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## Pica

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PICA

by

Richard A. Blatny

A THESIS

Presented to the Faculty of  
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In Partial Fulfillment of Requirements  
For the Degree of Doctor of Medicine

Under the Supervision of William R. Roth, Jr., M.D.

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Although it occurs rather frequently, pica is a subject about which very little study has been made. This paper defines pica and describes some of the more common forms. I have concluded the article with a discussion of some of the current theories concerning the etiology of this disease.

During the first few months of infancy, a child is in what is known as the oral stage of psychosexual development. In this stage the mouth is the chief erotogenic zone. At birth the primary stimulation to this area is the bottle or breast. At approximately six months of age the child begins mouthing objects such as his hands, toys, and in general whatever he finds available. Normally between one and one and one-half years of age the child acquires some physical capacity to control defecation and the anus supplants the mouth as the chief erotogenic zone. The child has now passed into the anal phase of psychosexual development.

In some children this mouthing activity persists as a major activity past the normal limits. When these children go one step further and develop craving for actual ingestion of a particular substance not normally considered as fit for food, the child is said to have pica<sup>10</sup>. Paint, paper, stones, cloth, cotton, leaves, wool, wood, worms and bugs, dirt, plaster, starch, soap, and matches are some of the sought after items.

Several studies have been done in an effort to determine the incidence of pica. Millican, Laymon, Lourie, Takahashi and Dublin ran a random survey of 859 children in 1962<sup>13</sup>. They reported that pica as a symptom occurs chiefly in pre-school children, the greatest incidence occurring in those between 18 months and two years of age. In lower socioeconomic classes the incidence among children in this age group was between 50 and 60 percent, compared to about 30% in higher income families.

After two years of age, the incidence of pica dropped. By 3 to 4 years, the manifestation seemed to be mostly relinquished as a persistent habit by children of the "private patient" economic level, while it continued to be evident in about 20% of the Negro children of lower economic status found with this condition. They also found that pica does not usually occur in persons past 6 years of age with notable exceptions such as organically damaged or schizophrenic children, pregnant women, and in some subcultural groups.

A more recent and perhaps more thorough study was carried out by Barltrop in 1966<sup>4</sup>. In an attempt to rule out bias in selection of cases, three populations were prepared using a table of random numbers. The first two populations totaling over 400 children were studied with interviews with the parents. One of these consisted of white children, the other of colored children. Both were selected to contain equal numbers in each age group. The

third population composed of 277 white children similarly selected for age, was studied by means of a questionnaire mailed to the parents.

In the interviewed group, Barltrop found that 78% of the children in the one year plus group had mouthed objects, and 35% of them had ingested these objects. The prevalence of mouthing and pica decreased at similar rates until the age of four when 33% of the children were mouthing and 6% still exhibited pica. Thereafter a small rise in prevalence took place, although these groups contained only small numbers of children. Barltrop found that 22.8% of the colored group had pica compared with 14.8% of the white group. The value obtained for  $\text{Chi}^2$  is not significant statistically.

The third group studied by questionnaire reported mouthing in 100% of the one plus age group, and this fell to 80% in the six plus group; pica occurred in 48% of the one plus group and fell to a final value of 20% in the six plus group. Thus these results coincided well with those of the interviewed group.

An attempt was made to determine the most commonly ingested articles among both the interviewed group and the questionnaire group. The objects ingested were divided into nine major categories as listed in the following table.

THE DISTRIBUTION OF CHILDREN WITH PICA ACCORDING  
TO THE TYPE OF OBJECT INGESTED\*

Nature of Object	Interview Study	Mail Study
	(81 children)	(89 children)
	%	%
<u>Paper</u> : newspaper, wallpaper, toilet paper, sherbet cups, cardboard	48	18
<u>Clothing</u> : shirts, jackets, blankets, shoes, woollens, cottons, hats, gloves, handkerchiefs	25	3
<u>Dirt</u> : yard dirt, house dust, plant-pot soil, pebbles, ashes, cigarette ash, glass fragments, lint, hair		
combings	23	44
<u>Matches</u> : Live and spent	23	0
<u>Toiletries</u> : hair shampoo, toothbrushes, baby lotion, sponge, toothpast, cosmetic powder, soap suds, hopper water	19	95
<u>Plaster</u> : wall	12	0
<u>Writing Materials</u> : crayons, pencils, erasers	12	16
<u>Tobacco</u> : cigarette and pipe	9	9
<u>Other</u> :	27	25

\* from Barltrop, 1966<sup>4</sup>

The two study groups varied greatly with respect to which objects were most commonly ingested. There was no apparent common factor among the variety of objects that might have determined their selection by the child. The number of types of objects mouthed per child decreased from 4.9 in the one plus group to 1.8 in the four plus age group and fluctuated between 1.7 and 1.8 objects per child in the older age group. The number of different types of objects ingested per child decreased in an almost linear manner from 2.7 in the one plus group to 1.4 in the six plus age group. Barltrop believed this increasing discrimination was more consistent with a developmental process than with an attempt to offset a dietary deficiency by self-selection.

