

Research Article

Studies on Ethnozology in Sudan: 1. Zootherapeutic Practices

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Abstract: The present ethno-zoological study recorded the indigenous knowledge related to usage of different animals, their parts and products in zoo therapeutic practices in Sudan. Meetings with practitioners and elderly people were carried out intermittently from 2010 to 2019. Animals species and their products believed to cure 108 different therapeutic disorders amount to 49. The disorders included tuberculosis, earache, gastro-intestinal disturbances, respiratory disturbances, skin related problems among others. The zootherapeutic applications were based on invertebrates, fishes, reptiles, birds and both domestic and wild mammals. Some animal species like Bees *Apis* spp. and the one-humped camel, *Camelus dromedaries* dominated the medicinal resources. Of the total 49 animal species reported Rhim gazelle and the Soemmerring's gazelle. (4%) are included in IUCN red list data as endangered and vulnerable species, respectively. Thirteen (27%) animal species are enlisted in the Convention of international Trade in Endangered Species appendices I, II, and III. This kind of neglected traditional knowledge should be included into the strategies of conservation and management of fauna resources in Sudan.

Keywords: Ethnozology, Zoo therapeutic, Sudan.

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INTRODUCTION

Zootherapy is the cure of human diseases by using prescriptions obtained from animals (Costa-Neto, E. M. 2005). It is of importance in traditional medicine strategy (WHO 2019). Zootherapeutic practices by different ethnic groups are well documented in India (Kakati, L. N. *et al.*, 2006; Jamir, N. S., & Lal, P. 2005; Mahawar, M. M., & Jaroli, D. P. 2006); Latin America (Alves, R. R. *et al.*, 2007; Martínez, G. J. 2013) and several European countries (Pieroni, A., Grazzini, A., & Giusti, M. E. 2002; Hatfield, G. 2004; Vallejo, J. R. *et al.*, 2017). The findings encouraged tapping different faunal forms for novel drugs and led to promising results. Examples are anticancer potentials of peptides of coelomic fluid of earthworm *Eudrilus eugeniae* (Dinesh, M. S. *et al.*, 2013); inhibitory effects of camel urine components of the growth of cancer cells and shrink of tumors and secondary metastases as indicated by *in vitro* and *in vivo* studies (Romli, F. *et al.*, 2017).

Ethnozological remedial uses by the indigenous inhabiting areas close to National Parks Mahawar, M. M., & Jaroli, D. P. (2006), or wildlife sanctuary Borah, M. P., & Prasad, S. B. (2016) raised issues relevant to conservation, sustainable management of natural resources and involvement of the people in these areas. A number of investigators (Martínez, G. J. 2013; Alves, R. R. N. 2012) adequately addressed the conservation issue. Research interest in ethnobiology have increased and contributed to raise the level of understanding traditional medical knowledge and practices. Worldwide, ethnobotanical information were well documented than ethnozological information. To the best of our knowledge, this Ethnozological study is the first of its kind in Sudan.

METHODS

Information was gathered intermittently from 2010 to 2019 from practitioners and elderly people.

RESULTS

Database

The study showed that the 49 animal species used in therapeutic treatments in Sudan (Table 1) belongs to five taxonomic groups. These is categorized as seven invertebrates (14%), two fish species (4%), 6 reptilian species (12%), 8 birds species (16%) and 26 mammalian species (53%).

Reported curative uses of meat amounted to 27 (25%). Honey and its related products are used to cure 25 (23%) diseases; the one-humped camel products are used for 13 (12%) diseases; cuttlefish are used to cure 8 (7%) of the diseases; wasps house and oil of animals were reported three times (3%) the rest of the animals are used to treat 1 to 2% of the cases.

It is apparent from Tables 1 and 2 that fishes are the lowest and mammals are the highest used animal species for traditional medicinal purposes.

Table 1. Animals, their parts and products used for therapeutic purpose in Sudan. The conservation status of the animal species followed (IUCN, 2019; CITES, 2019).

