Tracing the paths of the body's hormones

Radioimmunoassay has provided insights into two hormones related to water retention and birth

by Joan Lynn Arehart

This is the first of a series of articles by the medical sciences editor of SCIENCE NEWS *stemming from a recent reporting tour of European laboratories.*

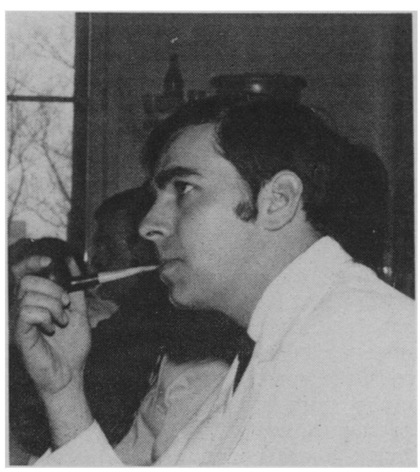
During the past decade or two, hormone researchers have come to a remarkable understanding of the various hormones secreted by the pituitary gland—a quarter-sized chemical factory tucked away in the brain. The pituitary hormones are critical to life. They turn on and off the thyroid, adrenal and sex glands. In small quantities and with great precision, when working normally, they influence metabolism, growth, reproduction and other physiological functions.

Most of the progress in elucidating the pituitary hormones has been with those made in the anterior pituitary gland. Far less attention has been directed to the posterior pituitary hormones, which are actually produced in a nearby cluster of brain cells—the hypothalamus. The two main hormones of the posterior pituitary—vasopressin and oxytocin—have been chemically unraveled and synthesized. Vasopressin is involved with the retention of water in the body; oxytocin, with influencing milk ejection in the nursing female, in expanding the uterus during childbirth and in transporting sperm into the female during copulation. On the whole, though, the roles of vasopressin and oxytocin are far from completely understood. The main deterrent to a better understanding has been a lack of good methods for measuring their levels in the body under various conditions.

Now a group of Belgian and English investigators have found that when either oxytocin or vasopressin is released from the pituitary into the bloodstream it is accompanied by a protein called neurophysine. For the work they used the relatively new and sophisticated technique called radioimmunoassay, which is particularly adept at picking up protein hormones. But the workers have not yet shown that the two hormones are still bound to neurophysine as they make their way through the bloodstream to the final target sites. If they can make this demonstration, or at least indirectly correlate levels of neurophysine with various actions of vasopressin or oxytocin, they should have one of the best means yet for probing the physiology of oxytocin and vasopressin under both normal and pathological conditions.

The researchers are Jean Jacques Legros, P. Franchimont, J. J. Nordmann and J. J. Dreifuss of the Institute of Medicine in Liége, Belgium, in collaboration with A. S. McNeilly of the National Institute for Research in Reading, England, and Mary L. Forsling of St. Bartholomew's Hospital in London.

Although levels of vasopressin and oxytocin in the blood are difficult to determine, the Liége investigators have managed to correlate levels of neurophysine in the bloodstream of some patients who have cancer or a collapsed lung condition with levels of vasopressin in their bloodstream. But generally they will probably have to take indirect approaches to correlate neurophysine levels with vasopressin and oxytocin actions. They have found, for example, that levels of neurophysine in the bloodstream of women are greater when they are pregnant. This is a time when vasopressin's antidiuretic action and water-retention activities would be expected to be operating. They have also shown that release of vasopressin by the pituitary, which causes water retention in the kidney, is accompanied by elevation of neurophysine in the bloodstream during hemmorrhage. Such a correlation of vasopressin and neurophysine, they say, "represents an indirect, but precise index of vasopressin function for physiological and pathological studies."



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Legros: Neurophysine is the key.

They must keep in mind too that radioimmunoassay picks up a kind of neurophysine that seems to be more closely associated with vasopressin than with oxytocin in live animal studies. This, they believe, may explain why they have not been able to detect elevated levels of neurophysine in the blood of women during childbirth—a time when blood levels of oxytocin would be expected to be high.

Pending the long, difficult route of correlating various bloodstream levels of neurophysine with actions of oxytocin and vasopressin, the radioimmunoassay for neurophysine may prove useful for other kinds of medical research. The Belgians have detected with radioimmunoassay, for instance, that neurophysine is rich in the bloodstream of patients with kidney disease, whether the patients were receiving dialysis therapy or not. Legros thinks it unlikely that neurophysine would cause the disease since hormone abnormalities often reflect a more basic biochemical problem. He believes that elevated levels of neurophysine in the bloodstream of kidney-disease patients probably reflect some more elusive metabolic dysfunction of water metabolism. If so, either the kidney is no longer able to degrade neurophysine or neurophysine is released because of the metabolic abnormalities. This is what happens in one kind of kidney disease called nephrogenic diabetes insipidus, the investigators have found.

They have likewise noted an upsurge of neurophysine in the bloodstream of women on birth control pills, and are looking for links between those elevated levels and side effects from the pill. "It wouldn't surprise me," says Legros, "if we find that elevated levels of neurophysine in the bloodstream correlate with water retention—a common toxic effect from the pill. High levels of neurophysine would be expected to reflect vasopressin's antidiuretic action."

The bulk of the European researchers' work has just been published in Clinical Endocrinology (1972), or is in press with Les Comptes Rendues des Séances de la Société de la Biologie (Paris). □