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Finding Out About Growth Hormone

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Finding out about Growth Hormone

A HORMONE WITH MANY COMPLEX AND INTERESTING ACTIONS.

Hormones direct, regulate, and coordinate the body systems. Since the mid-1960s they are studied intensively in small animal medicine. Researchers find that hormones have many more effects and roles than previously thought.

J. Eugen Eigenmann, D.V.M., Ph.D., assistant professor of medicine at the School of Veterinary Medicine is interested in growth hormone, a substance produced by the pituitary gland, a tiny body located at the base of the brain. "Growth hormone is unique among the hormones," he explained. "Unlike other hormones which, for instance, stimulate steroid hormone production in a specific gland, the actions of growth hormone are not confined to one main single target. Further, growth hormone stimulates the production of other hormones, somatomedins or insulin-like growth factors which are produced in the liver and other tissues and which are held responsible for growth." Growth hormone has two main activities. 1.) Anabolic ones causing biochemical reactions which build up body systems and increase energy resources. This appears to be mediated by the growth factors. 2.) Catabolic ones where complex substances are broken down into simpler ones, this appears to be a direct effect of the growth hormone.

Dr. Eigenmann's research is concerned with these two activities of growth hormone and diseases which result when the hormone is secreted in improper quantities.

One of his studies, begun in 1979 while at the University of Utrecht, Holland, tested the hypothesis that diabetes melitus, occurring frequently in elderly female dogs, is due to an overproduction of growth hormone triggered by elevated levels of progesterone. He also studied acromegaly, a condition occurring in elderly female dogs treated with progestagens or occurring spontaneously after heat. Affected animals show a sudden increase of soft tissue growth and a thickening of bone.

Diabetes melitus in dogs is not rare. A recent study concluded that the prevalence ranges from 1/100 to 1/500 in dogs brought to veterinary hospitals. The risk is lowest in young dogs and is about equal for males and females in this group. In older animals however, females are at a greater risk.

"It has been found that diabetes occurred frequently in elderly female dogs during diestrus," Dr. Eigenmann said. "It had also been found, in pharmacological studies conducted by pharmaceutical companies, that some dogs developed diabetes and acromegaly-like signs after having been given high doses of progestagens. Thus we thought that this type of diabetes and acromegaly might be caused by progesterone-evoked growth hormone elevation."

Dr. Eigenmann used isolated canine growth hormone and developed an antibody against it for the radioimmunoassay which was needed to measure growth hormone levels in dogs. In the diabetic animals studied it was found that elderly female dogs with a mean age of 8.5 years did have elevated growth hormone levels during diestrus or after injections of medroxyprogesterone acetate (MPA), a progestagen. Diabetes occurred about four weeks after the onset of diestrus if the dog had cycled naturally. In animals which were given MPA injections, diabetes occurred also.

The dogs showed high circulating levels of growth hormone, glucose and insulin. "This is typical for growth hormone-induced diabetes," he said. "We know that growth hormone is a diabetogenic agent. It causes insulin resistance mainly..."
in the tissue thus insulin cannot act normally at these sites. The dog becomes hyperglycemic and in many cases the body responds by producing more insulin. This is reflected by increased insulin levels in the blood. The dog is diabetic because insulin levels are elevated. This condition is reversible provided no major damage has occurred to pancreatic cells producing insulin.

A number of dogs studied recovered spontaneously from diabetes when the progesterone levels dropped at the end of diestrus or when the dog was spayed. This was accompanied by a decrease of the growth hormone level. Others recovered when the injections of MPA ceased. They showed a decrease in the levels of progesterone and growth hormone. "Female dogs produce equally high amounts of progesterone during diestrus whether pregnant or not; also, reproductive cycles in dogs do not cease as the animal ages. It could be possible that the lifelong exposure to these high progesterone levels in some animals eventually evokes growth hormone elevation. The mechanism by which this occurs is not known, however. Ovariohysterectomy was performed, the progesterone and growth hormone levels dropped to normal." Dr. Eigenmann explained that for elderly diabetic cats, diabetes in cats is not as frequent as it is in the dog. Untoward effects were noted on the animal when growth hormone-related diabetes has also been found in a cat. Dr. Eigenmann has a unique multidiscipline laboratory, arranged and equipped such as to allow for study by a number of disciplines for laboratory instruction. When this laboratory was put in use in 1970 it allowed the School to increase its enrollment to over one hundred students per year. In 1974 the basic science facility was dedicated as the Gladys Hall Rosewell Building. The new building was the result of a generous, concerned support of Mr. Alfred Rosenthal. Until his death in 1979, Mr. Rosenthal remained a great friend to the Veterinary School and his wife, Gladys, continues that support.
GROWTH HORMONE

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hormone, growth factors and thyroid hormone. All three are necessary. If one is absent or deficient, normal growth will not take place.

