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Geophagy: A Dietary Practice in Holmes County, Mississippi

by

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September 1973
Abstract

Geophagy has been observed and documented for over fourteen centuries. From the initial reportings till the present geophagy has been considered an example of a perverted appetite, and accordingly has been classified under pica. An in-depth study in Holmes County, Mississippi, revealed that at least 80 percent of all women will consume clay at least once in their adult life. The practice, though centered on pregnancy, occurs from about the time of the first menstrual period till menopause. The practice itself is perpetuated culturally and not biologically as a mother will introduce her young daughter to the practice. Although mineralogical and chemical analyses on clay samples reveal that many elements necessary for body functions are present in the clays, hematocrit data and other biological data indicate that clay consumption has minimal physiological effects.
Introduction

Geophagy, or the practice of consciously consuming clay or dirt, has been a scientific curiosity reported for over fourteen centuries as Aetius in the sixth century A.D. observed and documented the practice among pregnant women in Greece. An examination of the literature on geophagy indicates that the practice has no temporal, geographical, or racial limitations. Among the different ethnic groups in which the practice has been reported are: Chinese, North and South American Indians, Black Africans, Anglo-Americans, Afro-Americans, West Europeans, and Australian aborigines.

In the United States the practice of geophagy centers on the South and Southeast where it is usually associated with pregnant Black women and Black children. Recently the practice has been observed in northern urban areas where medical personnel are less familiar with the practice and its implications than their southern colleagues.

Historically, geophagy has always been considered an aberrant habit and not an actual dietary practice, and numerous accounts exist describing the strange occurrence of clay eating. Presently, geophagy is classified under the nutritional heading of pica, which refers to the general category of "perversions of appetite" along with such other items as eating paint. Classifying geophagy as an unnatural practice of consumption is also upheld by
the Cumulated Index Medicus which categorizes geophagy under the heading "Appetite Disorders". Numerous factors have had a direct influence on creating this attitude toward geophagy. One factor has been the association of certain disorders with geophagy, such as iron deficiency anemia and helminthic infections. 13 Other factors that have contributed to a general lack of understanding of the practice include: the reported low incidence, the limited research on the practice, and the assumed limitation to pregnant women and children.

Numerous etiological theories on geophagy have been put forth by both the biological and behavioral sciences. The biological explanations center on either caloric or biochemical deficiencies of the practitioners. The caloric deficiency theory associates geophagy with hunger and satiation. The etiological theories emphasizing biochemical aspects range from iron deficiency anemia as a cause to zinc, or trace element deficiency as a cause with iron deficiency anemia as an effect. 14,15

Within the behavioral sciences, etiological theories have been more limited. One theory on pica in general relates the practice in children to instability in the social sphere of the home. 16 Another behavioral explanation invokes the possible association of geophagy to in-group solidarity among Black women. 17

Although documentation exists on all of the preceding etiological theories, research on geophagy has been limited. The majority of
research efforts have investigated geophagy by examining only a few respondents not in the natural loci of the practice, the community. Also, studies on geophagy have been characterized by limited research designs stressing either biological or behavioral variables with little consideration to the fact that any consumption practice involves the interrelationship of biological, cultural, and environmental variables. This lack of a holistic approach has also contributed to the present association of geophagy to an appetite perversion.

This essay discusses a composite of cultural, environmental, and biological variables associated with geophagy, and this presentation is not to add to the archives of "Appetite Disorders" but to place geophagy in the proper perspective as a dietary practice. The field research, conducted in the predominantly Black community of Holmes County, Mississippi, between January, 1971, and August, 1971, was an integral part of the Black community operated Health Research Project. *

* In 1967 a Mississippi State Charter was granted to the Milton Olive III Memorial Corporation, a Black community corporation. The initial project, the investigation of the health conditions in the County, was funded in April, 1969, by grant HS 00422, National Center for Health Services and Research Development. The Health Research Project, directed by Mr. Eddie W. Logan, provided a framework for the geophagy research. Consulting assistance for the Health Research Project has been furnished by the University of Illinois and Rush-Presbyterian St. Luke's Hospital in Chicago. Dr. Donald E. Vermeer has been especially helpful in organizing the geophagy research. Other project consultants, Kenrad E. Nelson, M.D., Dr. Demitri Shimkin, Edward Eckenfels, Dr. Richard Roistacher, and William Peltz, have also added valuable assistance.
The geophagy research was designed to measure incidence of the practice on a county-wide basis, to sample and to analyze chemically the clays, to ascertain the cultural milieu surrounding the practice, and to obtain biochemical data on the effects of clay consumption.

