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Review Article

PALEOPARASITOLOGY: A MODERN-DAY RETHINKING OF HG WELLS TIME MACHINE

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ABSTRACT: This compilation deals with recent records of paleoparasitology both in Old World and New World. Paleoparasitology study has been started very recently in 1910 when M.A. Ruffer described *Schistosoma japonicum* eggs in Egyptian mummies (dated 1250-1000 BCE). Since then, paleoparasitological records have been published even if in 21st century. Three types of substrates are used for paleoparasitological diagnosis. They are coprolites (fossilized faecal samples), skeletons and mummies. With the advancement of microscopic technique, molecular biology (after standardization of extraction of ancient DNA) and immunological technique accurate diagnosis has been feasible. This compilation elaborates usefulness of paleoparasitological study in terms of understanding of (i) dietary habits and migration of ancient people, (ii) change in living pattern, (iii) archaeological doubts about prior use of an ancient structure and (iv) primate heritage of human being.

Keywords: Coprolite, Heirloom parasite, New World, Old World, Mummies, *Enterobius*, *Trichuris,* Human lice.

INTRODUCTION

Paleoparasitology is the examination of parasites found in the remains of humans and other animal species obtained from archaeological or paleontological sites, or any other preserved source. This particular scientific field banks upon interdisciplinary approaches. To mention a few are anthropology, geography, biology, medicine, genetics and obviously involvement of molecular biologists. Paleoparasitological findings also correlate with the history of medicine and disease [1].

To justify the issue on history of disease, let us cite an example on dirt-eating activity amongst shamans (individuals possessing spiritual abilities and serving as intermediates between the human and spiritual realms). Ancient literatures suggest that these individuals possess an uncivilized practice. When these individuals get distressed or disenchanted then wanted to perish. They used to take soil gradually each day until they deteriorated, resulting in facial and ocular swelling, ultimately leading to death. No one can intervene or dissuade them from their desire to death. They used to assert that the devil instructed them and manifested before them, which is the reason for their resolve to consume the earth. This particular habit and clinical symptoms refer to geophagy and hook worm infection by *Necator* sp. [2].

Therefore, this may be stated that, study on ancient parasites (specifically gastrointestinal parasites) can address (i) dietary habits of ancient people, (ii) migration of ancient people, (iii) change in living pattern, (iv) archaeological doubts about prior use of a structure and (v) primate heritage of human being. Thus, paleoparasitology explains historical development of parasite and host-parasite interaction which is the subject of choice of modern era [3].

DIETARY HABITS OF ANCIENT PEOPLE

The Samoyedic ethnic group is a native people who stay in the Far North of Russia. They are known as Nenets. An excavation study was undertaken in three different burial grounds where Nenets live (Vesakoyakha and Nyamboyto). In this study soil samples were

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collected from burials which were taken from intact skeletons' pelvic region (dated between 19th to early 20th centuries). From the samples of Taz Nenets, two species of parasites were recorded. They were *Taenia* sp. and *Diphyllobothrium* sp. Out of these two identified species, diphyllobothriasis infection was more common amongst Taz Nenets (dwellers of Taz of Siberia) and Nyamboyto Nenets (riverine people staying near lake of Nyamboyto of the Taz River basin). From this observation this has been postulated that, these Nenets used to consume raw fish from their very childhood. Vesakoyakha Nenets (riverine people of Siberia) used to suffer from taeniasis since they used to consume reindeer [4].

Piaui and Pernambuco are two states of Northeastern part of Brazil. Coprolites (fossilized faecal sample) of human origin (dated at least 10000 years ago) were collected during excavation from these states and were analysed. Parasite eggs (*Pharyngodonidae*) were detected. This family of parasites infect amphibians and reptiles. Therefore, it was concluded that the native people of these two states had a habit of consumption of meat of undercooked/raw reptiles and amphibians [5].

