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& BIOLOGICAL ENGINEERING • ENTOMOLOGY

**IF YOU BUILD
A BETTER
MOUSETRAP**
Dr. Roland M. Leach, Jr.
Professor

In past articles, I have frequently discussed our research program dealing with skeletal development. This research program is designed to understand the mechanisms

involved in skeletal development so that we can minimize losses due to skeletal deformities.

This is not only a problem of economics but it is also becoming a serious animal welfare issue.

A spin-off of this research is the possible application to human skeletal problems. For example, if we understood the mechanisms involved in tibial dyschondroplasia, we might understand how to alleviate or prevent osteoarthritis.

The cells responsible for long bone growth (chondrocytes) go through a life cycle just like we do. They are born and progress

through infancy, adolescence, adulthood, and senility.

There are specific nutritional and hormonal signals that tell the cells what to do and when. If we disrupt this intricate (set of signals) cycle we get skeletal deformities such as rickets, tibial dyschondroplasia, dwarfism and arthritis.

Several years ago, in order to sort out which signals do what and when, we developed a cell culture system which would allow us to answer these questions.

In this procedure, a few chickens willingly donate a few pieces of cartilage tissue. The tissue is gently treated with some enzymes to release the cells (chondrocytes) which are recovered and placed in flasks maintained in special environmental chambers. We used our background in nutrition to develop a chemically defined media (food)

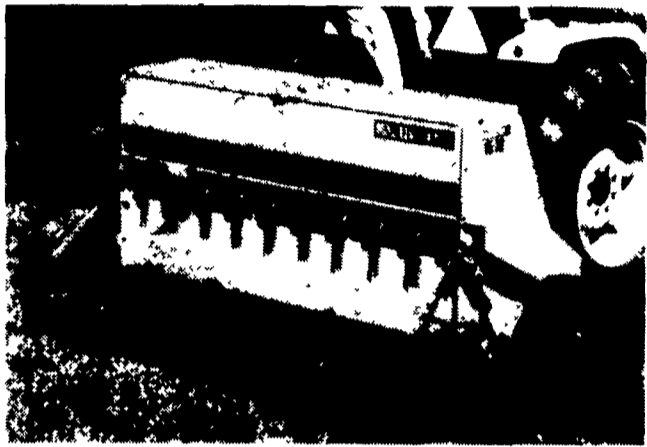
which allowed us to study the hormones important to chondrocyte metabolism.

This procedure has attracted the attention of a biotech company interested in growing human cartilage cells. In a recent pilot experiment, this company obtained a small cartilage sample from a human patient who had suffered severe cartilage damage. Chondrocytes were isolated from a biopsy sample and grown in culture until large numbers were obtained. These cells were then used to make a repair patch in the damaged cartilage. The implanted cells continued to grow and restore the cartilage to a status close to the original undamaged tissue.

In the future, the chicken cartilage procedure we've developed at Penn State is likely to be adapted for use in human cartilage replacement grafts.

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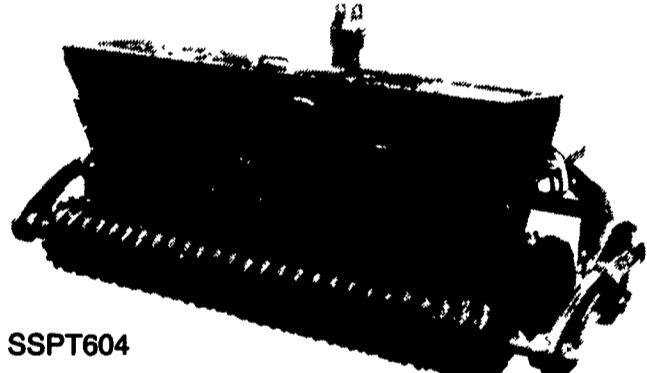
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