MEDICINE

Spare Parts for Human Body

Unromantic but lifesaving mechanical hearts, freeze-dried bones, living bits of nerves and arteries, and hormone chemicals are now available for patching humans.

By JANE STAFFORD

➤ TO JOIN store teeth and wigs, standard replacements on the human body since Grandpa's day, science now adds heart, lungs, kidneys, stomach, eyes, bones, nerves and even blood and the arteries it courses through.

No one, to be sure, is running around with an artificial heart beating in his body. But mechanical hearts, unromantic as they seem, may keep the human body and brain alive until the real heart has been repaired.

The same goes for the artificial kidneys —bulky devices of glassware, tubing, pumps and control dials. They can take over temporarily the waste removal job that has become too much for the natural kidneys in some sicknesses. Once the crisis is past, the mechanical kidney is disconnected and the patient's own go back on the job.

Modern replacements for parts of the human body are not all mechanical and temporary devices. Some are living bits of tissue donated as blood is donated. The cornea, transparent structure in the front of the eyeball that gives new sight to a blinded eye, comes from another human eyeball and is a permanent replacement.

So are the slivers and larger pieces of bone and the bits of nerves and arteries used in repair jobs on the human body.

Insulin Replaces Chemical

Between the mechanical heart or kidney and the nerve or other tissue graft lies still another type of replacement to keep human bodies alive and functioning effectively. The diabetic who takes insulin is getting replacement treatment, replacement of the chemical that his own glands fail to make.

Sex gland replacement can be accomplished in the same way, by medically prescribed doses of hormone given to young men who have lost their sex glands through surgery or disease. Chemical replacement of this type is also made in some cases to cushion the changes of middle age brought on by the ending of the functioning of these glands.

Adrenal gland extract keeps patients of once always fatal Addison's disease alive by replacing the chemical the patient's sick glands have stopped making.

Even cortisone and ACTH which can restore pain-free motion to arthritic joints seem to be replacements, since their effect wears off and the patient relapses when the hormone medicines are stopped.

Replacement for blood that has been lost must be made with blood, whole red blood from the veins of another man or woman. But when blood is needed as a medicine to fight shock and tide the patient over, various other fluids can be used. These include plasma which is the fluid part of blood, a solution of a special kind of animal gelatin, a sugary chemical called dextran, and a synthetic chemical called polyvinyl pyrrolidine or PVP for short.

Success in making many of these replacements which are rapidly becoming standard depends in large part on being able to keep the replacements. Whole blood can be kept for 21 days in a refrigerator. After that chemical changes rapidly break down the vital red blood cells, though the plasma and its valuable constituents can be salvaged for some uses.

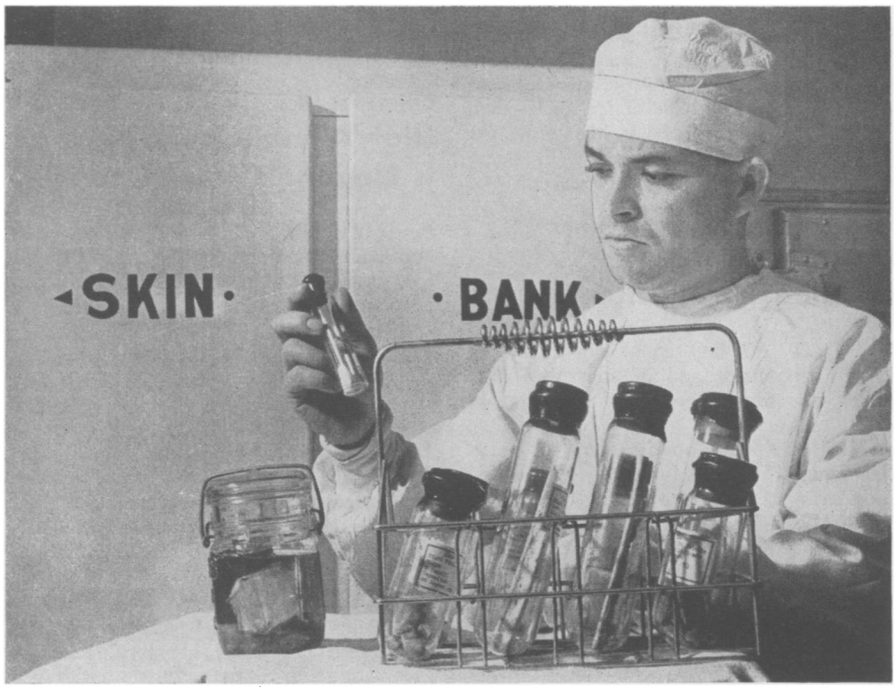
But to keep the transparent cornea of a human eye or a bit of nerve or skin or bone alive and germ-free so that it can be put into another body ready to take up life and function in its new location requires many special techniques. And when you want to ship the live replacement half way round the world, for use in a wounded soldier, sailor or Marine, the problem is even more complicated.

