A treatment for spinal cord injury?

Five years ago Russian neuroscientists seemed to have achieved what neuroscientists had tried to achieve for many years but had failed to do — come up with a successful treatment for spinal cord injury. It consisted of enzyme injections to block the formation of scar tissue around severed nerves. Two years ago, however, hopes for the treatment were dashed when American neuroscientists were not able to duplicate the Russian investigators' findings (SN: 5/19/79, p. 326). Now, once again a successful therapy for spinal cord injury is looming large. This time it's thyrotropin-releasing hormone (TRH), one of the hormones secreted by the hypothalamic gland below the brain.

Several years ago Alan I. Faden and Thomas P. Jacobs of the Uniformed Services University of the Health Sciences in Bethesda, Md., and John W. Holaday of the Walter Reed Army Institute of Research in Washington postulated that endorphins (pain-relieving proteins naturally present in the body) are released after spinal cord injury and aggravate reduction of blood flow to the spinal cord, thereby heightening neurological damage. If these events indeed took place, the investigators continued to reason, then naloxone, a drug that blocks the actions of endorphins, should improve blood flow to the spinal cord after injury and thus lessen neurological damage. Then they decided to determine in cats whether their hypotheses were correct, and as they reported last year, they seemed to be (SN: 4/26/80, p. 260). The problem with using naloxone to treat spinal cord injury patients, however, was that it would aggravate the pain following such injuries because it would suppress endorphins' pain-relieving actions. TRH, in contrast, was known to be capable of blocking certain behavioral and autonomic actions of endorphins without blocking endorphins' pain-relieving abilities. So Faden, Jacobs and Holaday wondered whether TRH might be able to lessen spinal cord injury.

The researchers anesthetized 26 cats, then produced spinal cord damage so that the animals could hardly stand up, if at all, and could not walk without severe problems. They then gave the cats drug treatments starting an hour after injury for four consecutive hours. Six of the cats received TRH as their treatment, 10 of the cats got saline and served as one control group, and the other 10 cats got dexamethasone and served as another control group. (Dexamethasone is a synthetic adrenal gland hormone that has been used for some years to treat spinal cord injury patients in order to decrease the inflammatory response associated with spinal cord injury, but it has never been conclusively shown to produce such an effect.) The forelimbs and hindlimbs of each of the 26 cats were then scored for: presence or absence of voluntary movement; spontaneous movement but inability to support weight; ability to support weight but not to walk; ability to walk but marked spasticity or loss of power in muscle coordination or both; ability to run but marked spasticity or loss of power in muscle coordination; normal motor function. Each cat was then given a total functional neurologic score by adding the scores of its forelimbs and hindlimbs.

As the researchers report in the Oct. 29 NEW ENGLAND JOURNAL OF MEDICINE, functional neurologic recovery, as measured by total functional neurologic scores, was significantly better after treatment with TRH than after saline or dexamethasone. The median cat treated with TRH had entirely normal motor function whereas the median control cats in the saline and dexamethasone groups had marked spasticity or loss of power in muscle coordination or both in the forelimbs and hindlimbs. There were no significant differences in functional neurologic recovery between the saline-treated and dexamethasone-treated cats. So it looks as if TRH might make an effective treatment for spinal cord injury patients, Faden, Jacobs and Holaday conclude. In an accompanying editorial, Arthur J. Prange Jr. and Robert D. Utiger of the University of North Carolina School of Medicine in Chapel Hill agree.

The question now is, when might clinical trials get underway to determine whether TRH can keep spinal cord injury patients from losing use of their arms, legs or other body parts? As Holaday told SCIENCE NEWS, "We don't anticipate any ourselves." But, he said, other researchers (he did not specify whom) may be planning such trials in the U.S. And as Prange told SCIENCE NEWS, "A European colleague tells me that Europeans will probably be all over it [TRH]. That is one man's opinion, but I think he's correct. It urgently needs to be tested [since spinal cord injury] is a dreadfully common injury in young people. It seems to me there is a lot to gain and very little to lose. TRH is a fairly innocuous substance." □

Order out of chaos: The bodies electric

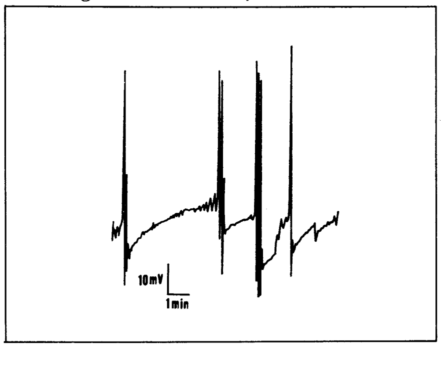
The formula for the origin of earthly life is enveloped in billions of years worth of mystery that researchers are attempting to unwrap. Some of those researchers believe the prebiotic formula involved a relatively complicated evolution from primordial ingredients to replicating DNA; others believe the formula for this "protolife" was much simpler. A recent discovery by Sidney W. Fox and colleagues of the University of Miami's Institute for Molecular and Cellular Evolution (IMCE) strengthens the view that life could have emerged from the simpler building blocks. Fox and co-workers discovered "excitability," or bioelectric behavior, in simple, purely artificial cells they dub "simulated protocells."

These artificial cells are microspheres of protein-like (proteinoid) material formed by warming a specific mixture of amino acids. Previously, IMCE researchers demonstrated that the artificial cells have primitive abilities to reproduce, to synthesize their own protein-like compounds and to screen large molecules from small ones — properties presumed necessary for a prebiotic cell. The latest findings of bioelectricity — reported at the recent Society for Neuroscience meeting in Los Angeles, Calif. — further strengthen the theory that such protocells were the roots of earthly life.

Specifically, the "syn-cell" bioelectricity, similar to the electrical activity of modern cells, verifies the presence of a structure vital to complex cellular behavior — a membrane. Using an oscilloscope and microelectrodes, Fox and colleagues found that their syn-cells show resting potential (a difference of electrical charge inside and outside of the membrane) and action potential, or spiking (a discharge of accumulated electricity indicated by the near-vertical lines on the oscilloscope pattern).

Some of the observed action patterns resemble the neuronal discharge in the *Aplysia* seahare, Fox says. Consequently, the easy-to-manipulate synthetic protocells could help neuroscientists determine the precise biochemical mechanisms of natural neurons. Moreover, says Fox, the research has possible implications for the development of solar energy cells. Simple proteinoid material is less expensive than the current solar cell favorites such as silicon crystals, he explains. If researchers could develop the "excitability" of simulated protocells, then "it may be possible simply to paint a slurry of them onto surfaces," to generate electricity, Fox says. For now, however, the implications of the work lie in origin-of-life research. Says Fox, the electric proteinoid microspheres "fit in as a cornerstone . . . in the theory of how protolife began." □

Discharge of simulated protocell.



Fox et al.