MIGRATION OF ANCIENT PEOPLE AND ANIMALS

This world is divided into two parts: (i) the Old World (refers to Africa, Asia and Europe) and (ii) the New World (refers to North and South America as well as Australia). It is said that due to human migration, many of the parasitic diseases have been transferred from the Old World to the New World after the pre-Columbian period. We take the privilege to cite an interesting example of *Entamoeba histolytica*. Its has been evidenced that, *Entamoeba histolytica* infection has been present in Western Europe since the prehistoric period. This species has been identified from samples collected from Switzerland (of Neolithic period dated 3700- and 3400-years BCE), from Greece detected in samples of early iron age and samples of Bronze age collected from France. During the Roman period, this parasite was detected from Italy, Belgium, France and Israel. From the Roman period, the situation changed. There was wide circulation of human beings and goods to most parts of the Middle East Asia. It is thought that, during the Roman period there was diffusion of this parasite from Europe to the Middle East Asian countries [6].

On the contrary, the occurrence of pathogenic amoeba in America is less compared to the countries of the Old World. But very interestingly, this parasite has been identified from human samples of pre-Columbian period (much before 15th century) and from North America (samples dated 12th to 13th centuries CE) [7]. Therefore, from these observations, this may be concluded that this particular parasite has diffused to America from the Old World before the arrival of Christopher Columbus in the New World in 1492. Some debatable historical records suggest that, migrations of human beings from the Old World to the New World occurred before the arrival of Columbus. Archaeological evidences suggest about Viking colony (dated 1000 CE) in North America through the trans-Atlantic route via Greenland [8, 9]. The parasite was introduced into America from the Old World and can travel a long way since this parasite can survive in cyst form in ordinary and freezing temperatures [10]. Moreover, as it is well known that migratory birds play a key role in dispersal of various parasites [11], including protozoa, it might be possible that amoeba parasites were transmitted from the Old World to the New World through them.

Paleoparasitological evidence exists on the roles of domestic animals and migrating birds in transmitting parasites in both humans and animals. Analysis of intestinal microbiomes preserved in coprolites of ancient birds revealed a diverse array of microorganisms, including parasites [12]. It was thought that zoonotic Trichostrongylus spp. was restricted to the New World; later, Gonçalves et al. [13] demonstrated that the species is widespread worldwide through paleoparasitological evidence. As infection of Trichostrongylus spp. is linked to the consumption of animals such as cervids, it can be postulated that the migration of the parasite happened through the migration of animals.

CHANGE IN LIVING PATTERN

The Inca civilization was initially located in Peru. As the time passed, the Inca civilization started to spread to neighbouring areas which are presently known as Argentina, Chile, Bolivia and Ecuador. A chronological study was undertaken in the Lluta area (a district situated in Chile) to know dynamics of parasitic infection in this region among people of the Lluta during the pre-Inca, Inca and Hispanic contact periods (this is a period when indigenes of America came in contact with the Europeans specifically Spanish people). Fourteen coprolites of three different periods were evaluated. During this study four parasites (*Trichuris* sp., *Enterobius vermicularis*, *Trichostrongylus* sp. and *Eimeria macusaniensis*) were detected. *Enterobius vermicularis* eggs were not detected in the coprolites of the pre-Inca period. On the contrary, intensity of infection of *Enterobius vermicularis* was more during the Inca and Hispanic contact periods. This observation may be attributed towards transition of life pattern. During the pre-Inca period the Lluta people used to live in isolated hamlets. But during the Inca and Hispanic contact periods started to stay in densely populated villages. This may be granted as a cause of more *Enterobius vermicularis* infection through direct contact [14].

ARCHAEOLOGICAL DOUBTS ABOUT PRIOR USE OF A STRUCTURE

This is very interesting to note that, paleoparasitology can confirm some of the archaeological structures about their use during pre-historic period especially latrines and cesspit through identification of parasitic fauna [15].

PRIMATE HERITAGE OF HUMAN BEING

This is a universal truth that, human being has emerged from primates. Our family members are apes, monkeys and lemurs [16].

This is further to mention that, humans and so-called anthropomorphous monkeys *alias* big apes are similar in terms of evolution. Gorillas and chimpanzees in Africa and orangutans in Asia serve as the group's representatives. In addition to having very similar morphologies and behaviours, we share about 98% of our genetic material with the latter [17]. Many extinct branches serve as a representation of the speciation process that caused humans to diverge from our primate predecessors. We only have a rough idea of where these predecessors fit into the human lineage because fossil availability varies and some species are only preserved by a few pieces of bone or tooth. The suggested stages of hominization are based on the morphology and chronology of primates during the Pleistocene and Miocene [18].