Scientists at the National Naval Medical Center in Bethesda, Md., have solved the problem for bone replacements. They now have a mobile bone bank. Bones in bone banks of the past have been made of frozen bones which had to be kept frozen until the surgeon was ready to use them. The Navy scientists found that bones could be preserved by the freeze-drying methods used for preserving blood plasma. In this state they can be packed in a light, small cardboard carton and shipped without refrigeration. Besides this weight and space-saving advantage, the freeze-dried bone keeps longer than frozen bank bone.

Bones preserved by this method are not live bone. But when grafted they act as a strut or trellis until the body can form its own bone.

Experiments with freeze-drying for preserving arteries at room temperatures are also underway.

A new method of storing skin for grafting has also been developed by the Navy scientists with cooperation from scientists at



SKIN BANK—Specially preserved skin is kept in jars in the refrigerated skin bank at the Naval Medical Center, Bethesda, Md. The pieces of bone in the tubes in the rack and the bit of artery in the tube the man is holding are freeze-dried and can be kept at room temperature.

the U. S. National Institutes of Health. The old method was to store it in pliofilm. With the new method it is stored in a liquid made of balanced amounts of salt and blood plasma with penicillin and streptomycin added to prevent growth of germs. This will keep at icebox temperatures for as long as 187 days. Pliofilm-stored skin kept at icebox temperatures only 21 to 28 days.

Latest advance reported in human tissue bankkeeping applies a cathode ray food sterilization method to sterilization of arteries for grafting. If the tissue is frozen it will not be damaged by the high voltage rays that kill the germs.

Though you may walk on freeze-dried shin bone, see through the cornea of another's eye, and have your blood run through a piece of donated artery stitched to your own while a mechanical heart and lung kept you alive on the operating table, the chances of your ever thinking with a brain replacement seem very slim. Mechanical brains, so-called, have been made and are in operation in countless laboratories and offices now. But they remain purely mechanical aids, computing machines that speedily perform numerical calculations. The fragile cells and complex fluids that make up man's brain may always defy the attempts of the best human minds to duplicate or transfer them.

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RADIO

Outbursts of Solar Noise

When solar noise outburst is picked up with radio telescope, checking shows, almost without exception, that a solar flare occurred at the same time.

➤ "WHEN AN outburst of solar noise is picked up with a radio telescope, almost without exception we find upon checking back with observatories that a solar flare occurred at the same time as the radio outburst," Dr. J. P. Hagen of the Naval Research Laboratory told members of the International Scientific Radio Union and the Institute of Radio Engineers meeting at Cornell University in Ithaca, N. Y.

The Laboratory's two-foot basket-shaped reflector was used for the observations. This radio telescope trapped waves about a third of an inch long, much longer than the waves of visible light which you see or photograph, but much shorter than the radio frequency to which you are accustomed.

A radio outburst is a tremendous increase in the amount of radio radiation the sun is putting out for a short period of time, for a few minutes up to 20 minutes. The outburst Dr. Hagen reported occurred at the shortest wavelength at which such radio outbursts have been detected.

Another report on the correlation between what can be seen and what is heard with a saucer-shaped radio telescope was given by Dr. Helen W. Dodson of the McMath-Hulbert Observatory of the University of Michigan and Leif Owren of Cornell University's School of Electrical Engineering, on leave from the Institute of Theoretical Astrophysics, University of Oslo. Their work was with radio waves of greater length than those trapped at the Naval Research Laboratory.

When there is a flare on the sun and a small region on the sun's disk shows an intense brightening, the amount of solar noise picked up with the Cornell radio telescope at a frequency of 200 megacycles frequently is also greatly increased, Dr. Dodson stated.

"Not only does the outburst of solar noise occur simultaneously with the visual and photographic brightening of the flare, but the location on the sun of the source of the radio outburst agrees with the observed position of the flare," she reported.

Studying 14 periods during the past year or so when there was increased burst activity on the radio records, Dr. Dodson and Mr. Owren found that the location on the sun of the source of the radio bursts agreed well with the position of solar regions observed and photographed as active at the McMath-Hulbert Observatory.

In several cases the burst source was observed on successive days and found to move westward across the sun's disk at the usual rate of rotation, they found. Thus the active regions that even last for weeks in the neighborhood of certain spots can be heard at 200 megacycles as well as the more intense but shortlived solar flares, Dr. Dodson pointed out.

Radio telescopes today are not perfected to the point where they can pinpoint the source of 200-megacycle "noise," Dr. Dodson noted. But if the bursts or increased base level originate in small, localized areas on the sun, it is possible to establish this fact by use of the interferometer.

On the Cornell radio telescope Mr. Owren used two broadside antennas placed with their centers 51 wavelengths apart on an east-west line. This interferometer not only showed that the increased radio noise came from small regions on the sun, but also indicated the strip of the solar disk within which the radio source was located.

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