Another interesting finding was that there were more children with pica among siblings of affected children than among siblings of children without pica. Also there was a slight preponderance of Negro children with pica compared with the white children but the difference was not significant. Barltrop believed that the higher incidence of pica found in Negro children in earlier studies possibly was due to there being a larger proportion of younger children in the Negro group, and older children in the white group.

Thus Barltrop concluded there is no significant relationship in the prevalence of pica according to the



sex of the child, the size of the family, the family rank, and the index of social position.

Although parents often regard pica as being relatively benign, associated hazards have been reported. One of the most serious of these is lead poisoning. Although in adults it is most commonly due to inhalation on the job, in children lead poisoning is due primarily to the ingestion of lead-containing substances, chiefly paints which contain lead. Some, used formerly in house painting, had up to a 10% lead concentration. Since not all the lead in the ingested paint and plaster is absorbed, it is estimated that three to six months of fairly steady ingestion is necessary in most cases before toxic levels are reached.

The symptoms of lead poisoning are non-specific and are generally related to these main categories:

1. Anemia - the mother notices her child is pale and acting run down.
2. Gastrointestinal symptoms such as nausea, vomiting, diarrhea, constipation, anorexia, and abdominal cramps appear.
3. Central nervous system involvement appears with symptoms ranging from minor mild behavioral changes to those as serious as convulsions and coma.

This third area of involvement is by far the most serious. According to Cohen<sup>6</sup>, the most important tests

in determining lead toxicity are the blood and urine levels. If the blood shows 0.06 mg. per 100 ml. or the urine 0.08 mg. per 100 ml. these are definitely toxic levels and treatment with EDTA should be initiated immediately.

Oliver and O'Gorman investigated the association between the incidence and severity of pica and blood lead levels in a group of children diagnosed as manifesting the schizophrenic syndrome, a condition in which pica in some degree seems particularly common. They found, in general, the more severe the pica the higher was the blood lead level<sup>15</sup>.

Another type of pica which occurs quite frequently is geophagia. The ingestion of dirt itself does little harm to the child; however these children occasionally swallow other objects along with the dirt which can lead to intestinal obstruction. These children also have an increased chance of developing a parasitic infection of the gastrointestinal tract.

Geophagia is not limited to children alone. Physicians are becoming more aware of its presence in women during pregnancy, especially in the lower socioeconomic classes in the southeastern part of the United States.

O'Rourke, Quinn, Nicholson and Gibson reported in 1966 that geophagia was a frequent occurrence among the obstetric patients in their hospital in Augusta, Georgia.

They found the incidence of geophagia to be 55% in 200 randomly selected obstetric patients<sup>16</sup>. The majority of those with pica were medically indigent non-whites living in the rural area. One of the world's largest deposits of kaolin, a form of clay that is usually white in color and has a fine consistency, is found in the Augusta area. This clay is eaten by the pregnant women and considered a delicacy. Most of the women give no explanation for eating the clay other than that they just have a taste for it when they are pregnant. The vast majority eat the clay only during pregnancy. Many stated they also ate dry laundry starch, sometimes in combination with the clay. In a comparison of 90 non-pica patients with 110 patients with pica, no adverse effects in the newborn were apparent. However, the incidence of toxemia was more than twice as prevalent in the pica group as the non-pica group.

In 1895, Thomson first pointed out the existence of two types of pica<sup>17</sup>. "Malignant" or cachectic pica is found in association with extremely inadequate diets, and the victims often die of malnutrition. In the sixteenth century this type of pica was a serious problem among male slaves on large plantations. Many of them actually committed suicide in this manner. They had an uncontrollable craving to eat unusual materials, though most often dirt. Sluggishness,

mental insensibility, profound muscular weakness, lassitude, mild edema and anemia, were the predominant symptoms. Although rarely seen today, Mengel, Carter, and Horton reported a case of cachectic pica in a 17-year-old Negro girl in 1964<sup>12</sup>. She had the above symptoms with hypokalemia and a severe anemia (hemoglobin - 4.7 gm%). Marked improvement was noted after iron and potassium therapy.