Evolution of human being from anthropomorphous monkeys have been correlated with some commonly shared infectious and non-infectious diseases and conditions. The best examples are diseases treponematoses and rheumatism. Both the disease conditions are seen in human and non-human primates [19, 20]. This finding specifies that, these conditions have been acquired by present day *Homo sapiens* from common hominid ancestors [21, 22, 23].

Apart from these two examples, we specify three heirloom human parasites having pre-hominid ancestors with some scientific justification.

(i) ***Enterobius vermicularis***

This particular species is cosmopolitan in distribution and directly transmitted between hosts. In different literatures, evolution of pinworm has been described on the basis of paleoparasitological records. Further refined cladistic analysis of *Enterobius* spp. of human and non-human primates was helpful to draw conclusion that, pinworms originated in pre-hominid human progenitors and hence predate humans as well. This particular hypothesis is popularly known as "association by descent coevolution adjunct with cospeciation" [24] . To elaborate the issue further let us describe hypothesis of Cameroon [25]. He explained that, *Enterobius anthropopitheci* (occurs in chimpanzee) is the closest relative of *Enterobius vermicularis* and *Enterobius gregorii* (affects solely human being).

Further, the results of a tree reconciliation between parasites and their host species using TREEMAP [26] showed that 64% of the trees had superimposable nodes; however, when viewed at the level of "parasite clades vs. host families," the congruence increased to 84% of superimposable nodes. A Markovian test indicates that the likelihood that such a large percentage would occur by random is $p = 0.001$ Therefore, the most likely theory to explain the genesis of human pinworm appears to be through co-evolutionary pathway.

(i) **Human lice**

Humans (*Homo sapiens*) are infested by two genera of sucking lice: one common with chimpanzees (*Pan* spp.) and the other with gorillas (*Gorilla gorilla*). Human head and body lice, along with chimpanzee lice, belong to the genus *Pediculus* (*Pediculus humanus* and *Pediculus schaeffi*, respectively). No species of *Pediculus* is known to parasitize gorillas. Human pubic lice and gorilla lice are classified within the genus *Pthirus* (*Pthirus pubis* and *Pthirus gorillae*, respectively), and no *Pthirus* species is recognized as a parasite of chimpanzees. *Pediculus* and *Pthirus* are sister taxa according to morphological and molecular evidence and primate lice have been documented to have cospeciated with their hosts for a minimum of 25 million years [27]. The intriguing distribution of these two genera prompts a compelling inquiry into the evolutionary history of primate lice. Why do humans possess both genera, while chimpanzees and gorillas possess only one genus each? The explanations are as follows:

(a) Lice infestation in primates is present since 25 million years ago. After chimpanzees and humans diverged some 6 million years ago, the two host species shared the genus *Pediculus* [28, 29].

(b) On the contrary, presence of genus *Pthirus* in man and gorilla has been explained on the basis of host switch phenomenon. A number of literatures suggest that, this phenomenon is common among lice infesting different avian and mammalian hosts [30, 31, 32]. The

Table 1. Updates on paleoparasitological records in animals and undefined samples (2000-2025)