English, Scientific and Arabic names	Part used	Prescribed to cure/ trade use
Terrestrial arthropods all the listed species are all LC*		
Any Grasshoppers	Feces soaked in water and taken orally	Jaundice, Diabetes
	Honey	Constipation, cold, cough, rheumatoid arthritis, diarrhea, obesity, diabetes, pimples, bed sores and diabetic wounds
	Propolis	Antifungal, antimicrobial and wound healing.
Honey bee <i>Apis</i> spp.	Royal jelly	Asthma, hay fever, liver disease, pancreatitis, type 2 diabetes, diabetic ulcers, insomnia, fatigue and fertility problems
	Venom	Rheumatoid arthritis, neuralgia, sclerosis, malaria
Wasps	Its house is made into a paste and used externally as a mask for	Tonsillitis, sore throat and breast pain
A variety of black ants,	Kept with the penis in a cloth like condom	Relieve urine retention when starts biting
Spiders	Spider web	Antiseptic for wound healing.
Marine invertebrates all the listed species are all LC		
Giant clam <i>Tridacna maxima</i>	Gelatinous tissue	Hemorrhoids
Cuttlefish <i>Sepia officinalis</i>	Powder of endoskeleton	Cure kidney, liver and stomach diseases, some intestinal disorders, skin rashes, ulcers lesions. Stops bleeding of the uterus, enuresis
Pisces: Both are LC		
Female tiger shark, <i>Galeocerdo cuvier</i>	Foetus	Aphrodisiac
Catfish <i>Synodontis</i> spp.	Liver	Malaria
Reptilia: all listed species are LC		
Any skink	Fried meat	Whooping cough
Desert monitor <i>Varanus griseus</i> I		
Savannah monitor <i>Varanus exanthematicus</i> II	Oil	Earache
Spiny-tailed Lizard <i>Uromastyx dispar</i> and <i>Uromastyxocellata</i> II	Oil	Leprosy
Crocodile, <i>Crocodylus niloticus</i> I, II	Dry penis powder	Aphrodisiac
Aves: all listed species are LC		
Kite <i>Milvus</i> spp.II		
Lappet-faced (Nubian) Vulture <i>Torgos trachelotus</i>	Fried meat	Asthma
White-headed Vulture <i>Trigonoceps occipitalis</i> II	Meat	Night blindness (nyctalopia)
Quail <i>Coturnix</i> spp.	Meat	Chest pain
	Oil	Massage for muscles and to easing joints
Ostrich, <i>Struthio camelus</i> I	Powdered gizzard drink	To facilitate release of kidney and ureteric stones

Crow <i>Corvus albus</i>	Fried meat	Whopping cough
Doves <i>Streptopelia</i> spp.	Fried meat	Bronchitis, accelerates broken bone healing
Pigeons <i>Columba</i> spp.	Egg and honey drink with a sprinkle of ground cinnamon	Sooth sore throat
Chicken and Bees		
Mammalia: Hedgehog and Thomson's gazelle are LR/LC; Rhim gazelle is EN; Dorcas gazelle, Red-fronted gazelle and Soemmerring's gazelle are VU; the rest are LC		
Aardark, <i>Orycteropus afer</i>	Meat	Asthma
Yellow-spotted hyrax, <i>Heterohyrax brucei</i>	Meat soup	Asthma
Rock hyrax <i>Procavia capensis</i>	Fried meat	Diabetes
	Urine of a nursing mother	Whopping cough
	Urine	Antiseptic for wound healing.
Human, <i>Homo sapiens</i>	Earwax	Soften the skin and ease removal of a broken thorn by gentle pressing
Any rat	Meat	Toothache, Whopping cough
Any Gerbil <i>Gerbillus</i> spp	Meat	Toothache
Crested porcupine <i>Hystrix cristata</i>	Feces filtered drink	Abdominal colic especially for infants
Any Squirrel	Meat	Ascites
Domestic rabbit <i>Lepus</i> spp.	Feces taken orally	Trachoma
Wild rabbit, <i>Lepus</i> spp.	Burned wool cure	Wounds associated with burns
Hedgehog, <i>Hemiechinus aethiopicus</i>	Meat	Diabetic
	Feces	Abdominal colic
Any Bat	Babies meat soup	Whopping cough
<i>Felis lybica</i> LC	Fried meat	Whopping cough
Spotted hyena <i>Crocuta</i>	Meat	Tuberculosis, pleurisy
Ruppel Fox, <i>Vulpes rueppellii</i>	Fried meat	Asthma
Fennic fox, <i>Vulpes zerda</i> II	Unheated milk	Whopping cough
Donkey, <i>Equus asinus</i>	Semen + powdered lupin (<i>Lupinus</i> sp.)	Hemorrhoids
	Milk	Antibacterial, anticarcinogenic, antiviral and antidiabetic, cancer, skin problems, hepatitis, stomach ulcers infections, heart problems, promote immunity .
One humped camel, <i>Camelus dromedarius</i>	Urine	<i>Tineacapitis</i>
	Feces mixed with latex of <i>Clatopris procera</i>	
Sheep <i>Ovis aries</i> I, II	Fat is boiled sieved mixed with herbs.	cream for paronychia and abscess
Goat <i>Capra hircus</i> III		
Cow <i>Bos indicus</i>	Bone marrow	Chronic bronchitis, tuberculosis
Cow <i>Bos indicus</i>		
Dorcas gazelle, <i>Gazella dorcas</i> II		
Rhim gazelle, <i>Gazella leptoceros</i> I		
Red-fronted gazelle, <i>Gazella rufifrons</i>		
Soemmerrings gazelle, <i>Gazella soemmerringii</i> VU	Powdered dry meat	Sprinkled on wounds
Thomson's gazelle, <i>Gazella thomsonii</i>		

