MORPHOANGIOGENESIS: A UNIQUE ACTION OF GROWTH HORMONE THAT PRODUCES FENESTRATED CAPILLARIES AND STEM CELLS

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INTRODUCTION: A newly discovered form of angiogenesis, named Morphoangiogenesis(1) produces, under the influence of growth hormone, fenestrated capillaries in mature rabbits. Fenestrated capillaries normally found only in the fetus produce stem cells. Morphoangiogenesis was discovered during experiments on adult rabbits to regenerate articular cartilage. It is proposed that by harvesting the stem cells earlier in the cascade that regenerated cartilage cells, that pleuripotent stem cells might be obtained to form other tissues and organs.

METHODS: The experimental group consisted of 16 adult New Zealand rabbits of mixed sexes, weighing from 3.5 to 5.0 Kg. They were fed Purina rabbit chow and water ad lib., and housed in approved cages in air conditioned rooms. Two sterile solutions were prepared. The first contained purified Bovine Growth Hormone (B-1 or B-18 NIADDK) 1.00 mgm/ml in Hank’s buffer solution, and the second contained Hank’s buffer solution alone. Both solutions were brought to pH 8.2. The author performed surgical debridement of the patello-femoral(trochlear) surfaces in both knees of rabbits anesthetized with IV pentobarbital(25mgm/kg). Immediately post-operative, while each rabbit was under anesthesia, the right knee (IAGH) knee received an injection of 1.25 ml growth hormone solution and the left knee received 1,25 ml of control buffer solution. Limbs were not immobilized. Animals were sacrificed at intervals: 48 hours, 47 days, 58 days, and 103 days. Specimens of the trochlear surface were excised, decalcified, stained and prepared as slides.

RESULTS: Morphoangiogenesis appeared in stages in all the growth hormone injected knees. Islands of morphoangiogenesis response was observed in 18 per cent. of the surfaces in some of the controls. Morphoangiogenesis response was observed in 86 per cent. of the surfaces of the growth hormone(experimental) knees. The cascade of changes in growth hormone injected knees was as follows:

At 48 hours vascular changes consisted of duplication of the mature subchondral arteries. At 47 days mature vessels were replaced by fenestrated capillaries and a new cartilaginous surface was filled with chondrocytes. At 58 days the growth hormone injected knees were filled with vascular retes composed of fenestrated capillaries called Glomeruloids. These retes also produced stem cells and chondrocytes. At 103 days the growth hormone injected knees were observed to have new cartilaginous surfaces with vertical microfibrils and arcades. The new surface was firmly attached to host bone.

DISCUSSION: Morphoangiogenesis produced fenestrated capillaries from mature subchondral vessels by some form of rejuvenation. The signaling materials have not yet
been identified. Fenestrated capillaries were first identified in the 47 day specimen. It is likely that these fenestrated vessels which produce stem cells were formed earlier than 47 days. The author therefore theorizes that stem cells could be harvested before 47 days and that these earlier stem cells might be pluripotent. The cartilage production observed from 47 days to 103 days indicated that intra-articular growth hormone (IAGH) injections are capable of producing new joint surfaces. Indeed, the author, has since 1998, treated over 600 patients with arthritic joints with intra-articular injections of Human Growth Hormone. Knees have a 75 per cent. success rate, and ankles have a 95 per cent. success rate.

CONCLUSIONS

1. Growth hormone injected in a joint produced fenestrated capillaries which are normally observed only in a fetus. Fenestrated capillaries produce stem cells.
2. Growth hormone injections in a joint can produce new joint surfaces containing the components of normal mature joint surfaces. The joint surface regeneration requires the vascular changes produced by morphoangiogenesis.
3. The author theorizes that by early harvest (prior to 47 days) the stem cells might be pluripotent and therefore be able to form numerous tissues and organs other that cartilage.

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