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Review

Use of medicinal fauna in Mexican traditional medicine

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ABSTRACT

Ethnopharmacological relevance: Mexico has great biodiversity of fauna. The use of fauna with medicinal properties is a common practice since pre-Hispanic times. In the last decade, there has been an interest in ethnozoological studies in Mexico. Therefore, more studies are needed in order to gather information regarding the use of fauna with medicinal properties in México. Ethnozoological studies are necessary in order to discover new medications for human health. This review presents current information in terms of ethnozoological, conservation status, trade, toxicological and pharmacological effects of fauna used for medicinal purposes in Mexican traditional medicine (MTM), based on scientific literature. Future prospects for research with medicinal fauna are discussed.

Materials and methods: Bibliographic investigation was carried out by analyzing recognized books and peer-reviewed papers, consulting worldwide accepted scientific databases from the last five decades. Reports included in this review complied with the three criteria cited as follows: (i) used in Mexican traditional medicine for medicinal and/or magical-religious purposes, (ii) with experimental studies regarding the toxicological or medicinal effects and/or with studies exploring mechanisms of medicinal effects, and (iii) with information obtained from a clear source.

Results: A total of 163 animal species, belonging to 79 families and 4 taxonomic categories, used for medicinal purposes are reported in this review. Medicinal fauna used in MTM come from birds (48), fishes (3), insects (22), mammals (49) and reptiles (41). The most versatile species which had the greatest number of medicinal properties were *Mephitis macroura* (21 uses), *Crotalus atrox* (17 uses), *Dasypus novemcinctus* (13 uses) and *Didelphis virginiana* (13 uses). However, 14 of the 161 species listed in this review are classified as endangered. Animal species are mainly used for the treatment of inflammatory, respiratory and gastrointestinal diseases. Furthermore, insects and reptiles are the animal groups with more pharmacological studies. Approximately, 11% and 5% of medicinal fauna have been tested in terms of their pharmacological and toxicological effects, respectively.

Conclusion: Despite the use of medicinal fauna in MTM, during centuries, there are a very limited number of scientific studies published on this topic. This review highlights the need to perform pharmacological, toxicological and chemical studies with medicinal fauna used in MTM.

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1. Introduction

Along the history, humans have searched on nature how to obtain resources for their basic needs (Cragg and Newman, 2001). Many years of observation and experimentation have provided medical knowledge in the use of natural products (Alves and Rosa, 2013). Around 60% of commercially available drugs are based on bioactive compounds extracted from natural sources (Cragg and Newman, 2013). A great number of these natural products have come to the market from the scientific study of remedies traditionally used by various cultures around the world (Cragg and Newman, 2013).

Zootherapy is defined as healing human diseases using animals or animal-derived products (Costa-Neto, 1999). Nowadays, the use of animals with medicinal properties is a common practice worldwide. In China, more than 1500 animals are used as medicine, in India 15 to 20% of the Ayurvedic medicine is based on animal-derived substances. In Brazil, 326 animal species are recorded with medicinal purposes (Costa-Neto and Alves, 2010), whereas 584 medicinal animal species are reported in Latin America (Alves and Rosa, 2005; Alves and Alves, 2011).

Mexico has a great biodiversity of fauna, accounting about 10% of the reported biological species on the planet and ranks first place in terms of reptiles (717), of which 50% are endemic, second in mammals (491), fourth in amphibians (290) and tenth in birds (1054) (PROFEPA, 2009; Instituto Nacional de Estadística y Geografía (INEGI), 2010). However, many factors such as the illegal trade have contributed to the decrease of animal populations in Mexico (PROFEPA, 2009; Instituto Nacional de Estadística y Geografía (INEGI), 2010). Mexican traditional medicine (MTM) is based, mainly, on herbolary. According to Alves and Rosa (2010), the lack of ethnozoological studies in a region might contribute to an underestimation of the importance of zootherapeutic resources. Ethnozoological studies are important as a step in the discovery of new medications (Alves and Rosa, 2005). In the last decade, there has been a great interest in ethnozoological studies in Mexico (Jacobo-Salcedo et al., 2011). Therefore, more studies are needed in order to gather information regarding the use of fauna with medicinal properties in México. It is important to document the traditional knowledge in Mexico because many rural communities are losing their socioeconomic and cultural characteristics (Alonso-Castro et al., 2011). This review presents current information in terms of ethnozoological, conservation status, trade, toxicological and pharmacological effects of fauna used for medicinal purposes in Mexico, based on scientific literature. Future prospects for research with medicinal fauna are discussed.

