Comparative “in vitro” evaluation of the antiresorptive activity residing in four Ayurvedic medicinal plants. *Hemidesmus indicus* emerges for its potential in the treatment of bone loss diseases

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**ABSTRACT**

*Ethnopharmacological relevance:* Four Indian plants, traditionally used in Ayurvedic medicine: *Asparagus racemosus* Willd., *Emblica officinalis* Gaertn., *Hemidesmus indicus* R. Br., and *Rubia cordifolia* L. were selected on the basis of their ethnobotanical use and of scientific evidence that suggests a potential efficacy in the treatment of bone-loss diseases. The antiresorptive properties of the four plants have been investigated. The aim was to provide adequate evidence for the exploitation of natural compounds as alternative therapeutics for the treatment of diseases caused by increased osteoclast activity.

*Materials and methods:* Decoctions were prepared from dried plant material according to the traditional procedure and standardization by HPLC was performed using marker compounds for each species. Total polyphenols, flavonoids and radical scavenging activity of the decoctions were also determined. The bioactivity of the plant decoctions was evaluated in subsequent phases. (1) A cytotoxicity screening was performed on the mouse monocyctic RAW 264.7 cell line to define the concentrations that could be utilized in the following step. (2) The antiresorptive properties of plant decoctions were compared with that of a “gold standard” drug (alendronate) by measuring osteoclastogenesis inhibition and osteoclast apoptosis. (3) The toxic effect on bone forming cells was excluded by evaluating the impact on the proliferation of osteogenic precursors (mesenchymal stem cells, MSC).

*Results:* All the decoctions inhibited osteoclastogenesis similarly to alendronate at the highest doses, but *Hemidesmus indicus* and *Rubia cordifolia* were also effective at lower concentrations. Apoptosis increased significantly when cells were exposed to the highest concentration of *Emblica officinalis*, *Hemidesmus indicus*, and *Rubia cordifolia*. All concentrations of *Emblica officinalis* tested inhibited the proliferation of osteogenic precursors, while only the highest doses of *Asparagus racemosus* and *Rubia cordifolia* were toxic. On the contrary, *Hemidesmus indicus* did not affect osteogenic precursor growth at any concentration tested.

*Conclusion:* Among the medicinal plants included in the study, *Hemidesmus indicus* showed the greatest antosteoclastic activity without toxic effect on osteogenic precursors. Therefore, *Hemidesmus indicus* exhibits the properties of an antiresorptive drug and represents the ideal candidate for further clinical investigations.