

Medical World News

*Doctors use a Swedish technique to peer into a subject's arm to view . . .
 . . . the actions of red corpuscles (right) as they move through tiny vessels.*

MICROCIRCULATION

60,000 miles of blood vessels

Where 8-micron cells squeeze through 4-micron tubes, doctors find implications for the problems of aging

Each person houses some 60,000 miles of minuscule blood vessels that do all of the body's nutritional and gas-exchange work.

Until recently, these have received little medical attention. Now many thoughtful physicians are wrestling with the problems of what happens to the blood after it leaves the well-mapped heart-pump and major arteries, journeying out to bone, skin, brain, stomach, liver and other vital tissues.

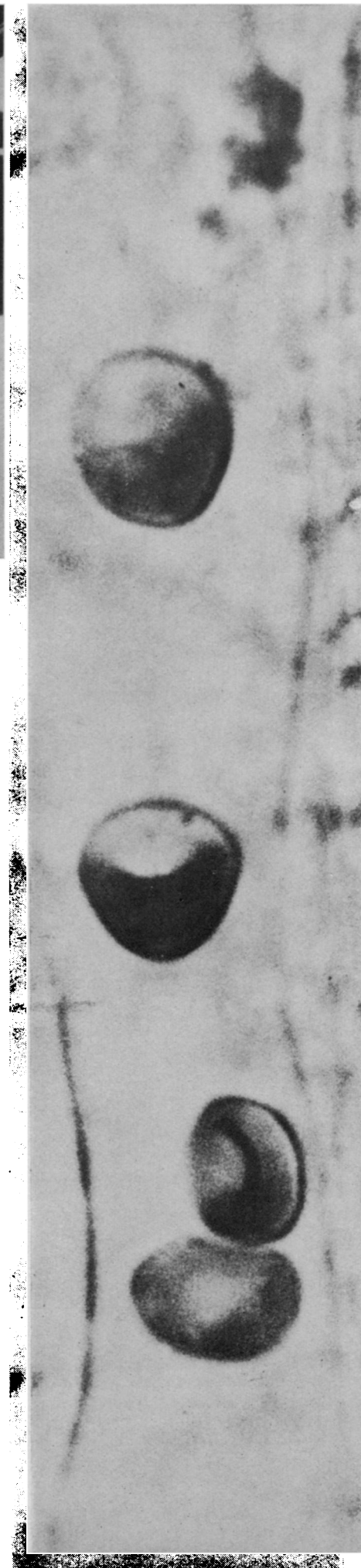
The answers, while not perhaps as dramatic as the cures sought in the national campaign against heart ailments, cancer and stroke, have immense implications, especially for all the diseases that make growing old such a painful process.

For if red blood cells cannot squeeze through the tiny capillaries in the foot of a diabetic or the ear of an aged person, he may suffer gangrene or deafness or both.

"There are people," says Harvard Medical School internist Dr. Roe Wells, "with obvious angina and coronary in-

sufficiencies in whom X-rays show no blockage or abnormality of coronary blood flow." Dr. Wells goes on to suggest that these angina patients may be suffering from blocked blood flow through the infinitesimal arteries and capillaries that finally supply heart muscle with energy in the form of sugar and oxygen.

At the University of Minnesota, physiologist William Kubicek has taken another tack. A professor of physical medicine, Dr. Kubicek knew that a drug modeled on histamine aided patients suffering from Meniere's syndrome—a loss of hearing and balance often accompanied by ringing in the ears. Dr. Kubicek thought that the trouble in the inner ears of old people might be a result of loss of blood flow to the system of pretzel-shaped inner-ear channels in which fluid sloshes to tell us where our heads are. In a report at a recent meeting of the American Academy of Ophthalmologists and Otolaryngologists in Chicago, Dr. Kubicek reported drug-induced increases in



the flow of blood through arteries in a dog's brain—arteries only one-fifth as thick as the lead of a pencil. Measuring flow in such a tiny artery takes electronic expertise; an electromagnetic collar must be put around the artery to measure its flow.

Dr. Kubicek was surprised to find that a drug called betahistine increased flow in the tiny brain arteries 60 percent. He assumes that a comparable increase in blood flow in humans explains why the drug helps Meniere's syndrome victims avoid surgery, the only previous treatment for the disease.

To understand the importance of Dr. Kubicek's finding, one must ignore the textbook descriptions of blood flow. They are fine for big vessels like the veins you see in your arm or the arteries that pulse in your temple. Flow of blood through those is controlled basically by the brain and its subordinate nervous system.

