ISSN: 2320 - 4230

Journal of Drug Discovery and Therapeutics 1 (5) 2013, 65-67

REVIEW ARTICLE

POST MENOPAUSAL OSTEOPOROSIS: TREATMENT WITH NUTRACEUTICALS

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ABSTRACT

Osteoporosis, a silent epidemic has become a major health hazard in recent years. Osteoporosis which increases bone fragility and thereby the risk of fractures is associated with high mortality, morbidity and high medical expenses throughout the world. Though ovarian hormone deficiency is a major risk factor for osteoporosis in the postmenopausal women. Phytoestrogens are believed to play a role in maintaining or improving skeletal health. The present work reviews scientific information on medicinal plants which have been documented for their antiosteoporotic activity. These plants may differ from each other in their mechanisms of action, they either bind with estrogen receptors which exhibit responses at the cellular and molecular levels, or in some cases they act by improving defense against oxidative stress.

KEYWORDS: Antiosteoporotic, phytoestrogens, medicinal plants, postmenopausal osteoporosis.

INTRODUCTION:

Osteoporosis has become a major health hazard afflicting over 2000 million people worldwide (Meryl et al 1997). It is a major growing health problem for elderly women associated with ovarian hormone deficiency following menopause and is by and far the most common cause of age related bone loss in women. According to the WHO "Osteoporosis is a disease characterized by low bone mass and micro architectural deterioration of bone tissues, leading to enhanced fragility and consequent increase in fracture risk that results in fractures with minimal trauma". Osteoporosis is one of the most widespread metabolic bone disorders (Henry, 2001), affecting one in three women and one in twelve men (Ligett and Reid, 2000). A sharp decrease in ovarian estrogen production is the predominant cause of rapid, hormone related bone loss during the first decade after menopause (Wehren, 2003). The common sites of fracture among postmenopausal women include the vertebrae, forearm and hip. Globally, osteoporosis is highest in Whites and Asians and lowest among Blacks. Blacks have more bone density than other racial groups, lowering their risk of osteoporosis (Kumar and Clark, 2002). In India, based on 2001 census, approximately 163 million Indians are above the age of 50 and this number is expected to increase to 230 million by 2015 (Gali, 2001). With aging, however, an erratic absorption of calcium from gut disturbs the calcium homeostasis leading to an imbalance in the calcium regulating hormones (parathyroid hormone and calcitonin) and thereby increase bone turnover (Bennet et al 1984). Osteoblastic activity and calcium absorption from the gut also suffers with the age (Canalis et al 1988). In addition to menopause and aging, hereditary factors, lack of exercise or immobilization, lifestyle, prolonged steroid administration, excessive diet, alcohol intake, smoking, thyroxin therapy and geographical variations are the major causes of osteoporosis, among which lifestyle changes, diet and estrogen deficiency are modifiable factors, whereas hereditary factors are non modifiable (Adams, 1989).

Osteoporosis is a silent disease, reflected only in a low bone density, till a fracture occurs. It is best diagnosed by the estimation of bone mineral density and bone mineral content by Duel energy X-ray absorptiometry (DXA) or peripheral quantitative computed tomography (Genant et al, 1989). Besides Hormone Replacement Therapy, many pharmacological agents, used to manage the osteoporosis act by decreasing the rate of bone resorption, thereby slowing the rate of bone loss or by promoting bone formation. To overcome the wide range of side effects produced by these synthetic drugs, there is an increasing demand for 'green medicines' which are thought to be healthier and safer for the treatment of osteoporosis. The phytoestrogens, which are known to bind to the estrogen receptor sites of the cell and trigger the components and processes of estrogenic activity, have a promising role in the treatment of osteoporosis (Sivarajan and Balachandran, 1994). The isoflavonoids are among the most active phytoestrogens in the flavonoid class. Ipriflavone, a synthetic flavonoid derivative has been found to be effective in preserving

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bone mass in several models of experimental osteoporosis (Nadkarni, 1954 and Benvenuti et al 1991). The isoflavones found in soybeans, such as genistein, were found to prevent bone loss in the ovariectomized rat model of osteoporosis (Udupa et al, 1965, Chopra et al, 1976). Hadjod, soyabean and pila bhagra have been documented for their antiosteoporotic activity.