Benign pica is presently the most common type of pica in the United States. There is very little evidence associating this type of pica with malnutrition. Nevertheless, the possibility exists that the lack of some nutrient or nutrients in the diet might cause pica. Supplying this lacking substance might prove to be curative in the treatment of pica.

In 1962 Gutelius found that the hemoglobin concentrations and ascorbic acid blood levels were significantly lower in thirty children with pica than in a comparable group. This they attributed to the fact that the amount of milk, meat, and foods rich in vitamin C contained in the diet of the children with pica was much less than that of the comparable group. Gutelius found that the administration of intramuscular iron was no more effective in curing pica than the intramuscular administration of saline solution<sup>7</sup>

In 1963, Gutelius conducted a double blind experiment

with 24 Negro children with pica who were two to four years old. Half of the group were given a multiple vitamin and mineral preparation (excluding iron) daily for a period of six to seven weeks. The other half of the group, serving as controls, were given placebos daily. A final check on pica three to thirteen months after treatment showed the administration of the multiple vitamin and mineral preparation was no more effective in curing or improving the habit of pica than placebos<sup>8</sup>.

In 1964, McDonald and Marshall carried out a double blind study to determine the efficacy of iron in the treatment of pica<sup>11</sup>. One group of children received intramuscular iron and a control group of equal mean age received intramuscular injections of normal saline. Four months later nearly all of those given iron had lost their pica, but it was still present in three-quarters of the controls. However, after five to six months there was no significant difference between the two groups. McDonald and Marshall believed this failure of maintenance of cure may have been related to the fall in the mean hemoglobin level which occurred. Five children who initially received saline and in whom pica was still present were given iron at 6 months and all lost their pica. McDonald and Marshall concluded, contrary to the results of previous experiments, that pica can be cured by iron in nearly all cases, but that permanent cure may be dependent on the maintenance of

adequate hemoglobin levels.

Chamberlin has pointed out that one should always look for a source of anemia in a child with pica. In 1965, he presented a case of a four year old Negro girl with pica who had recurrent pica and anemia following iron therapy. At surgery a small bowel intussusception with a polyp as the bleeding point was found<sup>5</sup>.

One of the most recent attempts at proving a cause and effect relationship between anemia and pica, was made in 1966 by Okcuoglu and co-workers in Turkey. Pica, consisting of mainly the eating of dirt and plaster by children and clay by women, is an important health problem in Turkey. One hundred eighty two subjects were included in the study of which sixty-nine were control subjects, seventy-three had pica, and forty had a history of pica earlier in life or of intermittent pica during pregnancy.

The average hemoglobin concentration of the sixty-nine control subjects of all ages without a history of pica was 13.0 gm. per 100 ml; 17 per cent were anemic. The average hemoglobin concentration of the seventy-three persons of all ages with pica was 9.8 gm. per 100 ml and 64 per cent were anemic. Anemia associated with pica appeared to be reversible since the average hemoglobin level of the forty subjects who were former dirt or clay eaters was 12.6 gm. per 100 ml. and only 20 per cent

were anemic<sup>2</sup>. The results of this study again pointed out an association between pica and anemia, but did not disclose a mechanism by which a cause and effect relationship could be established.

The following year the same group of Turkish researchers tested four varieties of clay and one soil sample for their effect on the absorption of  $\text{FeSO}_4$  and  $\text{Fe}^{59}$ -labelled hemoglobin in normal and iron deficient subjects. One sample of clay was obtained from Turkey; the others from the United States. The clays tested represented the types most commonly ingested by patients with pica.

The clays differed in effect depending on their cation exchange capacity (CEC). Clay from Turkey with a high CEC was more effective in blocking absorption of iron and  $\text{Fe}^{59}$ -labelled hemoglobin than were the other three clays with lower CEC values. The mechanism involved is explained by the fact that iron readily exchanges cations with other substances present in the clay such as Ca, Mg, Mn, Na, K, and H. In the process, non-absorbable iron compounds are formed. This study appears to be one of the first which has yielded a possible mechanism by which pica and anemia may actually have a cause and effect relationship. Okcuoglu concluded that the effect of clay and soil on iron absorption may not be the sole factor in the production of anemia in geo-

phagia, but it could be contributory. They feel nutritional and parasitic factors also are often involved.<sup>3</sup>

Another type of pica and the last we will consider in this paper is that of coprophagia. This is often found in the wards of psychiatric hospitals where patients are treated in the most advanced stages of their illness. Although these coprophagic patients may put into their mouth everything, indiscriminately and incidentally their own feces, this is rather exceptional. As a rule, they show a marked discrimination in eating specifically their own feces<sup>1</sup>. Klüver and Bucy found that the removal of both temporal lobes in trained monkeys caused similar behavior. The monkeys showed an irresistible tendency to grasp anything within reach. They placed the grabbed object in their mouth, bit it, touched it to their lips and finally would ingest it, if it could be swallowed. No such lesion or dysfunction of the temporal lobes has ever proved to be the cause of coprophagia in man.

