MAGNETIC FIELDS IN MEDICINE: BONE REPAIR

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Evidence is accumulating which shows that magnetic fields may prove to have beneficial aspects for human beings. This information is being used in medical research, and therapeutic results obtained. Here some data are presented on one example: the healing of fractures of bones.

There is evidence that the earth's magnetic field may formerly have been greater than at present. The implications of such a situation, particularly to the life spans of the patriarchs, are discussed.

History

The rapid exponential decay of the earth's magnetic field with time is a most remarkable discovery of modern science.[1] This electromagnetic field (EMF) analysis has led to speculations of a young earth age and, through biological reports, of organic benefits. [2,3] Some of the reported bio-physical effects of variously applied EMF's seems to be a retardation of ageing and a stabilization of the genetic code.[4] Recently medical investigators have used EMF's in an increasingly wide variety of areas such as disintegration of intragastral blood coagula by electromagnetic resonators,[5] EMF anti-inflammatory affects in arthritic animals,[6] and in EMF treatment of traumatic edema in humans.[7]

Also dogs exposed to high electromagnetic pulses (447 KV/M) over long periods of time have shown no biological impairments and no injurious affects even to highly mitotic tissues such as hematopoietic bone marrow.[8] Partly based on similar findings the Occupational Safety and Health Administration decided that a proposed standard on human exposure to electromagnetic pulses should not be issued (St 75). Thus this expanding knowledge of the value of EMFs has led Dr. C. Andrew L. Bassett, professor of orthopedic surgery at New York's Columbia P&S, to say ". . a modern era of electrotherapy (via magnetic inducements, author) built on sound scientific foundations is being established."[9]

Fracture Therapy

The case of EMF influences on bone repair and healing is most interesting. Surprisingly this attempt was first introduced 168 years ago when a non-union fracture was treated electrically in 1812.[10]

In 1964 Dr. C. A. L. Bassett demonstrated that increased osteogenesis could be 'triggered' by weak electric currents.[11] Medical news (1980) offered a report that 4 of 5 patients with fractures in which the bone ends did not unite with time could heal themselves with electromagnetic units that promote bone growth at the fracture site.[12]

Dr. Bassett developed the technique of non-invasive stimulation by the application of electromagnetic coils strapped to the outside of the patient's cast. See Figure 1. Some of the EMF methodology is detailed in reference 13.

The original tests were done on humans with multiple failures of surgical repair and candidates for amputation.[14]* Although the procedure can not bridge wide gaps (greater than 1 cm),[15] an 80% success rate has been reported. In a study conducted over a five year period the inductive coupling resulted in functional union of 198 of 249 fractures with 86% joining in tibial fractures and 66% joining in femoral fractures.[16]

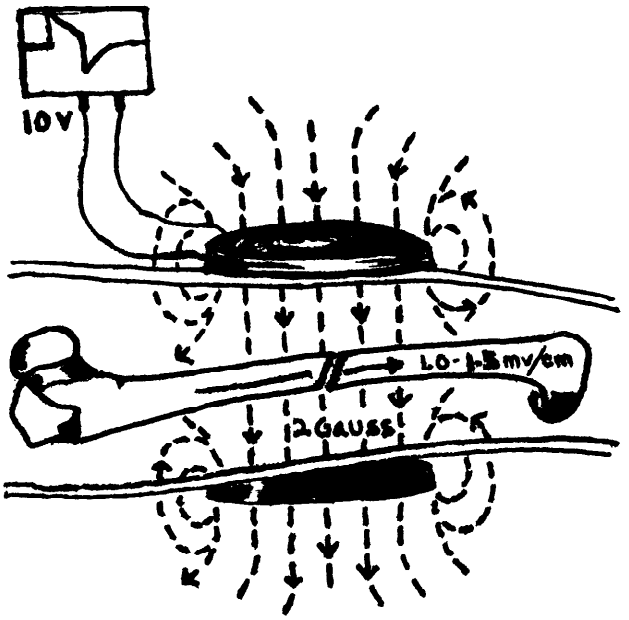

Figure 1. The application of electro-magnetic treatment to promote healing of a fracture. Drawn by the author, from information in Reference 12.

