

# Phyto-Oestrogens for Growth Modification – A Novel Therapeutic Possibility

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Height is not only important to physical health but also to social and psychological well-being. It is widely accepted that growth is a sign of health. At all statures an unattainable dream for many. At present, treatment with growth hormone alone or with growth hormone-releasing factor is the only treatment available. However, long-term treatment with growth hormone has numerous side effects, including rapid progression through puberty and a reduction in bone mineral density [1]. In addition, the need for daily injections makes growth hormone treatment unpopular; therefore, this treatment is reserved for patients with the most severe growth deficiencies.

The current methods for growth enhancement include growth hormone (GH) treatment alone or combined with a gonadotropin-releasing hormone (GnRH) analogue [2]. However, these treatments have several side effects: an increase in the rate of passing the growth spurt period and rapid progression through puberty; a reduction in bone mineral density [1]; increases in lean bodyweight, muscle mass and lipid weight; and uncertain short- and long-term benefits [3]. The levels of insulin-like growth factor-1 (IGF-1) and insulin-like growth factor-binding protein-3 (IGFBP-3) can be used as indices to monitor growth [4].

Oestrogens also play a pivotal role in the regulation of normal skeletal growth and maturation in both boys and girls [5]. In both sexes, oestrogen deficiency leads to the absence of a pubertal growth spurt [6].

Phyto-oestrogens are plant-derived nonsteroidal compounds that bind to oestrogen receptors (ERs) and have activities similar to that of oestrogen [7]. Phyto-oestrogens can increase alkaline phosphatase activity and promote the mineralization of bone in mouse calvaria osteoblast-like cells [8].

Over the years, our team has investigated Traditional Chinese Medicines and the active components of these medicines that enhance bone healing. We have identified several chemicals from plants that have strong bone healing effects. To examine the effects of various agents (e.g., naringin, statin and quercetin) on bone formation, we have used New Zealand White rabbits with surgically created bone defects in the parietal bone [9-12].

In addition, to investigate the possibility of modifying jaw growth either by physical or chemical means, we have researched the sphenoid occipital synchondrosis, which is the growth centre at the base of the skull. We developed an organ-culture technique for the synchondrosis in neonatal mice, and we have demonstrated that mechanical tension can enhance growth across the synchondrosis [13,12]. Using the same model, we have demonstrated that quercetin, a phyto-oestrogen commonly found in onions, apples and grapes, enhances bone healing and formation and promotes growth across the synchondrosis [14]. This result suggests a novel therapeutic possibility: growth can be enhanced by a single phytochemical.

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