*Species' conservation status as assessed by the IUCN:

CR (Critically endangered) = the species is in imminent risk of extinction in the wild.

EN (Endangered) = the species is facing an extremely high risk of extinction in the wild.

VU (Vulnerable) = the species is facing a high risk of extinction in the wild.

LC (Least concern) = There are no current identifiable risks to the species.

LR/lc (Lower risk/least concern) = Species for which there are no identifiable risks.

Zootherapy

It is apparent from Table 2 that:

At least 12 categories of diseases amounting to 108 (Table 1) are treated by 47 species of animals including their body parts and products.

1. Twenty 16 and 10 animal species and/or their parts and product cured respiratory disturbances, skin related problems and gastro-intestinal disturbances, respectively.
2. Consumption of raw liver of the catfish *Synodontis* spp. cures malaria in localized spots in Atbara River.
3. The sting of the Bee *Apis* sp. is a therapy for malaria in few specialized canthers in Khartoum.
4. Honey is the most common animal products used to treat various types of diseases.
5. Sprinkling powdered dry meat of Dorcas gazelle, Rhim gazelle, Red-fronted gazelle, Soemmerrings gazelle and Thomson's gazelle cured wounds.

Table 2. Disease Categories and animal species and/or part and product used in treatment in Sudan.

Disease Categories	Animal species and/or part and product used
Burn	Honey, wool of domestic and wild rabbits.
Eye diseases	White-headed Vulture, Domestic and wild rabbits.
Earache	Desert monitor, Savannah monitor.
Gastro-intestinal disturbance	Grasshopper, Honey, Giant clam, Cuttlefish, Ostrich, Crested porcupine, Squirrel, Hedgehog, Donkey, One humped camel, Rock hyrax.
Reproductive system	Honey, Female tiger shark, Crocodile, Wasps, Cuttlefish,
Nervous System	Honey.
Respiratory disturbance	Honey, Wasps, Skinks, Kite, Lappet-faced (Nubian) Vulture, Quail, Crow, Doves, Pigeons, Aardvark, Human urine, rats, Bats, Wildcat, Yellow-spotted hyrax, Spotted hyena, Ruppel Fox, Fennic fox, Donkey, Cow
Musculoskeletal system	Honey, Ostrich, Dove, Pigeon.
Skin related Problems	Honey, Wasps, Spiders, Cuttlefish, two species of Spiny-tailed Lizard, Human (urine, earwax), One humped camel, Sheep, Goat, Cow, Dorcas gazelle, Rhim gazelle, Red-fronted gazelle, Soemmerrings gazelle, Thomson's gazelle.
Toothache	Rats, Gerbils.
Urinary tract disorders	Black ants. Cuttlefish, Ostrich
Infectious and tropical diseases	Honey bee, Catfish, Spiny-tailed Lizard, Spotted hyena, Cow
Miscellaneous	Cuttlefish, One humped camel

Conservation Status

According to IUCN. (2019) the animal species reported for medicinal purposes in Sudan of concern to the Red List are the endangered (EN) Rhim gazelle and the Vulnerable (VU) Soemmerring's gazelle. These constitute 4% of the animal species used in zootherapy. Thirteen (27%) species of the animals fall into the 3 classes published by CITES. (2019), Table 3.

