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Potential osteogenic activity of ethanolic extract and oxoflavidin isolated from *Pholidota articulata* Lindley ☆

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ABSTRACT

Ethnopharmacological relevance: *Pholidota articulata* Lindley (PA) locally known as *Hadjojen* (bone jointer) belongs to family Orchidaceae is used for healing fractures in folklore tradition of Kumaon region of Uttarakhand, Himalaya, India. Bone is a dynamic organ and is constantly being remodeled in order to facilitate growth and repair. This process requires the involvement of bone forming osteoblast and bone resorbing osteoclast cells, which function in generating and mineralizing bone, giving strength and rigidity to the skeletal system. Present study was aimed to determine the therapeutic potential of ethanolic extract of PA and its isolated compound oxoflavidin, by characterizing their fracture healing properties.

Materials and methods: Ovariectomized (Ovx) estrogen deficient adult female Balb/c mice were used for in vivo evaluation of osteogenic or bone healing potential of ethanolic extract of PA. Further, its isolated compounds were tested for their osteogenic efficacy using alkaline phosphatase assay and mineralization assay in vitro in mice calvarial osteoblasts.

Results: The ethanolic extract of PA exhibited significant restoration of trabecular micro-architecture in both femoral and tibial bones. Additionally, treatment with PA extract led to better bone quality and devoid of any uterine estrogenicity in ovariectomized estrogen deficient mice. One of the isolated compound, oxoflavidin enhanced ALP activity (a marker of osteoblast differentiation), mineral nodule formation and mRNA levels of osteogenic markers like BMP-2, Type 1 Collagen, RUNX-2 and osteocalcin.

Conclusion: These results warrant that ethanolic extract of PA and it's pure compound oxoflavidin have fracture healing properties. The extract and oxoflavidin exhibit a strong threapeutical potential for the treatment and management of postmenopausal osteoporosis.

1. Introduction

Orchids contains a wide range of bioactive compounds viz. alkaloids, flavonoids, glycosides, benzyl derivatives, phenanthrenes, terpenoids etc. used for the treatment of various diseases (Hossain, 2011). Genus *Pholidota* has nearly, 46 species widely distributed all over the world, only 5–6 species of them have been investigated in some scientific details (Gaur, 1999; Bandi and Lee, 2011). *Pholidota chinensis* Lindley and *Pholidota yunnanensis* Rolfe were shown to be rich source of stilbenoids and also possesses sedative and anticonvulsant activities (Bandi and Lee, 2011). *Pholidota articulata* Lindley (PA) is distributed throughout montane to submontane zones from Uttarakhand Himalayas (Kumaon and Garhwal) to Aruunanchal Pradesh and Indo-China to Malaysia (Gaur, 1999). Poultice made from PA locally known as *Hadjojen* (bone jointer), is one of the most common ailment used for healing fractures in folk tradition of Kumaon, Uttarakhand, India (Jalal et al., 2009; Sharma et al., 2014a, 2014b). In Ayurvedic formulation, it is referred as "*Jivanti*" and used as tonic (Ballabha et al., 2013).

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