Holmes County is located fifty miles north of Jackson in west-central Mississippi. Geographically Holmes County spans two distinct physiographic regions. The Mississippi-Yazoo River Flood plain, or Delta region, covering about one-third of the 769 square miles of the County is characterized by flat terrain, oxbow lakes, alluvial soils, large plantations, and low population density. The remaining two-thirds of the County, a coastal plain or Hill region, is characterized by rolling hills, red-yellow podzolic soils, erosion, small family farms, and rural settlements.

Research Findings

The initial phase of the research on geophagy was to measure the incidence of the practice, and to accomplish this three separate surveys were conducted. The first survey randomly sampled about 2 percent of the approximately 18,000 Blacks residing in the County. Ten of the 56 nonpregnant women surveyed, or 20 percent, reported regular consumption of clay; no pregnant women fell into the random sample. An additional 40 percent, or 22 women reported regular consumption of clay in the past but were not presently doing so. This survey also sampled 109 children ranging in age from zero to
thirteen. In this group 18 children of both sexes, or 15 percent, were presently consuming clay; none of the men surveyed were practicing geophagy.

The second survey on geophagy involved a two year project with pregnant women. Geophagy is more frequent during pregnancy as approximately 40 percent of the 200 pregnant women questioned were actively practicing geophagy. This survey also revealed that pregnant women consumed such other items as, laundry starch, baking powder, baking soda, dry powdered milk, and flour.

The third survey on geophagy questioned 197 females aged fifteen to twenty-six years. Out of the aggregate of 197, 26 women, or 13 percent, were actively consuming clay, while an additional 34 women, or 15 percent, were consuming other substances such as laundry starch, baking soda, and dry powdered milk.

Although the three surveys indicate that geophagy is widespread in the County it is mainly centered on a select segment of the population, adult females. And although incidence is higher among pregnant women, the practice is found among nonpregnant women, a group usually ignored in the literature. Though it may appear that at any given time the percentage of practitioners is not very high, it must be stressed that all of the surveys were based on self-admission and consumption on a regular basis; thus, the actual incidence may be much higher. In fact, if all the women were counted in the first survey who had at least consumed clay for a short
period of time during their adult life, the percentage of participation would rise to about 80 percent. In other words, 44 out of 56 women had consumed clay at some time in their adult life. The women who decided not to consume clay on a regular basis gave a straightforward reason for their action—they did not like the taste of clay.

All of the 18 children of both sexes who were consuming clay reside in a home where the mother was an active practitioner, or had a history of geophagy. Geophagy among Black children in Holmes County is not the normal exploration of the environment so frequently associated with pica in children but rather an imitation of the mother's diet. In fact, it is a common practice for the mother to give the young child a piece of clay as a pacifier. The ages when children consume clay are quite restricted, and range from about one and a half to four years. When a child reaches approximately four years of age the mother will usually cease giving clay to the child and will openly suppress the practice. The reason given by the mothers is that geophagy is an adult female practice not to be adopted by children. Thus, a very young child may participate in token fashion, but once he or she reaches an age when its cultural milieu may be understood, the practice is stopped.

After childhood geophagy becomes very sex specific, with the next period of onset in females approximating the first menstrual period; 100 of 127 respondents indicated that they initiated the
practice around the age of thirteen. If the practice is not started then, they will wait till their first or subsequent pregnancies. Throughout the adult years a woman will periodically stop consumption, and for as indicated before, the highest rate of incidence occurs during pregnancy. It also appears that there usually is an age when the practice is completely halted, and this age approximates menopause, or around fifty years. A few women, however, continue to consume clay past menopause; one woman was still consuming clay at the age of 83.

The general period of consumption in women coincides with the belief system. The most common beliefs held on geophagy are that clay consumption promotes health and is especially valuable during pregnancy, where it benefits not only the mother but the fetus as well. In other words, clay eating is considered an adult female diet to be practiced during the fertile years.

Geophagy is not developed individually through biological processes but is learned. Often a mother will take her young daughter out to the "dirt site" and show her what clays are preferable. In fact, a complete classification system surrounds geophagy, and outsiders as well as most males in the community are oblivious to the proper terms. For instance, the word "clay" is never used to describe an edible geophagical substance but rather certain variations of the "dirt", such as "hill-dirt" or "red-dirt" are used for edible clays. And in other instances when it is necessary to define nonedible substances such terms as "red clay-dirt" are used. The
definitive element between edible and nonedible substances is texture, with a fine grained substance preferred.

