V. THE VIABILITY OF PATHOGENS IN ANCIENT HUMAN COPROLITES

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Abstract

A one-thousand-year-old human coprolite was investigated for viable microorganisms common to the intestinal tract; these were found to be absent.

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In many archeological sites, human coprolites are found which can offer important clues to the dietary habits of the respective population (Callen 1963, 1966). Occasionally the question has been raised as to whether such coprolites still contain today ancient, but nevertheless viable, microorganisms, especially as there have been reported in the literature remarkable survival times for microorganisms (Sneath 1962). In fact some extraordinary claims of viability have been made over the years (Lipman 1931; Reiser and Tasch 1960; Dombrowski 1963).

The following human coprolite samples were submitted by Robert F. Heizer[1] to this laboratory for radiocarbon dating. UCLA-1071E came from a crevice along the east edge of the low original entrance of Lovelock Cave, Nevada, 40° 10' N Latitude; 118° 30' W Longitude (Loud and Harrington 1929). There a large collection of human fecal material had been made in the summer of 1965 from what appeared to be a latrine. The collection was aimed at the establishment of dietary elements and patterns for the area and prehistoric time period. Another coprolite was excavated from undisturbed trash inside the cave (UCLA-1071F).

Prior to radiocarbon analysis, the dry coprolites were immersed in dilute hydrochloric acid to remove all traces of isotopically different carbon such as inorganic carbonate. After drying, the specimens were burnt to carbon dioxide and counted for at least 1000 minutes in a proportional counter. The radiocarbon ages obtained were 1210 $\pm$ 60 for UCLA-1071F and 145 $\pm$ 80 years for UCLA-1071E (Berger and Libby 1967). These ages can be interpreted in terms of the most probable historical age by taking into account the secular variations in the production rate of radiocarbon (Suess

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[1] Other analyses of coprolites and suitable references are presented elsewhere in this volume.

1965; Horn, Charles and Berger 1966; Berger and Horn 1967). The resulting final ages are for UCLA-1071F either A.D. 880, A.D. 800, or A.D. 680. This triple possibility is due to the character of the relationship at the time in question between radiocarbon years and calendar years, which is a curve in the shape of an S turned 90° anticlockwise. The other coprolite may be either about 250 or 300 years old for similar reasons.

For bacteriological analysis, directed to establish the presence or absence of microorganisms common to the intestinal tract, a sample from the interior of the older UCLA-1071F, which was not pre-treated, was ground using a sterile mortar and pestle. Then a suspension was prepared with 0.85% sterile saline solution in a proportion of 1 gm sample to 10 ml of solution. From this suspension a number of different cultures were made. The first involved a MacConkey agar plate which is a differential medium distinguishing between the coliforms and enteric pathogens such as Salmonella, all of which can be found in feces. The growth of gram positive organisms is essentially inhibited by the MacConkey agar. Another culture was tested on nutrient agar plate. This medium permits the propagation of some organisms inhibited by the MacConkey differential plate. In addition, an infusion broth (Difco, heart infusion broth, B-38) was inoculated from the original suspension. Finally, another portion of the suspension to be investigated was exposed to thioglycollate broth which permits the growth of anaerobic bacteria such as Clostridia.

All cultures were incubated at 37° C and checked for growth after 24, 48, and 96 hours. No growth was detected in any of the cultures. Lastly, a gram stain was prepared from the original saline suspension of the coprolite. What appeared to be as gram negative organisms was more than likely some form of contamination as a control with a slide on the saline solution without coprolite material indicated.

In conclusion, under the conditions of biological assay employed, no viable gram negative organisms common to the human intestinal tract nor gram positive were found in the more than one-thousand-year-old human coprolite preserved in the dry climate of Nevada. Of special interest is the fact that sporogenous bacteria would have been the most likely to survive since their resistance is known to be the greatest among microorganisms. But the present results indicate no survival of such species. While this study is not a totally complete assay for the viability of all possible microorganisms, it is nevertheless of interest to the archeologist and may concern those interested in the problems of the viability of microorganisms.

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