel R. Weinberger. The results suggest that "chronic schizophrenia with ventricular enlargement may be a biologically different illness or group of illnesses," they say.

Because prolonged use of neuroleptics can trigger significant side effects (SN: 1/26/80, p. 53), Weinberger and his colleagues say "it would be clinically expedient if patients who are unlikely to derive significant benefit from such [drug] treatment could be identified in advance." He emphasizes, however, that many patients with enlarged ventricles "do benefit from drug therapy" in ways perhaps not measured by BPRS scores. □



Rating scale reflects less improvement in "ventricle" group after drug therapy.