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Safeguarding folk knowledge of medicinal animals being lost in China: Urgent call for documentation, preservation, and scientific research

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Author contributions
Lin SS and Luo BS conceived the idea and drafted the manuscript. Wu BH and Hu RC contributed to revisions. All authors reviewed the final manuscript.

Competing interests
The authors declare no conflicts of interest.

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Abbreviations
TCM, traditional Chinese medicine.

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Abstract
Traditional medicinal animals and their derivatives hold a significant place within the traditional Chinese medicine framework. However, substantial knowledge about medicinal animals is being lost – particularly within China's folk practices and ethnic minority groups – remains unrecorded and unverified scientifically. Such knowledge, primarily preserved through oral instruction, is now at risk of disappearing due to its fragmented and regionalized nature. This paper underscores the importance of documenting and scientifically validating these medicinal animals as valuable resources. We advocate for a comprehensive, systematic approach to recording, screening, and verifying the pharmacological mechanisms of medicinal animals. It can contribute to the modernization and globalization of traditional Chinese medicine. In the future, interdisciplinary and international collaborations are essential to advance the systematic documentation and scientific management of medicinal animal knowledge, to ensure its preservation and application in global healthcare, sustainable health practices, and biodiversity conservation efforts.

Keywords: medicinal animals; traditional knowledge; TCM; scientific validation; sustainability; biodiversity conservation

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Highlights

Substantial traditional knowledge about medicinal animals in China is being lost due to modernization and globalization. This paper advocates for the systematic documentation and scientific validation of medicinal animal practices to preserve their cultural and medicinal value. By integrating traditional knowledge with modern science, these efforts could contribute to global healthcare, sustainable development, and biodiversity conservation, emphasizing the importance of interdisciplinary and international collaboration.

Medical history of objective

The use of medicinal animals in traditional Chinese medicine can be traced back to ancient texts such as *Shennong Bencao Jing* (*The Divine Farmer's Classic of Materia Medica*, about 220–280 C.E., the earliest existing pharmaceutical monograph in China) and later comprehensive works like *Compendium of Materia Medica* by Li Shizhen (1578 C.E.). These texts document the therapeutic applications of various animal-derived substances for conditions ranging from detoxification to joint pain relief, highlighting their importance in traditional medical systems.

Background

Medicinal animal products are integral to traditional medical systems worldwide, embodying a wealth of ethnomedicinal knowledge across diverse cultures and healing practices [1]. However, this knowledge is at risk of disappearing under the pressures of modernization and ecological challenges [1]. With the expansion of traditional Chinese medicine (TCM) on a global scale, research efforts have increasingly focused on a few well-known medicinal animals, such as deer antlers and bezoar, often overlooking the wide array of animals used in regional folk practices. Compared to botanical medicines, these animal-based remedies have yet to enter mainstream medical systems and are often excluded from global recognition and application [1, 2]. Therefore, the scientific exploration and validation of these valuable traditional animal-based medicines are essential – not only to advance the modernization and globalization of TCM but also to preserve the diversity of global traditional knowledge. This concept is illustrated in Figure 1, which presents the study framework and highlights potential future directions in this field.

Undocumented traditional knowledge

In the ethnic communities and remote regions of China, the knowledge of medicinal animals is still largely transmitted orally, lacking systematic or written documentation and scientific validation [3, 4]. Additionally, geographic limitations and variations in the oral transmission of animal-based medicine create significant regional and cultural differences. These differences encompass diverse ethnic and subethnic practices, as well as variations in species distribution and usage methods. At the same time, there is also cultural exchange. For instance, "fragrant medicines" used by the Hui ethnic group in western China and on the Silk Road include a variety of animal-derived ingredients, such as the fat of a lion living in Africa. In the Zhuang and Miao regions of southern Guangxi, bile from certain snake species is widely used for treating rheumatism and detoxification. Similarly, in the Hakka communities of coastal Fujian, a type of ant is used to alleviate joint pain.