(1) HADJOD (*CISSUS QUADRANGULARIS* LINN.):

Cissus quadrangularis (Vitaceae), a rambling shrub, characterized by a thick quadrangular fleshy stem, is an edible plant found in hotter parts of India, Sri Lanka, Malaya, Java and West Africa. Commonly known as the "bone setter," the plant is referred to as "Asthisamdhani" in Sanskrit and "Hadjod" in Hindi because of its ability to join bones (Enechi and Odonwodo, 2001). Nadkarni describes the root as most useful for the fractures of bones, with the same effects as plaster externally (Krebs et al, 2004). Since anabolic/androgenic compounds are known antagonists to the glucocorticoid receptor as well as promoters of bone growth and fracture healing, it has been postulated that *C. quadrangularis* possesses anabolic and androgenic properties (Prasad and Udupa, 1963, Shirwaikar et al, 2006). In addition to speedening the remodelling process of the healing bone, it also leads to a much faster increase in bone tensile strength and fracture healing time (Anonymous, 1964). The findings assessed on the basis of biomechanical, biochemical and histopathological parameters showed that the ethanol extract of the plant has a definite antiosteoporotic effect (Boericke, 1921). The alcoholic extract was shown to enhance the development of cortical bone and trabeculae in the foetal femur (Circosta et al, 2007). The increased bone formation in the *C. quadrangularis* plant extract treated pups was attributed to the rich calcium and phosphorous present in the plant. The stem extract of this plant contains a high percentage of calcium ions (4% by weight) and phosphorus, both essential for bone growth. Thus the plant *C. quadrangularis* appears to be very useful in treating diseases involving deficiency in the bone formation and fracture healing (Zervakis et al, 2001).

(2) SOYBEAN (*GLYCINE MAX* L.) MERR:

The soybean (*Glycine max*), belonging to the Family Fabaceae, is a species of legume native to East Asia. The pods, stems, and leaves are covered with fine brown or grey pubescence. The oil and protein content together account for about 60% of dry soybeans by weight with protein at 40% and oil at 20%. Soy foods and supplements have been the subject of much interest for the reduction of menopausal symptoms because of their high concentrations of phytoestrogens. At the end of three months, there were no differences between the treatment and control group suggesting that soy isoflavones do not affect *in vivo* biological indicators of estrogenicity and most likely act more like Selective Estrogen Receptor Modulators (SERMs). However, a recent study in which 25g of soy protein was substituted for meat in the diet showed no improvement of calcium retention, cardiovascular, or bone health indicators in postmenopausal women (Roughead et al, 2005).

(3) PILA BHRINGA (*WEDELIA CALENDULACEA* LESS.):

Wedelia calendulacea (Less.) or *W. chinensis* known also as pila bhangra is a perennial herb with erect stems, 20-40 cm. high, with bright yellow flowers and a light, camphor like odor. The fruit is an achene. It grows wild in wet places and is propagated by seeds. The plant is abundantly found in India, and is used traditionally as a cholagogue and deobstruent in hepatic enlargement and jaundice. A decoction of the herb is used in uterine hemorrhage and menorrhagia. The leaves contain as its principal constituent, isoflavanoids and wedelolactone, which is analogous in structure to the clover estrogen coumestrol (Roughead et al, 2005). Shirwaikar *et al* studied the antiosteoporotic effect of the ethanol extract of *W. calendulacea* in the ovariectomized rat model of osteoporosis, at two different dose levels of 500 and 750 mg/kg body wt. The findings, assessed on the basis of biomechanical and biochemical parameters, showed that the ethanol extract of the plant had a definite protective effect. They suggested that the presence of isoflavones and wedelolactone, which are known to act as phytoestrogens may be responsible for the antiosteoporotic activity (Shirwaikar et al, 2006).

SUMMARY:

The silent epidemic osteoporosis has been neglected for years and is often under diagnosed and under treated. The awareness of the consequences of the disease, among the public and a majority of health professionals particularly in developing countries, is poor. As the longevity of the world population increases, the risk of low bone mass and osteoporosis is also increasing. Treatment modalities for osteoporosis include anabolic agents, antiresorptive agents and estrogenic modulators. Phytoestrogens with established safety may be useful as alternative medicines for osteoporosis especially in the early stages along with

exercise, calcium and vitamin D supplementation to slow down the bone loss.

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