Though all of the preceding cultural elements are shared by all Black women in this community, variations of the practice do exist. For example, out of 127 practitioners, 81, or approximately two-thirds bake their clay before consumption. And one-fourth of those 81 women also add vinegar or at times salt to the clay before baking. The major reason given for these variations of preparation is individual preference.

As indicated previously additional substances such as laundry starch, baking powder, baking soda, dry powdered milk, and flour, are often consumed. Users consider these substances as replacements or substitutes for clay, and consequently, the belief system surrounding clay consumption is also found with these items. Thus, laundry starch is considered to be beneficial for the fetus, and it is not unusual to see a woman baking laundry starch or flour before consumption. The data indicate that in two types of circumstances women are more apt to consume one of the replacements. First, women who experience difficulties in going to their "dirt site" may replace clay with one of the substitutes until they can obtain some clay. Second, younger women as indicated by the third survey, tend to prefer packaged, processed substances over clay, indicating a possible change in the traditional practice. Although there appears to be a great range in the selection of a replacement, all of the substances share one characteristic, a basic similarity in
texture to clay.

The clays themselves are extracted from the B, or clay, horizon of the red-yellow podzolic soils. Clay source sites are centered on the Hill area of the County due to the nature of soils found there, and during the seven month study twenty-five sites were located. Certain sites are known for their "better tasting dirt," and thus, are used by many individuals. In fact, one informant commented how at times cars would be lined down the road by one such site. These clay source sites are often used only by members of a single extended family.

X-ray diffraction analysis was conducted on sixteen geophagical earths in order to ascertain their mineralogical composition. The results of these analyses appear basically similar, as quartz accounts for over 75 percent by weight of each sample. Clay minerals, kaolinite and montmorillonite, are present in smaller amounts; additional minerals, such as mica, chlorite, and feldspar, are also present.

Three of the sixteen samples were subjected to x-ray fluorescence analysis to determine the chemical composition. Ten elements were consistently present in the three samples: silicon, aluminum, iron, calcium, titanium, potassium, manganese, copper, cobalt, and chromium. Silicon, aluminum, and iron are the major constituents present in amounts greater than 5 percent by weight. Calcium,

* I would like to thank Dr. Ray Ferrell, Department of Geology, Louisiana State University, for providing mineralogical and chemical analyses of the samples.
titanium, potassium and manganese are found in amounts approximating 1 percent by weight. The chemical analyses also revealed that several trace elements present in amount of about 0.1 percent by weight: copper, cobalt, and chromium. These results of the x-ray fluorescence analyses indicate that many of the basic elements necessary for efficient physiological operations are present in the clays, but it was not ascertained whether the elements exist in a state that can be absorbed.

Although geophagy is considered to be directly related to either biochemical or caloric deficiencies, examination of biological data on Black residents in Holmes County raises some critical questions. In some areas of the world geophagy may be used to provide a feeling of satiation, but hunger plays a doubtful role in Holmes County. In the first place, in 1971 the Health Research Project ascertained that although the overall nutritional status of Black residents in the County was marginal, severe malnutrition was not a real problem. 19 This first reason may well be a result of the second factor that in 1970 over 40 percent of the Black families were participating in the Federal Food Stamp Program. The program, though still limited in its contribution, has substantially increased the caloric intake. Thirdly, one of the major health problems of the County's Black population is obesity due to high fat and high carbohydrate diets. And finally, if geophagy were caused by a caloric deficiency why would no adult males consume clay? These factors seem to indicate that
caloric insufficiencies are not a dominant enough feature to explain why over 80 percent of all Black women in the County consume clay at least once in their life.

During 1971 the Health Research Project conducted a nutritional survey on approximately 500 randomly sampled Black households. One phase of the survey involved a complete physical examination of every member of each household. Of these examinations 368 women seventeen years or older were examined and the hematocrit determination established. The parameters used in interpreting the hematocrit determinations in adult females were: deficient, less than 31 percent, low, 31 to 37 percent, and acceptable, greater or equal to 38 percent. The distribution of the hematocrit determinations of the 368 women are shown in Table 1.