In man hypothyroidism (low levels of thyroid hormone) is the second most frequent endocrine disorder of childhood. In the dog this juvenile hypothyroidism appears to be rare. Instead it was found that dwarfism in the dog is of pituitary origin. It is postulated that these dogs may have a cyst of the pituitary and that this interferes with growth hormone production. Another possibility is that the pituitary cells are not properly developed. At this time it is not known why growth hormone production is lessened in the affected dogs. Pedigree analysis of affected German shepherds points to the condition being transmitted by an autosomal recessive inheritance.

The animals are small, they only grow for a few weeks after birth. Their skin is fragile and they do not develop an adult haircoat. Eventually the puppy coat starts to fall out and the dog becomes bald. Tests show that the animals are deficient in growth hormone and insulin-like growth factors. They can be treated with injections of growth hormone. “Treatment is quite expensive,” said Dr. Eigenmann. “The growth hormone injections will cause the haircoat to grow, also the skin will lose its fragility. Treatment will have to be repeated when the hair falls out again.” The injections of growth hormone do not cause the animals to grow as most are presented to Dr. Eigenmann when the growth plates have closed or are about the close.

Underproduction of growth hormone can also occur in older dogs. “This happens in some smaller breeds,” Dr. Eigenmann explained. “These dogs develop normally and then at about age one to three years, begin to show signs similar to those of the dwarfs. The hair falls out and no new coat growth take place.” These dogs can be treated by injections of growth hormone. It is not known why the production of growth hormone ceases. “The condition is not yet studied, though it is possibly genetic in origin,” Dr. Eigenmann said.

His current work involves the study of dwarfs and the older dogs which underproduce growth hormone. He is also studying several breeds to evaluate growth hormone secretion potential and the levels of growth factors. Growth factors have only recently been identified and Dr. Eigenmann’s project is designed to gather further knowledge about the importance of these factors. The dwarf dogs, the adult dogs with insufficient growth hormone levels, and dogs of different body size may provide some important answers. He is collaborating with Dr. D. F. Patterson from the Section of Medical Genetics, and Dr. E. R. Froesch, Metabolic Unit, University Hospital, Zurich, Switzerland.

Dr. Eigenmann came to the University of Pennsylvania in December 1980. He arrived there from the University of Utrecht where he received his Ph.D. in 1981. Prior to his work in Holland Dr. Eigenmann had been a visiting research fellow at the “Laboratoire Hormones,” Department of Biochemistry and “Institut National de la Sante et de la Recherche Medicale,” University of Paris. He received his veterinary degree from the University of Zurich in 1972 and the advanced Dr. med. vet. degree from the same institution in 1975.

ANIMAL CRACKERS

“NEW” DOG BREEDS

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The American Kennel Club recognizes 125 breeds of dogs, which may compete in championship shows. Beginning January 1, 1984, three breeds will be added to the show classification. These are the Pharaoh Hound in the Hound Group, Portuguese Water Dog in the Working Group and the Tibetan Spaniel in the Non-Sporting Group.

There is a Miscellaneous Class at A.K.C. shows. These dogs are not admitted to registration in the Stud Book and are not eligible for championship points. They may compete in obedience trials and earn obedience titles. In addition to the three breeds named above, the following may compete in Miscellaneous at this time: Australian Kelpies, Border Collies, Cavalier King Charles Spaniels and Spinoni Italiani.

The Federation Cynologique Internationale which governs dog shows in 30 nations, mostly in Europe (not Great Britain), accepts 325 breeds. The latest breeds they have recognized are a long-haired Weimaraner developed in Czechoslovakia and a South Russian Sheepdog.

ANIMAL PROFILE

THE SHORT LIFE OF JUSTIN

A baby gorilla dies.

Justin, the Philadelphia Zoo’s youngest gorilla, died May 20, 1983. Since April 27, the four-month-old had been ill with shigella, a condition that resembles dysentery in human beings. According to Dr. Keith Hinshaw, Zoo veterinarian, the shigella caused a severe inflammation of the bowels. From this, the infant developed the blood poisoning (septicemia) which led to his death.

The gorilla had been removed from mother Snickers on April 27 when he was first taken ill. After intensive care by the Zoo staff and after showing signs of improvement, it was decided to place him back with Snickers on May 7 in order to allow him to nurse. He had not been feeding well for the Zoo staff. On May 18, the staff noticed that the infant had become depressed and was not nursing. The next day Justin was again taken from his mother to be given treatment, including intravenous fluids and antibiotics. Following treatment he had appeared to be improving, however, he began to lapse in and out of consciousness until he died at 6:15 am.

The Spring issue of Belwether carried a story announcing the birth of the baby gorilla.