Sl. No.	Type of Study	Brief Finding	References
1.	Analysis of cave deposits (dated 500,000 to 300,000 years BP) from Britanny, France	*Toxocara canis* was detected which most probably used to parasitize hyenas and other carnivores	[36]
2.	Paleomolecular investigation of coprolite of Iron age of banded mongoose was carried out from Tanzania	*Cryptosporidium* sp. was identified on the basis of sequence information of 18S ribosomal RNA and heat shock protein 70. New genotype of this parasite was identified which was described previously in bear.	[43]
3.	Coprolites most probably of dog of aged 6540 ± 110 years BP were examined. Material was obtained from Santa Cruz Province of Argentina	Identified parasites were *Toxocara* sp. (most probably), *Trichuris*, *Uncinaria* and *Capillaria*	[44]
4.	Rodent coprolites aged 212 ± 35 years BP were collected from archaeological site of Chubut Province of Argentina	The identified parasites were *Monoecocestus* sp., *Pterygodermatites* sp. and *Trichosomoides* sp.	[45]
5.	Diagnosis of protozoan infection in Tyrant dinosaurs (non-avian dinosaurs)	Based on lesions in the mandible *Trichomonas gallinae*-like infection was suspected	[46]
6.	Coprolite analysis of a church La Concepcion in Somta cruz de Tenerife, Spain	Detection of *Ascaris* eggs (n=344). This record seems to be the first paleoparasitological detection of *Ascaris* sp. from this species	[47]
7.	Analysis of coprolites of rodents dated around 3440-6700 years BP from Santa Cruz Province of Argentina	From 47 coprolites, 582 number of parasitic ova was detected. They were *Trichuris*, *Colodium*, *Eucoleus*, *Echinocoleusi*, unidentified capillariid eggs and cestodes of family *Anoplocephalidae*	[48]
8.	Coprolites of late Holocene period was collected from Patagonia, Argentina	Identified parasites were *Colodium* sp., *Eimeria* sp. and *Taenia* sp.	[49]
9.	Analysis of coprolites of *Kerodon rupestris*, an endemic rodent of Brazil. Approximate age of those coprolites was 5300 ± 50 years BP from Brazil	*Syphacia* sp. was detected for the first time in pre-historic rodents of America	[50]
10.	Analysis of coprolites of cervid of Pernambuco, Brazil (dated 1040 ± 50 years BP)	*Trichuris* sp. was detected	[51]
11.	Analysis of coprolites of rodents from Patagonia, Argentina	Detected *Anoplocephalidae* cestodes for the first time from this area	[52]
12.	Coprolites most probably of dog of aged 6540 ± 110 years BP were examined. Material was obtained from Santa Cruz Province of Argentina	Identified parasite was *Dioctophyma renale*	[53]
13.	Review on *Diphyllobothrium* sp. from paleoparasitological angle	This genus is present in the New World and Old World in the last 10000 years and 9500 years, respectively	[54]
14.	Examination of pellet of small mammals dated 1980 ± 80 years BP from Patagonia, Argentina	Identified *Macracanthorhynchus* in the samples	[55]
15.	Coprolites collected from sheep and dog of Bronze age were analysed. Materials were collected from Shahr-e-Sukhtch of Iran	Parasites were *Dicrocoelium dendriticum*, *Capillaria* sp., and *Taenia* sp. Albeit *Anoplocephalidae* and *Toxocara* sp. was suspected but researchers were not confident about the claim	[56]
16.	Evaluation of deer coprolites (dated between 2370 ± 70 to 580 ± 60 years BP) was done. The samples were collected from a cave of Patagonia, Argentina	*F. hepatica* like eggs detected	[57]

Sl. No.	Type of Study	Brief Finding	References
17.	Deer coprolites collected from archaeological sites of Argentina	Mixed infection of helminths and protozoa were detected	[58]
18.	Compilation of Russian scenario on paleoparasitology	(i) From young mammoth eggs of platyhelminthes and nemathelminths was detected, (ii) Mummified remains of ancient horse (37000 years older) had nematode infection (suborder: Strongylata), (iii) Intestine of mummified rodents (dated 10000-12000 years ago) had infection of *Syphacia* sp., (iv) Mummified bison of 37000 BP had *Skrjabinagia kassimov* infection, (v) Siberian goat droppings (dated 33653 ± 1638 BP) harboured *Nematodirus* sp. infection, (vi) canine samples (n=34) were collected from two different archaeological sites. Coprolites were of 7th – 5th millennium BC. Eggs of *Opisthorchis felineus*, *Diphyllobothrium* sp., *Spirometra* sp., *Capillaria* sp. and *Alaria alata* were detected. The most prevalent helminth infections were of *Diphyllobothrium* sp. and *O. felineus*. Infection pattern suggests that, people and dogs of Moscow and suburbs during Neolithic and Mesolithic periods used to consume raw fishes, (vii) canine coprolites (collected from Western Siberia) of transition period from Bronze to Iron age showed presence of *Strongyloides papillosus* (due to consumption of hides and intestine of cattle) and *O. felineus* (due to consumption of raw fish of carp family) and (viii) Analysis of canine coprolites and organic soil collected from Siberian Arctic-Mangazeya (claimed to be first Russian city of 17th century) revealed the presence of *O. felineus*, *T. canis*, *Diphyllobothrium latum* and *Fasciola hepatica*. Therefore, this was predicted that, presence of *T. canis* on soil may be nidus for visceral larval migrans.	[59]
19.	Analysis of coprolites (70-80 million old) of crocodiles from Sao Paulo, Brazil	Two species of Ascaridoid described (*Bauruascaris* spp.) and acanthocephalan parasites detected.	[60, 61]
20.	Analysis of big size coprolite of carnivore collected from Brazil	Cysts of protozoa (order: Eucoccidiorida), and nematode (order: Ancylostomatidae) were detected	[62]
21.	Coprolite analysis of Late Triassic in Thailand	Presence of eggs belonging to Ascaridida	[63]
22.	Analysis of coprolites (n=39) of sheep by conventional and molecular methods collected from Patagonia, Argentina	Identified parasites were: *Trichuris*, *Nematodirus*, *F. hepatica*, *Eimeria* and unidentified strongyle eggs	[64]
23.	Analysis of coprolites of birds of Cenozoic and Mesozoic eras were done. The samples were collected from Brazil.	Ascaridoidea was detected.	[65]
24.	Coprolite analysis of birds of Sao Paulo, Brazil	Apicomplexa (mostly) and one cyst of Amoebozoa detected	[66]