Table 3. CITES categorization of animals used for medicinal purposes in Sudan.

CITES Class	Medicinal uses
I	Desert monitor, Crocodile, Ostrich, Sheep, Rhim gazelle.
II	Savannah monitor, Crocodile, Spiny-tailed Lizard, Kite, White-headed Vulture, Fennic fox, Sheep, Dorcas gazelle.
III	Goat.

DISCUSSION

Various faunal forms, their parts and products were integral components of traditional medicine in various cultures. This indigenous and inherited knowledge is improved over time by skills and practices.

In Sudan, urine of camels and donkeys treat several diseases and one's own urine is used as antiseptic for wounds. In India urine-therapy is based on urine of goats, sheep, buffalo, cow, deer, flying squirrel, dog and elephants (Kakati, L. N. *et al.*, 2006;

Jamir, N. S., & Lal, P. 2005). As an unconventional medicine, urine is used in many countries (Gader, A. G. M. A., & Alhaider, A. A. 2016; Loeffler, J. M. 2010; Alkhamees, O. A., & Alsanad, S. M. 2017;). Camel urine acts as a bronchodilator because it possesses anticholinergic characteristics (Zibayi, S. *et al.*, 2015).

Some Bedouins, Nilotics and Indians tribes drink a mixture of cattle urine and milk as a practice to enhance health. Some studies revealed that this practice is justifiable. *In vitro* and *in vivo* studies revealed those camel urine components have antimicrobial activity (Mostafa, M. S., & Dwedar, R. A. 2016); it also inhibits

the growth of cancer cells and shrinks tumor's and secondary metastases (Romli, F. *et al.*, 2017). According to (Hamers-Casterman, C. T. S. G. *et al.*, 1993) the smaller antibodies in camel blood passes through the milk of the lactating camel and also filtered in the urine making them readily absorbable from the gut into the general circulation of individuals who consumes camel's milk and/or urine. Camel milk contains protective proteins, which may enhance immune defense mechanism (Reuven, Y. 2013).

According to (Gupta, L. *et al.*, 2003) that Indian ass *Equus hemionus* dung is kept in water and after one day filtered, and the filtrate is taken orally to cure jaundice. In England home remedies to cure jaundice included ingestion of live head lice and use of snails Hatfield, G. (2004), ingestion of roasted powdered earthworms and drinking urine mixed with milk drink in Ireland Hatfield, G. (2004) and woodlouse extract in beer in Scotland (Hatfield, G. 2004). In Sudan, grasshopper feces soaked in water for some time, filtered and taken orally to cure jaundice.

In Sudan drops of desert monitor and savannah monitor oil is used to cure earache, while in India drops of dog urine are used for earache (Jamir, N. S., & Lal, P. 2005), in Spain human urine is used to treat at least 83 disease and pains including earache (Vallejo, J. R. *et al.*, 2017).

Treatment of baby constipation in India is based on feces of house sparrow (Gupta, L. *et al.*, 2003), while soaked and filtered feces of crested porcupine crested is used in Sudan. The flesh of *Streptopelia* sp. is used to in Sudan to cure bronchitis and accelerates broken bone healing, in India its meat is given to girls in order to attain early puberty (Gupta, L. *et al.*, 2003).

Conservation issues should go neck and neck with human needs for animals their parts and products as well as the animal welfare (Alves, R. R. N. 2012; Alves, R. R. N., & Souto, W. M. S. 2015) and *the directives of both IUCN (2019) and CITES (2019)*.

CONCLUSIONS

In the face of costly diagnosis and treatment, people rely on their indigenous knowledge and traditional practitioners to treat their illnesses. Collaboration between biologists, pharmaceuticals specialist and doctors is vital. This will lead to verify the identity of the on shelf commodity by taxonomy and PCR techniques, of its components by pharmaceuticals means and effectiveness by doctors in clinical trials.

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