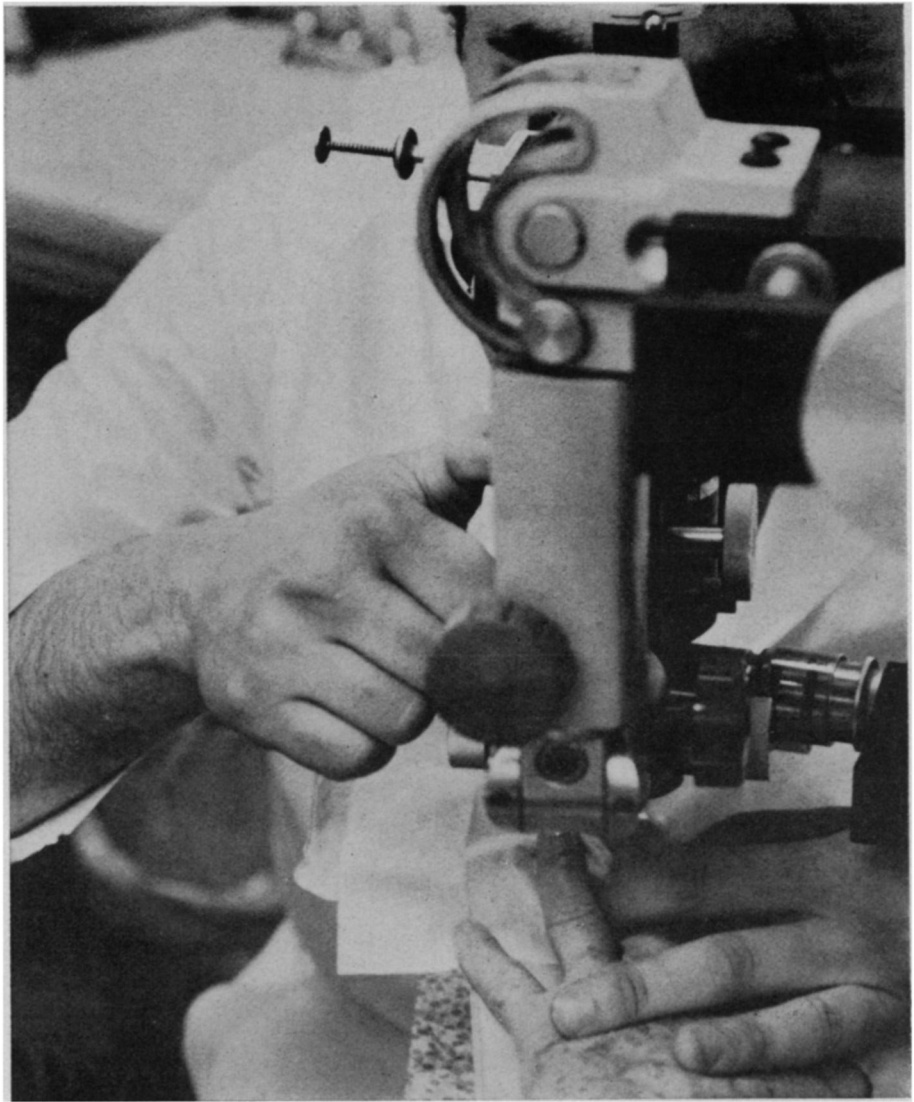
But in the microcirculation, other factors—chemical messengers—seem to be at work. The red of a sunburn, for example, doesn't come from reaction of the brain or nerves. Ultraviolet light striking the skin causes it to release a compound called histamine. That body drug causes tiny arteries and capillaries to dilate so that blood suffuses the skin—sunburn. Doctors have known of this histamine effect for many years and have used it in controlling severe allergies, runny noses, hives and similar manifestations of too much histamine production.

Dr. R. W. Schayer, formerly with Merck & Co., now with the National Institutes of Health in Bethesda, Md., has discovered in a 10-year research effort that the cortisone family of hormones opposes histamine—they cut down the blood flow to the tissues and hence produce the waterlogged symptoms so often seen in arthritis and asthma patients taking those drugs.

It seems possible, and indeed some experimental work shows, that the histamine-like drug can eliminate the unwanted effects of adrenal cortex hormones while keeping their desired effects.

But what is actually happening down at the four-micron level of the capillaries? How do eight-micron red blood cells squeeze through to give up oxygen and take on carbon dioxide from living cells?

In Sweden, Dr. Per-Ingvar Brane-mark is looking right into capillaries in the arms of stalwart medical students to see what happens. Dr. Brane-mark inserts a titanium disk into a skin fold on the upper arm of his volunteers. Then he trains his microscope on the blood vessels thus exposed and watches red blood cells ooze through the tiny channel.



Al Giese/Medical World News

Circulation patterns under the fingernails can reveal presence of diabetes.

In New York, on the other hand, Dr. Walter Redisch of New York University watches similar circulation through the fingernails of his patients. He can spot the circulatory signature of diabetics, for example, even before a blood sugar test reveals the disease. Such early diagnosis of blood vessel diseases can give doctors a strong clue to what produces the kidney and eye problems of diabetics.

Harvard's Dr. Wells is most concerned about the "stickiness" of red blood cells. If one cell can barely get through the tiny capillary channel, obviously two or three stuck together have little or no chance of coming to the place where they can exchange commodities with tissue cells. Dr. Wells believes that the usual stickiness measurements made by doctors (sedimentation rates taken from venous blood) tell little about the clumping of red cells in tiny arteries and capillaries.

The kind of electromagnetic flow

detectors used by Dr. Kubicek can tell physicians much about the flow of vital red cells to tissue. When Dr. Kubicek wants to know about flow through an artery, even one no bigger than a pencil lead, he puts the collar around it and reads his instrument. He uses the same kind of technique on astronauts, putting four huge collars around their chests and reading off their hearts' pumping efficiency with an electronic box the size of a cigarette package.

Aside from histamine there are several other natural compounds that are used as messengers to demand more blood flow. If Dr. Wells and Dr. Redisch and Dr. Kubicek are right, those signals—artificially produced by doctors—could revolutionize treatment of most of the diseases of aging, such as poorer vision, bad digestion, faulty memory, deafness and the rest—those that now seem to come with failing microcirculation.

Joe Hixson