divergence between *Pthirus pubis* and *Pthirus gorillae* is thought be more recent (<0.1 million years ago) than the chimpanzee/human split. But this prediction demands further verification [28].

This has been predicted that, host switching of the genus (*Pthirus*) has happened from gorilla to man. But very interestingly *Pthirus pubis* is transmitted from one individual to other by sexual contact. But such contact is not possible between man and gorilla. But lice may switch from one host to other unrelated host (i) prey-predator relationship [33] and through areas commonly used by different species of animals [34]. Therefore, one of the possible reasons of transmission of *Pthirus* is contact between archaic man and gorilla [28].

Table 2. Updates on paleoparasitological records in man (2000-2025)

Sl No.	Type of Study	Brief Finding	References
1.	Mummified tissues preserved in a museum of Chile (dated from 2000 years BP to 1400 AD	By PCR and using molecular probe, *Trypanosoma cruzi* was detected	[67]
2.	Screening of coprolites of archaeological sites of Chile and America	*Enterobius vermicularis* infection detected	[68]
3.	Detection of Chagas disease caused by *T. cruzi* by molecular method	Causative agent was detected from mummies of 9000 years ago. The mummies were of pre-Columbian Andean countries	[69]
4.	Evaluation of parasitic fauna in Korean mummies (Joseon dynasty) by scanning electron microscopy (SEM)	The identified parasites were *Gymnophalloides seoi*, *Paragonimus westermani*, *Metagonimus yokogawai* and *Ascaris lumbricoides*	[70, 71]
5.	Study on mummies found in Brazil (560 ± 40 BP)	Based on molecular technique *Echinostoma* sp. was detected	[72]
6.	Paleoparasitological study in Western Siberia (dated 12th centuries AD)	From the soil collected from abdomen of infant revealed infection of *O. felineus*	[73]
7.	Archaeological compilation of *Entamoeba histolytica*	From Old World (Eurasia and Africa) positive samples (n=40) recorded from prehistoric, Roman and Medieval periods. From New World (America) 31 positive samples were detected from Pre-Columbian and Colonial periods	[74]
8.	Investigation on paleoparasitological of Guanches (Canary Islands' ancient inhabitant) by analysing samples collected from mummies	Identified parasites were hook worms, *Enterobius vermicularis*, *T. trichiura* and *Ascaris* sp.	[75]
9.	Soil samples were collected from the areas of pelvic and sacrum regions from archaeological sites of Iran. The skeletons were of Bronze age.	*Physaloptera* sp. was detected in 320 skeleton samples. Authors suspected false negative cases due to presence of nematophagous fungus and faulty taphonomic processes	[76]
10.	Iranian update	(i) From mummy remains *Taenia* sp. identified, (ii) From coprolites of man *Taenia* sp., *Ascaris* sp., *Trichuris* sp. and *Enterobius vermicularis* detected, (iii) From burials and pelvic bone of adolescent male *D. dendriticum* was detected and (iv) *Enterobius* sp. and *Physaloptera* sp. detected from samples collected from sacrum and pelvic bones	[77]
11.	Compilation of Russian scenario on paleoparasitology	The first case of human *Taenia* sp. infection was detected from Russia and Western Siberia during early/ middle bronze age. The infection was acquired due to consumption of undercooked or raw roe deer and elk	[59]
12.	Review on existence of parasites in ancient Chile	Three parasites were detected. They were *Taenia* sp. *S. japonicum* and *A. lumbricoides*	[78]
13.	Study on mummies of Bolivia	The study suggested that, *Enterobius vermicularis* and *Capillaria* sp. infection was prevalent in pre-Columbian period	[79]
14.	Paleoparasitological study of gastrointestinal parasitic infection from Florence of Italy (dated 4th – 5th *c.* CE)	Detected three parasites (*D. dendriticum*, *T. trichiura* and *A. lumbricoides*)	[80]
15.	Human coprolite (dated 6040 ± 60.14 BP) was tested for parasitic ova. The study was conducted from Bonneville Estates, Rockshelter, Nevada, USA	Detected acanthocephalan eggs	[81]

