BIOMEDICINE

Quenching your thirst

Do you ever wonder about the reasons for thirst and how water and other liquids quench it? Two Johns Hopkins University psychologists, Elliott Blass and Warren Hall, will report their answers to these questions in a future issue of the JOURNAL OF COMPARATIVE AND PHYSIOLOGICAL PSYCHOLOGY.

In the past decade or so Blass, Hall and other thirst investigators have defined the physiological mechanisms that cause thirst. First, water is lost from cells and from the blood. Cellular water loss is detected by the lateral preoptic area of the brain, triggering cellular thirst. Meanwhile, water lost from the blood causes the release of the kidney hormone renin, which sparks the release of the hormone angiotensin from the bloodstream. And angiotensin signals the subfornical organ in the brain to trigger extracellular thirst.

With the process of thirst more or less explained, Blass and Hall have turned to investigating how drinking quenches thirst. They found that during liquid deprivation, water loss comes more from extracellular space than from inside the cells. But when we drink, water invades cells rapidly so that they expand. Cellular expansion then sensitizes the mouth and stomach (this process is, so far, unexplained) and turns off the desire for thirst.

A preventative for schistosomiasis

Schistosomiasis is one of the major parasitic diseases of the world, inflicting 200 million people in Africa, the Middle East and Asia. Although there are some treatments for the disease, they are not altogether satisfactory, and even worse, they are not available to the majority of people who need them. What is really needed is a preventative for schistosomiasis, specifically, a means of killing the freshwater snails that serve as a host for the parasites.

Such a preventative may have been found by Aklilu Lemma of Haille Selassie I University in Ethiopia. It is dried and ground berries of the endod plant, which are used by villagers in Ethiopia as a detergent for washing clothes at streamside.

In 1964 Lemma was studying the schistosome-transmitting snails in a small stream in northern Ethiopia when he observed large numbers of dead snails at spots downstream from where local people had done laundry using endod. Lemma then found that pulverized endod berries spread along stream banks could kill snails without hurting other animals and plants. In 1969 he began a field trial in the village of Adwa, where 70 percent of the total population and 50 percent of young children had schistosomiasis. Endod berries were applied to stream banks with watering cans every three to eight weeks.

Preliminary results from the study show that schistosomiasis among the children has dropped from 50 percent to 15 percent.

Getting physicians down on the farm

Do physicians really balk at working in rural areas? A study reported in the June 9 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION suggests that one of the physician recruitment programs previously labeled a failure is really a success.

From 1957 to 1970, the Sears Roebuck Foundation established the Community Medical Assistance Program (CMAP) to assist rural communities in attracting physicians. In 1970 Sears terminated the program, believing it was a failure, primarily because a number of the clinics were then unoccupied. Robert L. Kane and his team at the University of Utah College of Medicine have since followed up the CMAP efforts and have found that of the 165 communities that had built clinics through the program, 132 (81 percent) now have at least one physician. Ten other clinics have nurses or physicians' assistants.

EARTH SCIENCES

The spreading of Iceland

Iceland sits atop the Mid-Atlantic Ridge, the majestic linear seam along which the Atlantic Ocean is widening and building new crustal material. Two active rift zones identified on Iceland have been held responsible for the crustal spreading and volcanic activity there.

Now George P. L. Walker of the geology department at Imperial College, London, suggests the existence of at least four additional rift zones and provides evidence that the southern half of Iceland has a spreading rate three or four times greater than the northern half. (The northern half is presumably spreading at about the same rate as submerged parts of the Mid-Atlantic Ridge.) First, the total width of rocks younger than 3 million years reaches a maximum of 250 kilometers in southern Iceland, compared with 140 kilometers in northern Iceland and 60 kilometers in the submerged part of the Mid-Atlantic Ridge. Second, the frequency of volcanic eruptions for strips of equal width trending in the spreading direction is several times greater in southern Iceland than elsewhere; the number is taken to be a direct function of the spreading rate. In addition, the number of active high-temperature geothermal fields is greater in the south; that number is taken to be a direct function of the intensity of magmatism.

The prevalent view has been that the Iceland fissures are purely dilational and that the magma passively rises along them. Strainmeter measurements and an analysis of the fissures created by the 1973 Heimaey volcanic eruption have called that view into question. Walker's work, reported in the June 5 NATURE, further disputes it. "My view that the spreading rate is several times greater in part of Iceland than elsewhere on the Mid-Atlantic Ridge implies that the magma plays a very active role in creating and jacking open the fissures there and, indeed, perhaps in causing crustal spreading to occur."

Earthquake size and nature's lubricants

Why is it that earthquakes in the San Francisco area are fewer in number but larger in magnitude than quakes to the east and south? It has long been observed that along some faults there are frequent small releases of strain while other faults seem to be "locked" for long periods, then suddenly snap free in one gigantic jolt. An example of the latter was the 8.3-magnitude 1906 San Francisco earthquake, caused when the northern branch of the San Andreas fault suddenly snapped free and produced 20 feet of movement.

Geologist William P. Irwin and colleagues at the U. S. Geological Survey's Menlo Park, Calif., laboratories have found a cause for the fault system's separate personalities. They found that areas of gradual fault movement coincide with fault segments that cut a series of rocks called the Great Valley sequence; these rocks are not present where the fault is locked.

Irwin and his group believe the rocks cause the intersecting faults to be lubricated in one of two ways. First, the base of the Great Valley sequence includes serpentinite, a rock having great plasticity under pressure that could be "squeezed into and dragged along faults." Serpentinite might provide enough lubrication to allow gradual movement. The second possible lubricant is metamorphic water. Such water contains carbon dioxide and originates deep in the ground under high pressure in Franciscan rocks of the Coast Ranges. Where the impermeable rocks of the Great Valley sequence overlie the Franciscan rocks, the metamorphic water apparently tends to be forced laterally into the fault zones where it provides additional lubrication.

The study is one of the firmest links between regional geologic structure and the behavior of earthquake faults.