This leads us to the final consideration of this paper, namely the etiology of pica. In most cases, one specific cause for pica cannot be found. Rather, it is the result of interaction between forces acting within the child and in the environment.

Lourie, Layman and Millican explain the development of pica by the fact that some children naturally show



more interest in mouth activity than others. This hand to mouth activity persists when there are environmental pressures in this direction, commonly from the mother, siblings, or friends. If the child's mother cannot cope with the problem adequately and she supplies inadequate patterns of control for these oral activities, they eventually acquire a specific meaning for the child and become internalized. These children experience no conflict between their inner pressures to mouth objects and the external disciplines which have been non-operative and therefore develop pica.

Accordingly, in 1963 Lourie, Laymon and Millican formulated four ways in which pica may develop<sup>10</sup>.

1. Pica may be an attempt by a young child to solve the problem of meeting his oral needs when the mother is unavailable to him because of death or separation or because of personality disturbances in the mother.
2. Pica may represent excessive oral gratification resulting from overstimulation by the mother.
3. Pica may represent aggression directed toward the mother as a continuation or displacement of early conflicts over feeding, especially around the introduction of solid foods.
4. Pica may be accentuated or perpetuated by brain damage affecting perceptual and motor development.

In many cases, pica is an addiction in the psychodynamic sense, though it is not pharmacological. In both drug addiction and pica, a distorted instinctual satisfaction is impulsively engaged in as a compensation for the loss of security<sup>14</sup>. Knight, in presenting his psychoanalytic formulations regarding alcoholic addiction, stated that in fostering the pattern of soothing the infant through oral pacifying the mother builds in a pattern of tremendous strength<sup>9</sup>. This pattern of oral pacification could later become the principal driving force in many individuals with pica.

Millican has recently altered her original hypothesis concerning the etiology of pica because she now believes the lack of paternal support also may play a big role in a child's developing pica. Accordingly she has hypothesized that there are three main "factors" which commonly influence a child to develop pica<sup>14</sup>. These are:

Factor I: Maternal Deprivation

1. Major separation
2. Mother employed, with inadequate or shifting mother substitutes
3. Major emotional illness of the mother: Psychosis, depression, schizoid personality, paranoid personality, alcoholism.

Factor II: Maternal Fostering of Oral Defenses

Against Anxiety: The mother fosters

(consciously or unconsciously) the use of oral activity by the child to handle his anxiety.

1. Late weaning
2. Bottle used as a pacifier
3. Mother had pica
4. Mother seduces child to pica.

Factor III: Paternal Deprivation

1. No father ever present in the home
2. Major separation from father
3. Father alcoholic
4. Father rejects child.

In 1967, Millican tested her hypothesis by conducting a study to determine the incidence of the above factors in children with pica. Ninety-five children with pica were compared with twenty-seven other children in a normal comparison group. A child was considered to have been influenced by a factor if he had been subject to any of the conditions listed as subheadings under the given factors above.

Although according to Knight oral pacification may predispose a child to alcoholism, it does not itself produce pica. This was disclosed by the fact that almost half of the normal group had Factor II present. Only two children with pica had none of the three factors present. About two thirds of the group were in the

combinations of Factors II and III (31.2 per cent) and Factors I, II, and III. With the father unavailable for identification purposes, one of the resultant identifications ensuing was with the mother's oral defenses, including pica.

In addition many investigators feel there often is a cultural influence in the development of pica. In general, mothers who come from communities where clay eating and starch eating are common, or who engage in pica as adults, tend to have a tolerant attitude toward pica in their children, and some may even encourage it. As previously stated, this is a common occurrence in lower classes of southeastern United States residents where there has been a high incidence of pica for over a hundred years.

#### CONCLUSION

In conclusion, the more recent literature, as well as several older basic articles on pica, have been reviewed. The recent work by Okcuoglu has finally yielded a very plausible mechanism for the development of anemia in patients with pica. Although an occasional case of pica is reported which appears related to nutritional deficiencies, the majority of cases are of the benign type of pica, and are probably due to multiple factors. It is quite evident that there is need of much more extensive investigation in this field before the phenomenon of pica will be fully understood.

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