Sl No.	Type of Study	Brief Finding	References
16	Compilation of human coprolite study for detection of *Cryptosporidium* sp. infection	(i) *Cryptosporidium* sp. detected from samples dated 500-3000 years old samples collected from Andean region of South America, (ii) This parasite was detected from samples of pre-Columbian Peru, ancient samples of New Zealand, Mexico and North and South America	[82]
17	Study on zoonotic parasite in 5–7-year child from Cantabrian Spain (6-7 *c.* AD)	*D. dendriticum* detected	[83]

(i) ***Trichuris***

Trichuris trichiura infects man. *T. suis* is infective for pigs. This is thought that, *T. trichiura* infection was acquired by man after domestication of pig and this species (*T. trichiura*) has evolved from *T. suis* of pigs. For that reason, both the species are almost morphologically similar [35].

But other hypotheses suggest that, *T. trichiura* has been acquired from pre-hominid hosts not from the pigs. Paleoparasitological evidence of *T. trichiura* eggs in human coprolites and mummified remains lends credence to the theory that the species existed before the estimated age of pig domestication (which occurred only 7000-12000 years ago). *T. trichiura* was present in mummified bodies discovered in European turf bogs prior to the estimated dates for pig domestication, as well as in the well-known Tyrolean Alps mummy Ötzi [36].

FEW GLIMPSES OF PALEOPARASITOLOGICAL RECORDS

M.A. Ruffer in 1910 was the first scientist to describe presence of *Schistosoma haematobium* eggs in Egyptian mummies of 1250-1000 BCE [37]. After thirty years of this publication, Lothar Szidat (1944) [38] could demonstrate *Ascaris lumbricoides* and *T. trichiura* from samples of 600 BCE (Drobnitz girl of Poland) and from 500 years BCE (one bog mummy of Karvinden man). European and American paleoparasitology emerged simultaneously between the 1950s and the 1970s. In 1979, Luiz Fernando Ferreira, Adauto Araujo, and Ulysse Confalonieri finally established a definition, scope, and limitations of paleoparasitological study [39]. The National University of Mar del Plata in Argentina, the National University of Medicine in South Korea, the University of Cambridge in England, or the University of Bourgogne Franche-Comté in France are just a few of the highly active laboratories that have since emerged after the original Brazilian, American, and French laboratories (the Oswaldo Cruz Institute, the University of Nebraska, and the University of Reims Champagne Ardenne). Lastly, various teams of archaeologists, parasitologists, or biologists in Russia, China, Iran, Denmark, England, or the Czech Republic also conduct research in paleoparasitology [40, 41, 42].

With this brief introduction of paleoparasitological investigation, we are furnishing some updates on paleoparasitological records in animals and undefined samples (Table 1) and man (Table 2).

CONCLUSION

Paleoparasitology deals with the ancient records of man and animals. Through this approach one can assess health of man and animals during pre-historic period. Not only that, this study helps to find out the pattern of evolution from apes to man exploiting "heirloom parasites" as biomarker. With the recent advancement of molecular biology and immunological approaches (specifically direct fluorescent antibody test and antigen capture ELISA) it is possible to identify the parasites up to genus, species and strain level. Thus, this approach is helpful to find out the migration of parasite from Old World to New World even before pre-Columbian era. India is home to major ancient civilizations; the best example is the Indus Valley Civilization (3300–1300 BCE), also known as the Harappan Civilization. Domestication of several domestic animal species, including zebu cattle, goats, dogs, cats, and domestic fowl, occurred during the Harappan civilization. Therefore, it will be interesting to study paleoparasitology in the Indian context.

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