

TESTING THE COLOR PARAMETER OF COPROLITE REHYDRATION SOLUTION

Marcia Chame, Luiz Fernando Ferreira, Aduino Araújo and Ulisses Confalonieri, Escola Nacional de Saúde Pública, Rio de Janeiro

Coprolites are the main source of paleoparasitological research used so far in the Americas. They are collected mainly by archaeologists from sedimental layers during field excavations, and may be associated with artefacts or other human occupational remains. If found free in the soil, this can present difficulties in diagnosing the zoological origin (human or non-human, or from which animal).

For paleoparasitological analysis, it is usually necessary to rehydrate the coprolites. A rehydration technique was developed by Callen and Cameron (1960), in which the colour of the rehydration solution, after 72 hours of coprolite immersion, has been used as a parameter for the diagnosis of its origin. An opaque dark-brown colour is considered to be a human characteristic (Fry and Hall 1969, Fry 1970, Wilke and Hall 1975, Araújo et al. 1981).

This criterion was not well tested, but Bryant and Williams-Dean (1975) concluded that human coprolites turn the rehydration solution to dark-brown opaque colour; with herbivore coprolites, it changes to yellowish translucent; and with carnivore/omnivore droppings, the solution turns to a translucent pale brown. Fry (1976) noted that artificially desiccated faeces of coatimundi (*Nasua* sp.) turn the solution also to a dark brown opaque colour, like the human coprolites. Confalonieri (1983) also observed this same behaviour of the rehydration solution, with coprolites of *Kerodon rupestris* (Rodentia, Caviidae), found in archaeological sites in the Brazilian northeast.

This paper reports variations in the colour of the rehydration solution, using recent mammal faeces, naturally desiccated, from the archaeological region of São Raimundo Nonato, Piauí State, Northeast Brazil. The variation in the rehydration solution colour was analysed as a criterion for the diagnosis of the coprolites and of recent faeces; to ascertain their zoological origin; and to investigate the relationship between diet and taxonomic group.

Material and Methods

Forty-nine samples of recent naturally desiccated faeces from 20 mammal species were collected, to establish parameters for the identification of their zoological origin, from the region of São Raimundo Nonato, Piauí State (Chame 1988). Samples of 6 animal species, collected in the zoological garden, were also used. The faeces were from Carnivora, Artiodactyla, Rodentia, Edentata, and Primata. The faeces were

rehydrated in 0.5% aqueous trissodium phosphate solution (Callen and Cameron 1960). After 72 hours, the solution colour of each sample was recorded, using 3 colours (light brown, brown, dark brown). The translucence and opacity were assessed to determine the absolute grade of transparency in the rehydration solution.

Results

The rehydration solution of different faecal samples from the same species showed different colour patterns and/or transparency for Felis sp., Cerdocyon thous, Kerodon rupestris, Galea spixii, Trichomys aperioides, and Calomys callosus. The faeces of Alouatta sp. and Tamandua tetradactyla maintained the same colour and/or transparency in all samples. The colour and/or transparency of the rehydration solution varies also within the same species, among samples collected in the field and in the zoo, except for the Pantheria onca faeces. Table 1 shows the results obtained for each species.

TABLE 1		COLOURS AND TRANSPARENCY OBTAINED ON REHYDRATION SOLUTION OF FAECES FROM FIELD AND ZOO				
ESPÉCIE		LIGHT BROWN		BROWN		DARK BROWN
		OPAQUE	TRANSLUCENT	OPAQUE	TRANSLUCENT	OPAQUE
ORDEM EDENTATA						
<u>Dasypus novemcinctus</u>					X	
<u>Tamandua tetradactyla</u>						X
ORDEM ARTIODACTYLA						
<u>Mazama</u> sp.				X	X	
<u>Mazama gouazoubira</u>				X		
<u>Mazama americana</u>	ZOO		X		X	
<u>Tayassu</u> sp.						X
<u>Tayassu pecari</u>	ZOO		X			
ORDEM CARNIVORA						
<u>Felis tigrina</u>				X		
<u>Felis</u> sp.		X	X	X	X	X
<u>Felis concolor</u>	ZOO			X		
<u>Panthera onca</u>	ZOO			X		X
<u>Cerdocyon thous</u>		X		X	X	
<u>Conspatus semistriatus</u>		X				
ORDEM RODENTIA						
<u>Kerodon rupestris</u>		X		X		
<u>Galea spixii</u>			X	X		
<u>Trichomys aperioides</u>		X	X	X		
<u>Oryctomys subflavus</u>		X				
<u>Calomys callosus</u>		X	X			
ORDEM PRIMATA						
<u>Alouatta</u> sp.						X

Discussion

The colour of the trissodium phosphate solution used to rehydrate desiccated faeces of several individuals and species did not agree

with the results obtained by Bryant and Williams-Dean (1975) and Fry (1976). It is not possible to relate a colour pattern with a diet or to a taxonomic group of animals, as the opaque dark brown colour, thought to be a characteristic of human faeces, was observed for Alouatta sp., Tamandua tetradactyla, Felis concolor, and Felis sp., animals that have entirely diverse feeding habits. It also showed that variation occurred within the same species. The results point to the fact that the colour of the solution, used to identify faeces and coprolites, results from a complex assemblage of factors, which are not sufficiently understood. The rehydration solution colour is not a reliable criterion for identifying the zoological origin of recent faeces and coprolites. The final diagnosis must be based on other parameters, such as the shape and size of pellets, parasites found in the coprolites, and food remains.

Acknowledgements

We wish to thank Dr Niède Guidon from the Fundação Museu de Homem Americano for facilities used in the fieldwork. The work is supported by CNPQ and FINEP.

References

- Araújo, A., Ferreira, L.F. and U.E. Confalonieri. 1981. Contribution to study of helminth findings in archaeological material in Brazil. *Rev. Bras. de Biol.* 41:873-881
- Bryant, V.R., Jr. and G. Williams-Dean. 1975. The coprolites of man. *Sc. American.* 232:100-109
- Callen, E.O. and T.W.M. Cameron. 1960. A pre-historic diet revealed in coprolites. *New Scientist.* 7:35-40
- Chame, M. 1988. Estudo comparativo das fezes e coprólitos não humanos da região arqueológica de São Raimundo Nonato-Sudeste do Piauí. MS thesis. Federal Univ. of Rio de Janeiro Nacional Museum. 134 pp.
- Confalonieri, U.E., Ferreira, L.F., Araújo, A. et al. 1988. Trends and Perspectives in Paleopathological Research. In: Symposium on Human Paleopathology: Current Syntheses and Future Options. Zagreb
- Fry, G.L. 1970. Preliminary analysis of Hogup Cave coprolites. University of Utah, Anthropological Papers. 93:247-250
- Fry, G.L. 1976. Analysis of prehistoric coprolites of Utah. University of Utah, Anthropological Papers. 97 (45 pp.)
- Fry, G.L. and H.J. Hall. 1969. Parasitological examination of pre-historic human coprolites of Utah. *Proc. Utah Acad. Sc., Arts and Letters, Part II.* 46:102-105
- Wilke, J.P. and H.G. Hall. 1975. Analysis of ancient feces: a discussion and annotated bibliography. Archaeological Research Facility University of California, Berkeley. 47 pp.