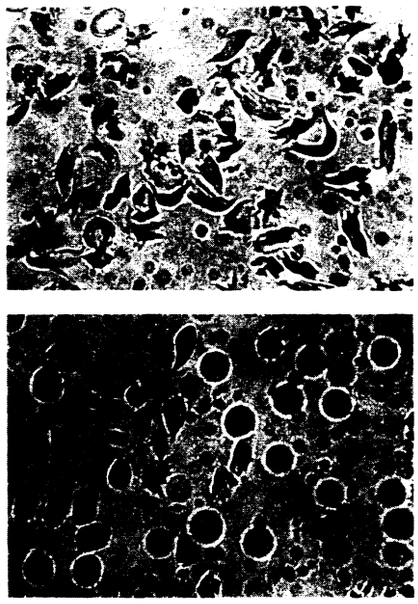
Desickling cells without chemicals

Several chemicals, called desickling agents, have been developed to treat sickle cell anemia. But because toxic effects limit the applicability of such agents, some researchers are now looking for ways to desickle cells without using chemicals. Writing in the April 22 SCIENCE, Shiro Takashima of the University of Pennsylvania and Toshio Asakura of Children's Hospital of Philadelphia report a method for desickling cells that uses an electrical field.

Sickle cell anemia is a genetic disorder caused by defective hemoglobin molecules, called hemoglobin-S, within red blood cells. When hemoglobin-S proteins release the oxygen molecules they are carrying, they tend to polymerize, linking together to form long, stiff chains, called gelled hemoglobin. Eventually, some cells distort from their normal disk shape to a crescent shape, which resembles a sickle. Whereas normal red blood cells are very flexible and can squeeze through the smaller blood vessels, these rigid cells cannot. They tend to clump, blocking the vessels and causing the pain of a sickle cell crisis.

Takashima and Asakura desickled cells by applying a pulsed electrical field to a solution of cells from sickle cell patients. The treated cells became rounder. However, Takashima told SCIENCE NEWS, the treated cells did not resemble normal red blood cells. "Instead," he said, "these look like round, swollen balls or bags." Takashima said he and his colleagues have not yet determined the mechanism for this change, but he hypothesizes that the electrical field causes pores to form in the cell membrane, allowing water molecules to seep into the cells and puff them up. He also has preliminary evidence that this treatment partially reverses the gelling of hemoglobin-S.

Another sickle cell researcher, Alan N. Schechter at the National Institutes of Health, has been working on a chemical method to desickle cells using small molecules that inhibit the gelling of hemoglobin-S (SN: 12/13/80, p. 379). Schechter says that he views Takashima's work as an "important technical accomplishment" in the search for an effective anti-sickling agent. But it is important, he says, to point out that "a change in morphology [of the cell] is not enough." Many cells, although they appear normal, are also rigid enough to clog the blood vessels, he notes. "In fact," he says, "the literature is filled with agents that change the morphology of cells but which have not proved to benefit the patient." Takashima agrees that more testing must be done. He says, "There is some possibility that [in the future] we can use this electrical field as a temporary cure to alleviate the pain." But, he adds, it could take several years to reach that point. *—P. Taulbee*



Takashima, Asakura/Science

Sickled red blood cells before (above) and after exposure to electrical field.

How stress causes high blood pressure

Although psychological stress has long appeared to contribute to high blood pressure, the means by which it does so haven't been clear. Now, however, the mechanism seems to have been pinpointed: Sympathetic nervous system reaction to stress causes the kidneys to retain salt, and this salt retention upsets blood pressure regulation.

Studies with rats have already shown that psychological stress is capable of inducing kidney retention of salt and that the amount of such retention is greater in rats that develop high blood pressure than in those that do not. The rat studies also showed stress-induced sodium retention to be mediated by the sympathetic nervous system — the part of the involuntary nervous system that makes blood vessels contract and prevents smooth muscle from contracting.

These findings prompted Kathleen C. Light and colleagues of the University of North Carolina School of Medicine in Chapel Hill to see whether psychological stress can cause sodium retention in humans, and, if so, whether the effect is greater among persons with a predisposition to high blood pressure or whose sympathetic nervous systems are especially responsive to psychological stress.

They studied 13 subjects with normal blood pressure but at risk of developing high blood pressure either because of family history or because their own blood pressure was in the "high-normal" range. Another 11 subjects had normal blood pressure and did not possess these high-risk factors. The 24 subjects were given a psychological stress test consisting of various competitive mental tasks and further subdivided into high and low sympathetic nervous system responders. Six low-risk subjects and six high-risk subjects were low responders, and five low-risk subjects and seven high-risk subjects were high responders.

Sodium excretion levels measured before and during the test showed the seven high-risk, high sympathetic response subjects retained sodium during the test. The other three subgroups did not. Thus, psychological stress can cause sodium retention in humans, but only among persons at high risk of developing high blood pressure who also have a high sympathetic nervous system response to psychological stress, Light and her team conclude in the April 22 SCIENCE.

The next challenge, Light told SCIENCE NEWS, will be to see whether individuals vulnerable to stress-induced sodium retention actually get high blood pressure. If so, it would constitute further evidence that psychological stress causes high blood pressure via sympathetic nervous system stimulation of the kidneys and salt retention. *—J.A. Treichel*

Sponge gets OK

A polyurethane sponge permeated with spermicide has been approved by the Food and Drug Administration for use by women as a nonprescription contraceptive. Placed in the vagina, the sponge acts as a barrier to sperm and also releases nonoxynol-9, a spermicide that has been used for about two decades in a variety of contraceptive foams and gels.

David Edelman of Family Health International in Research Triangle Pack, N.C., has been engaged in clinical trials of the sponge since 1978. He said that the sponge and the diaphragm "are equally effective and safe." The sponge, developed and to be marketed by V.L.I. Corp. of Costa Mesa, Calif., offers several advantages over barrier and suppository contraceptives. One size fits everyone, it is effective immediately after it is emplaced in the vagina and it remains effective for 24 hours.

There was no clinical evidence that the contraceptive sponge encouraged the growth of bacteria such as that which is responsible for toxic shock syndrome. Edelman believes this risk is minimal, since the spermicide should help inhibit bacterial growth.

V.L.I. Corp. expects to have the sponge available in 11 western states in July and nationwide by September. Retail price for the disposable sponge, which will be marketed under the brand name "Today," is expected to be $1. □