This lack of documentation and validation not only limits the dissemination and application of these practices but also diminishes their scientific potential. Although certain folk remedies show remarkable efficacy under specific conditions, they struggle to gain acceptance in mainstream medical systems due to the absence of scientific validation, and they risk being misunderstood or disregarded. This disconnect between traditional knowledge and its applications significantly constrains the innovative potential of TCM and hampers its impact on global healthcare systems [5, 6]. Furthermore, pressures from modernization and globalization are accelerating the loss of this invaluable knowledge of medicinal animals [5, 6]. Table 1 provides an overview of 10 typical animal-related medicinal practices, illustrating the breadth of traditional knowledge at risk [7–16].

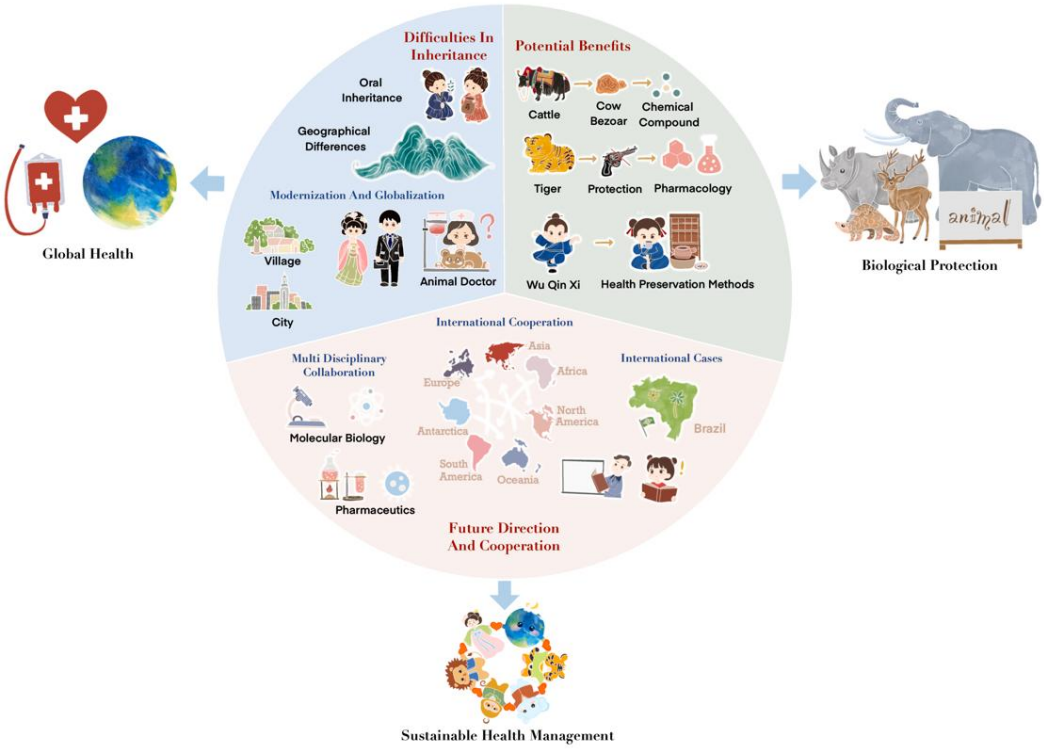

Figure1 Safeguarding folk knowledge of medicinal animals being lost in China

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Table 1 10 Typical animal-related medicinal knowledge

