BIOLOGY

Roberta Navickis reports from the recent meeting in Miami of the Endocrine Society

Encounters of a Third Kind

Circulating hormones recognize their target cells through protein receptors. Until now, the cellular whereabouts of a receptor appeared to be one of two places, depending upon the chemical nature of the hormone to which it was tailored. Receptors of polypeptide hormones, such as insulin, luteinizing hormone and growth hormone, are on the cell surface. When the hormone latches onto the receptor, a chain of events is started in the membrane that reaches all the way to the nucleus, where messenger RNA levels are selectively altered. These protein-type hormones must relay their orders because they are too large and too charged to squeeze through the cell membrane and manage affairs themselves. In contrast, receptors for the steroid hormones, such as estrogen and cortisol, reside in the cytoplasm. A steroid hormone, small and fat soluble, slips through the liquid, lipid plasma membrane and mixes with its cytoplasmic receptor. The hormone-receptor complex then migrates to the nucleus and directs nuclear activity more directly.

Jack H. Oppenheimer of the University of Minnesota at Minneapolis reports that thyroid hormone appears to interact with its receptor in yet another way. Thyroid hormone, being very small, slips through the plasma membrane, as steroid hormones do. But then it zips right through the cytoplasm to the nucleus before it ever encounters its receptor. Oppenheimer said that he knew of no other hormone that drove straight to the nucleus before interacting with its receptor. Moreover, he reports that once there, thyroid hormone is a bit more "republican" than most hormones. Most hormones "turn on" only selected genes; thyroid hormone turns on the lot, although some genes are more stimulated than others.

Releasing hormones: Catching a tartar

The discovery of the releasing and the inhibiting hormones in the hypothalamus uncovered a key link between the nervous and the endocrine systems. The find was so important that Andrew V. Schally of the New Orleans Veterans Administration Hospital and Roger Guillemin of the Salk Institute in La Jolla, Calif., were awarded the 1977 Nobel Prize in medicine for their independent efforts in the isolation and the mapping of the structure of three hypothalamic hormones. But that glory came only after years of relentless search. Fourteen frantic, disappointment-fraught years passed before the structure of a releasing hormone was finally mapped in 1969.

Two years later, a second hormone, luteinizing releasing hormone (LHRH) was isolated and its structure determined — an event laden with promise. LHRH appears to be the hormone that is head honcho of the reproductive system. Moreover, consisting of only 10 amino acids, it is simple enough that both the natural molecule and analogs — LHRH molecules with one or more amino acids changed — can be synthesized. Since the function of a hormone depends on its structure, amino acids can be systematically substituted to make hormones that are longer-lasting and capable of performing only some of the actions of the natural hormone. Therefore, the promise of a once-a-month contraceptive with minimal side effects, for both men and women, and of an inexpensive and manageable method of prodding the reproductive systems of the infertile was present.

What about the performance? Seven years after the amino acid sequence of LHRH was unraveled, Schally reports that the system still has a mind of its own. LHRH has been used to treat infertility in men and women, but the success rate is low. He said that long-acting superactive analogs of LHRH have been synthesized and are being scrutinized, but that suitable therapeutic regimens have yet to be developed. At present, he is testing LHRH analogs for contraceptive use in women.

BIOMEDICINE

Early detection of Huntington's chorea

Huntington's chorea is one of the most devastating neurological diseases. The celebrated folksinger Woodie Guthrie was one of its victims. His early symptoms included walking lopsided. Later he began flying into unexplained rages, and eventually lost his ability to talk, read and walk. Guthrie died in 1967, after 15 years of such agony. Equally cruel, the disease is inherited and usually does not show up until age 30 or 40. This means that the children of Huntington's victims must wait for a number of years before knowing whether they too have the disease — a 50-50 chance, since it is carried by a dominant gene. And by that time they may already have reproduced and passed on the condition to their own children — a 25 percent chance.

Now, finally, a simple test has been devised that appears to diagnose the disease in the children of Huntington's patients, thus allaying their need to wait years to learn whether they too have the disease and can pass it on.

Steven Rosenberg of the Bernard W. Schlesinger Foundation in New York City and his colleagues tested three groups of subjects, all right-handed, on the ability of their right hands to outperform their left hands in coordinating the thumb's movement in touching the other fingers of the hand. The three groups included 18 patients with Huntington's, 40 children at risk but with no signs of the disease and 17 asymptomatic siblings past the age of 50 who were "escapees" from the disease. None of the patients and just about half of the young, at-risk offspring demonstrated laterality, whereas nearly all of the escapees did — percentages one would expect if the test truly coordinated with genetic risk of the disease. Thus, the researchers conclude in NEUROPSYCHOBIOLOGY (3: 144-152) that failure on this test "might be effective in detection of presymptomatic carriers. . . ."

Legionnaire's disease strikes England

Back in the 13th century, the Sheriff of Nottingham, England, spent a lot of time looking for Robin Hood and his stalwart, mischievous band. Now, 700 years later, Nottingham has something more sinister than Robin and his followers to worry about — Legionnaire's disease.

The disease struck 12 residents of Nottingham and 19 residents of other British cities as well between July 1973 and April 1978, according to the June 16 MORBIDITY AND MORTALITY WEEKLY REPORT, published by the Center for Disease Control.

British scientists have not yet tracked down the origins of the infections. Six patients developed symptoms during or within seven days of returning from a holiday in Spain, but each had stayed at a different resort. Interestingly, six of the Nottingham cases occurred during August and September, a time of year when the disease has struck in the United States.

Possible diet-cancer link

Researchers used to think that any dietary changes that countered cancer probably worked by starving tumors. Not so, according to research by Martin J. Pine of the Roswell Park Memorial Institute in Buffalo, N.Y. His study showed that the survival time of certain leukemic mice could be doubled by restricting their dietary intake of the amino acid phenylalanine, and that this effect was achieved by stimulating the mice's immune systems against the tumors, rather than by starving the tumors.

The mice were fed a commercial diet developed for children with phenylketonuria, an inborn inability to dispose of phenylalanine. Might such a diet benefit leukemia patients? Possibly, Pine told SCIENCE NEWS, but it's too early to say right now.

Pine's study was published in the March JOURNAL OF THE NATIONAL CANCER INSTITUTE.