While more research into the nature of magnetic influences is needed, Dr. Bassett has stated that the EMF "modifies cell behavior in the gap", resulting in increased alkaline phosphate levels, mineralization, vascular invasion, and endochondrol ossification.[17] Also another influence of EMF stimulation seems to be the increased release of calcium in the tissues. The release of Ca^{++} from membranes has been shown to affect mitosis, secretion, transcription, cyclic AMP, and calcification.[18]

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* One remarkable case of the pathologic lesions studied, was the example of the oldest living individual with Thalassemia major. He had extensive heart and lung disease, profound osteoporosis, non-union and excruciating pain in both hips. A coil was fitted over the anterior surface of the right hip joint. Three months of 'stimulation' achieved union, increased radiographic bone density with the electromagnetic field, and completely eliminated the right hip pain. The same procedure followed on the left hip and produced the same results.

Ageing

The ageing process involves almost all organs, tissues, and many cellular operations. Of the many interrelated proposals on ageing no one theory can yet explain the entire phenomenon. However some observations in the context of this report are worth mentioning.

Generally functions of replacement, regeneration, and wound healing processes decline with time in ageing.[19] It has been shown that chromosomal aberrations accumulate in mammalian liver cells with ageing.[20] Collagen, 30-40% of total body protein and an important organic component of bone, undergoes proportional cross-linking with ageing in the soft tissues.[21] Advancing age on the skeletal bones corresponds with decalcification and a 15% loss in mass between youth and old age.[22] And changes in body ions seem to exhibit important indications of ageing. In this regard evidence from P. S. Timiras, M.D., Ph.D. and author of *Developmental Physiology and Ageing* is most interesting:

"For example, aprogeria-like syndrome, i.e., precocious ageing, can be induced in rats by administering hydrotachysterol (DHT), a derivative of viosterol, used in the treatment of rickets and other manifestations of faulty calcium and phosphate assimilation. Young animals in which certain types of disturbances of calcium metabolism have been so induced demonstrate a variety of changes such as normally occur in old individuals (e.g., kyphosis, loss of hair, wrinkling skin with histologic changes reminiscent of senile elastosis, loss of muscle protein, involution of the thymus and lymphatic organs, atrophy of the sex organs, anomalies of the teeth. Such experiments have been conducted in order to clarify whether certain disturbances in calcium metabolism may underlie conditions resembling ageing and thus represent a significant factor in ageing itself.)"[23]

Discussion

These findings encourage the rationale behind the theory that a once stronger earth EMF might have had beneficial influences on past organisms, with special concernment for the early people of Genesis. The studies appear to indicate that EMF's may have greater effects on young tissues[24] and healing and repairing tissues as reported here. The possibility that EMF's may affect the genetic code is important in future investigations on ageing. Also the evidence that EMF's affect tissue calcium coupled with the speculation of the role of calcium in ageing should promote investigation into this area.

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"At present, the current-pulse induced in tissue, is quasi-rectangular, asymmetrical, and has a rapidly rising leading edge (less 10^{-6}). The total pulse width is approximately 300 micro-sec, and the duty cycle approximately 5:1. The peak induced current density is = 10 uA per square centimeter of tissue which is, at least three orders of magnitude less than that required to trigger most excitable membranes. Significant tissue heating is precluded since only 10^{-10} watt/cm^2, average energy in the form of heat, needs to be dissipated by the tissue (resulting in only a 10^{-2} to 10^{-3} °C temperature change.) The patient, therefore, has no adverse sensations during treatment.

[14]*Ibid.*, p. 131.

[15]*Medical News, Op. Cit.*, p. 4.

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