No.	Class	Species	Value
1	Oligochaeta	*Pheretima Aspergillum*	It is a famous TCM used for high fever and irritability [7]. In 2023, China strengthened the protection of wild earthworms.
2	Cephalopoda	*Sepiella Maindroni*	The cuttlebone was widely used in the treatment of the digestive system [8].
3	Insecta	*Polyrhachis Vicina*	Some of the ant was widely used to make medicinal liquor for rheumatism [9].
4	Arachnida	*Buthus Martensii*	It is a famous TCM and has even been made into a delicacy [10].
5	Amphibians	*Bufo Gargarizans*	The processed product of the toad and its skin gland secretions is a famous TCM [11].
6	Reptiles	*Deinagkistrodon Acutus*	This snake is thought to treat strokes and similar conditions, and the snake venom is useful [12].
7	Ornithischia	*Centropus Sinensis*	It was used to make medicinal liquor and had been a nationally protected animals [13].
8	Ornithischia	Wu Qin Xi	A TCM Exercises which imitate the gesture of 5 species of bird [14].
9	Mammalia	*Panthera* spp.	Tiger bones were very valuable medicinal materials in the world, and the research work on substitutes for endangered wildlife resources was important [15].
10	Mammalia	*Bos* spp.	Calculus Bovis Stativus was widely used in the treatment of neurological disorders [16]; Artificial products have now partially replaced its use.

TCM, traditional Chinese medicine.

Potential benefits of scientific validation and preservation

Scientific validation plays a pivotal role in addressing the challenges associated with traditional knowledge of medicinal animals. By applying modern chemical and pharmacological research, it becomes possible to identify the specific compounds and mechanisms underlying these traditional animal-based remedies. For instance, taurine from bezoar is widely used in modern medical treatments [16], and hirudin from leeches has become essential in anticoagulant therapies [17]. Similarly, the scientific validation of various folk medicinal animals could reveal new research pathways in TCM, elevating the role of these traditional practices within contemporary medical frameworks and supporting their sustainable use.

The need for such validation is increasingly pressing given that many medicinal animals are now at risk from overharvesting, with certain endangered species – such as tigers and rhinos – drawing a global conservation focus [18]. Research into the specific mechanisms of these traditional medicines can aid in developing synthetic alternatives or botanical substitutes, reducing dependence on wildlife. For example, synthetic tiger bone and herbal substitutes have begun to be used, helping not only to conserve biodiversity but also to foster a more ecologically balanced approach within traditional medicine.

Expanding scientific research into these folk medicinal practices could also offer valuable contributions to global health strategies. The TCM approach emphasizes holistic, preventive health practices, known as “Yang-sheng” (regimen), which also incorporate the use of animal and medicinal animals as one aspect of its broader framework. Certain trace or combined components found in these animals may hold therapeutic potential for addressing global health issues such as chronic diseases, immune disorders, and infectious diseases. Through systematic research, this knowledge could both revitalize TCM and introduce promising resources and tools to the global health landscape.

Future directions and opportunities for collaboration

Future research will require extensive interdisciplinary collaboration to integrate traditional knowledge with modern scientific methods effectively. Fields such as ethnopharmacology, pharmacology, ecology, and molecular biology all hold potential contributions to this endeavor. Through fieldwork and multicomponent analysis, researchers can not only systematically document previously undocumented traditional knowledge but also investigate its pharmacological components in depth, thus laying a foundation for future drug development [19, 20].

Equally important, international collaboration plays a vital role in advancing research on traditional knowledge of medicinal animals [21, 22]. Although Chinese folk knowledge in this area is unique, global scientific resources and collaborative networks provide broader research platforms. With the growing popularity of TCM worldwide, an increasing number of international research institutions are recognizing the potential ability of traditional medicinal animals for antibacterial, antiviral, and immunomodulatory applications. In recent years, numerous international projects and institutions have undertaken cross-cultural and interdisciplinary collaborations to validate and modernize this knowledge [23, 24]. Such collaborations not only accelerate scientific investigation into active compounds but also promote the dissemination and application of traditional knowledge globally. These partnerships also offer new opportunities for Chinese traditional medicine. By leveraging advanced research technologies and methodologies, TCM researchers can further the standardization and scientific management of medicinal animal resources, ensuring sustainable and responsible use on a global scale.

Prospects

Looking ahead, the potential of traditional knowledge of medicinal animals remains largely untapped. With scientific validation, interdisciplinary research, and international collaboration, the knowledge can be effectively integrated into modern medical systems to contribute to global health practices, biodiversity conservation, and sustainable development.

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