

# BIOLOGY

Julie Ann Miller reports from the meeting in Los Angeles of the Society for Neuroscience

## Genes behind the nervous system

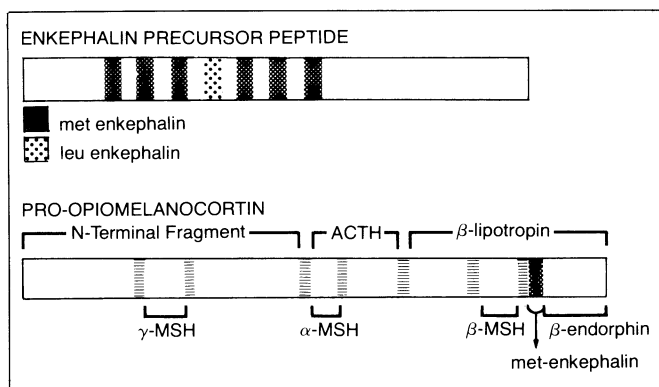
The new techniques for studying genes and their regulation will have "phenomenal impact on neuroscience," predicts Eric R. Kandel, last year's president of the Society for Neuroscience. "Learning and development are basically a matter of the switching on and off of genes."

Recombinant DNA techniques already have revealed that many small peptides active in the nervous system are derived from genes that encode much larger proteins. Some of these large precursors contain the sequences of several biologically active peptides. The precursor of beta-endorphin is best characterized; it contains also the sequence of ACTH (adrenocorticotropic hormone) and three varieties of MSH (melanocyte-stimulating hormone). The precursor, which is called POMC (pro-opiomelanocortin), also contains the sequence for the very small active peptide methionine-enkephalin. However, the source of enkephalins in the brain appears to be a separate, even larger precursor protein, which contains six copies of methionine-enkephalin and one copy of the related leucine-enkephalin.

The precursor POMC is found in both the anterior and posterior lobes of the pituitary gland, Edward Herbert of the University of Oregon says. The molecule is processed to different hormones in these sites and release of the hormone is differently regulated. Herbert reports that in both lobes of mouse and rat pituitary, the precursor is cleaved into ACTH and beta-lipotropin segments. In the intermediate lobe ACTH is further converted to alpha-MSH and another peptide and beta-lipotropin is converted to beta-endorphin.

The presence of ACTH and endorphin in a variety of tissues raises the question of whether the peptides are synthesized widely or made in the pituitary and exported to other sites. To learn whether POMC genes are expressed in a particular tissue, Herbert and others have used recombinant DNA to make a radioactive single-stranded DNA that binds specifically to POMC genes and the messenger RNA they produce. They find that the POMC gene is active in two brain regions — the hypothalamus and amygdala — as well as in the pituitary. Herbert also finds that levels of POMC messenger RNA in the anterior and intermediate pituitary lobes differ dramatically in their response to feedback hormones.

Visualizing cells with a particular gene active is also possible using short stretches of radioactive single-stranded DNA. James Roberts of Columbia University has made one such a marker to the growth hormone gene and another to the POMC gene. Each binds to cells only in the region of the pituitary where the gene is active, so those cells appear dark in autoradiography. In the future Roberts expects the method to identify particular cells within a tissue that contain a gene being expressed even at a low level.



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# ENVIRONMENT

Janet Raloff reports from Amherst, Mass., at the Indoor Air Pollution, Health and Energy Conservation symposium

## Lung cancer and energy-efficient homes

Though health effects of radioactive radon have been observed only after large exposures, Robert Fleischer of the General Electric Research and Development Center in Schenectady, N.Y., claims that linear extrapolation of those effects "to the lower levels normally encountered in the environment implies that a few thousand people in the United States die each year from lung cancer that is induced by levels that are typically in homes." Radon—a decay product of naturally occurring radium—is released by soil, rocks and contaminated groundwater (SN: 3/18/78, p. 168). But more important, Fleischer's own studies indicate that "the elevated levels found in a significant fraction of energy-efficient homes give exposures to radon that are equivalent to those that are directly known to produce lung cancer in miners with no extrapolation to lower levels being required."

Together with Antonio Mogro-Campero and Larry Turner, Fleischer reported on a survey of radon levels in 27 homes—14 of which were considered "tight," or energy efficient. Levels varied widely, based on architecture and construction materials, but were typically higher in the tight homes. Winter concentrations in half the tight homes, for instance, reached at least 4 picoCuries per liter of air. In one solar-heated home, radon levels fell within Environmental Protection Agency guidelines (3 pCi/l) in summer when open windows and doors offered ample ventilation, "but shot up to more than four times the acceptable level in winter, when the structure was tightly sealed." Typically, radon levels in the tight home's first and second floor living areas were 3.2 times higher than in the looser, ventilated homes; in summer they were 2.2 times higher.

Eleven of the 14 tight houses were solar heated, nine using sand, crushed rock or concrete slabs—all potential radon sources—for heat storage. The team cautions that these materials may pose a particular hazard in energy-efficient homes.

## The clean carpet syndrome

For months employees of a Denver-area office building complained of annoying respiratory problems. Epidemiologists called in to scout the situation administered questionnaires to 45 employees. Thirty—or 67 percent—reported coughs, dry throat, difficulty breathing, nasal congestion and headaches that improved when they left the office. The culprit, Kathleen Kreiss and colleagues at the Colorado Health Department now report, was "a novel indoor air pollutant, residue from carpet shampoo."

The outbreak was confined to those departments where rugs had been shampooed. In the most heavily trafficked areas—also the most frequently shampooed—respiratory irritation plagued 93 percent of the employees. Similar symptoms were reported among children and all 10 staff members of a day-care center after its carpets had been shampooed during a spring cleaning. Additional incidents linking carpet shampoos and respiratory problems were identified, including one involving a Washington, D.C., motel.

Though different shampoos were involved, the office building, day-care center and motel all used products containing an anionic detergent, sodium dodecyl sulfate (sodium lauryl-sulfate). Long known as an eye and skin irritant, only three years ago it was also confirmed as a potent respiratory irritant in tests using mice.

Kreiss's investigation showed that the shampoo used on the office building's carpets was actually four to eight times stronger than recommended. She suspects the day-care incident also resulted from insufficiently diluted shampoo. And that's why her team is now working with a trade association and with shampoo manufacturers to simplify dilution instructions for their products aimed at household consumers.

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