Of the aggregate of 368 women 19 were known practitioners of geophagy. The distribution of the 19 hematocrit determinations are shown in Table 2. A Kolmogorov-Smirnov test, a test of goodness of fit indicates ($P > .95$) that the two sets of hematocrit distributions came from a similar population. In other words, the hematocrit distributions for the 19 women were no different than those of the larger aggregate of 368 women. Thus, the hematocritic determinations

* I would like to thank Kenrad E. Nelson, M.D. and his staff at the University of Illinois Medical Center for the preparation of the hematocrit data.
Table 1. Hematocrit Determinations of 368 Females Seventeen Years of Age and Older

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<th></th>
<th>Deficient</th>
<th>Low</th>
<th>Acceptable</th>
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<tr>
<td>Number</td>
<td>6</td>
<td>109</td>
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<td>Percentage</td>
<td>1.6</td>
<td>29.6</td>
<td>68.8</td>
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<tr>
<td></td>
<td>Deficient</td>
<td>Low</td>
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</tr>
<tr>
<td>Number</td>
<td>1</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Percentage</td>
<td>5.2</td>
<td>36.9</td>
<td>57.9</td>
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Table 2. Hematocrit Determinations of Nineteen Females Practicing Geophagy
of the women practicing geophagy are representative of the adult female population as a whole. These findings indicate that geophagy has minimal effects on hematocrit determinations, especially in being associated with anemia.

Geophagy may have been beneficial effects by increasing the hematocrit determination, but this relationship as a causal factor of geophagy completely ignores the distribution of male hematocrit determinations. Using the parameters of deficient, less than 37 percent, low, 37 to 43 percent, and acceptable, greater than or equal to 44 percent, the distribution of hematocrit determinations of 193 males seventeen years or older indicate a significant percentage of deficient and low hematocrits in the male population (Table 3). Consequently, if geophagy contributed significantly to higher or a more acceptable hematocrit determination why do males not consume clay? The sex specificity of geophagy is interesting but not unusual; sex specific diets or diet restrictions, such as those found among Mexican-American women, are a common occurrence throughout the world. 20

Even though no biochemical information on trace element deficiencies was obtained certain inferences can be made. Chemical analyses of clays showed the presence of numerous elements vital for efficient physiological functions. But if women are dependent upon clay for certain trace elements why do they so often switch to laundry starch, baking soda, or another substitute when clays are not available?
Table 3. Hematocrit Determinations of 193 Males Aged Seventeen and Older

<table>
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<tr>
<th></th>
<th>Deficient</th>
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<th>Acceptable</th>
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<tbody>
<tr>
<td>Number</td>
<td>16</td>
<td>96</td>
<td>81</td>
</tr>
<tr>
<td>Percentage</td>
<td>8.29</td>
<td>49.75</td>
<td>41.96</td>
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Geophagy has also been considered a prime causal factor in helminthic infections, especially ascarid. Yet, data from the Health Research Project do not support this contention. In 1971 a study of parasitic infections among Black children in Holmes County showed that 31 percent of 116 children in the Delta region of the County had *Ascaris lumbricoides*. The same study showed that only 17 percent of 108 children in the Hills had the ascarid infection. The significance of the two percentages is that few if any children in the Delta consume clay, because Delta soils are not considered edible. Since women must constantly travel to the Hills for clay it is viewed as a scarce substance and thus, not to be handed out to young children who really do not need it. The Hill location of all children consuming clay was supported by the first survey; which showed that all 18 children who practiced geophagy resided in the Hills. The fact that a higher frequency of intestinal parasites was found in the Delta does not rule out parasitic infections as an effect, of geophagy, but it does indicate that other agents play a much more significant role, especially with the acquisition of *Ascaris lumbricoides*.

Discussion

The detrimental or beneficial effects of geophagy are still in question, but its existence and perpetuation is not. In the Black population in Holmes County, Mississippi, geophagy is perpetuated culturally rather than biologically from one generation to the
next. Even when women leave the poverty-stricken county the practice continues; a box of clay brought or sent from Mississippi to Chicago is a frequent and welcomed practice.

The universality of the practice is beyond dispute. The uses of clay as a food range from adding it to poi in Hawaii to adding it to bread in Sweden. Perversions of appetite, or pica, no doubt exist, but the actual practice of geophagy as represented in Holmes County, Mississippi is a dietary practice surrounded by a definite semantic structure and corresponding cultural milieu.

Dietary practices everywhere reflect environmental, cultural, and biological components. The environment establishes the matrix in which biology and to a larger extent culture shape specific dietary practices. Consumption of clays like that of berries or rocksalt are taken directly from the environment and reflect biology and culture. But unlike the eating of berries or rocksalt clay has been associated with numerous detrimental effects and has thus been labeled an appetite disorder. Yet, the world-wide distribution of geophagy, high incidence in areas like Holmes County, and the surrounding cultural belief system indicate that it should be considered a dietary practice and not a manifestation of a perverted appetite.
References


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