2. Medicinal animals in history

The traditional use of animals and their products for medicinal purposes has been documented since ancient times in the civilizations from China, Egypt, Greece and Mesopotamia (Lev, 2003). For instance, the Papyrus Ebers, written around 1550 B.C. in Egypt, includes more than 800 prescriptions of herbs, minerals and animals (Lev, 2003). The Sharaka Samhita, the first treatise written around 900 B.C. in India, indicates the practice of Indian Ayurveda and contains references to nearly 380 types of animal substances (Unnikrisnhan, 1998). Dioscorides, a Greek soldier and traveler, wrote about A.D. 65 “De Materia Medica” in five books, the most detailed collection of medicinal uses of herbs, as well as those derived from animals and minerals. Almost half of book II is devoted to the discussion of the medical properties of a great number of animals and their preparations (MacKinney, 1946).

3. Use of medicinal fauna in Mexico during pre-Hispanic times

Before the arrival of the Spaniard, Mexico was divided into 2 geographic regions: Mesoamerica (Centre and Southern Mexico) and Aridoamerica (Northern Mexico). Cultures such as Aztec and Maya were settled in Mesoamerica, whereas civilizations such as Tarahumaras were established in Aridoamerica. According to Tarahumaras and Aztecs, a disease was the result of lost in the equilibrium between the interaction of body and the cosmos, and therefore treatments for diseases were directed toward restoring this order (Guerra, 1966; Saucedo-Sánchez de Tagle, 2007). In Mayan culture, diseases were the result of the disobedience to gods (Gebler, 2011). In MTM, medicinal flora and fauna were used by a priest called “curandero” or “h-men” (in Mayan culture) to heal diseases (Guerra, 1966; Urzaiz-Jimenez, 2002; Saucedo-Sánchez de Tagle, 2007; Gebler, 2011).

In Mexico during pre-Hispanic times, many animals were considered as gods because they were a symbol of nature′s strength. In Mexico during pre-Hispanic times, many animals were considered as gods because they were a symbol of nature′s strength. Animals were considered as transmitters of relief or as divine messengers. For instance, owl (*Glaucidium brasilianum*) was considered as a messenger that something bad is going to happen (Saucedo-Sánchez de Tagle, 2007). Because of this, animals were venerated by Aztec and Mayan cultures, as well as by Tarahumaras (Guerra, 1966; Gómez-Álvarez et al., 2005; Saucedo-Sánchez de Tagle, 2007). During pre-Hispanic times, approximately 102 ingredients from animal origin such as ducks (Anatidae), pigeons (Columbidae), falcons (Falconidae), eagles (Accipitridae), bees (Meliponidae), ants (Formidaceae) and hens (Phasianidae), were used to treat several diseases (Anzures y Bolaños, 1983). The manuscript Libellus de Medicinalibus Indorum Herbis (written in XVI century), mentions the use of more than 80 animals for medicinal purposes (De la Cruz and Juan Badiano, 1991). Other manuscripts such as Chilam Balam from Na (64 pages written in XVII century), Chilam Balam from Chan Cah (128 pages written in XVII century) and Libro de medicinas muy seguro, para curar dolencias, con yerbas muy experimentadas, y provechosas, de esta provincia de Yucathan (1751) describe, each, the use of some animals in Mayan region during pre-Hispanic and Colonial times in Mexico (Gubler, 2000). For instance, it is mentioned that iguana