

Treatment of Pica with a Vitamin and Mineral Supplement

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IN the long history of pica, a question of recurring interest has been the nature of the relationship between this habit and malnutrition.¹ In order to understand this problem it is important to recognize the existence of two types of pica first differentiated by Thomson in 1895.² "Malignant" or cachectic pica is found in association with extremely inadequate diets and the victims often die of malnutrition. This type of pica, which primarily involves the eating of dirt, was a serious problem among male slaves in the nineteenth century.³ It is rarely reported in this country today.⁴ On the other hand, "benign" pica is a common finding, especially among young children and pregnant women of the Negro race.⁵ Moreover, until recent years there has not been much evidence associating this type of pica with malnutrition.

The suggestive evidence presented in 1942 by Dickens and Ford,⁶ based on data obtained from brief interviews with third grade children in one county in Mississippi, indicated the possible association of geophagy with diets

deficient in iron. More recently Lanzkowsky showed that iron deficiency anemia was significantly more severe in twelve South African children with pica than in comparable control children. In analyzing the diets of eighty-six women with pica and twenty control subjects, Edwards and others⁸ at Tuskegee Institute reported that the diets of a significantly higher percentage of the former were particularly low in calories, calcium, iron, thiamine and niacin.

In 1962 Gutelius and others⁹ found that the hemoglobin concentrations and blood levels of ascorbic acid were significantly lower in thirty children with pica than in a comparable control group. In addition, they found that the amount of milk, meat and foods rich in vitamin C contained in the diet of the children with pica was less satisfactory than that of the control children. However, these authors did not find that the intramuscular administration of iron was more effective in curing pica than the intramuscular administration of saline solution. Their evidence suggested that the relationship between iron deficiency anemia and pica was not one of cause and effect. Despite these findings, the possibility remains that some other nutrient or nutrients lacking in the diet might cause pica and thus prove curative in treatment.

Theoretically it would have been desirable to investigate the treatment of pica with a completely adequate diet or a complete nutritive supplement for each child tailored to fit his specific needs. However, from a practical point of view, such procedures were obviously impossible. Furthermore, the addition of calories and protein to the diets of these children was considered unnecessary since previous studies had demonstrated that the fat pads,

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muscle mass and body weight of children with pica were adequate.⁹ A review of the records of the eighty children studied nutritionally at Children's Hospital in Washington, D. C., showed that 85 per cent were drinking adequate or excessive amounts of milk, a fact which indicated sufficient protein intake in the majority of cases.

The present controlled study was undertaken in order to test the efficacy of a standard multiple vitamin and mineral preparation in the treatment of pica. It was considered advantageous to study a preparation readily available on the market, as well as one which contained as many of the vitamins and trace elements as possible, but without iron since the therapeutic value of this nutrient in pica had already been evaluated.^{7,9}

CLINICAL MATERIAL

Children with pica were referred to the research team from the Outpatient Department of Children's Hospital and the well-baby clinics of Washington, D. C. during the period from May 1960 to March 1961. The cases were screened by the medical social worker (C. C. D.) during a preliminary interview with the mother. The twenty-four patients accepted for study represented a consecutive series of Negro children (two to four years old) without chronic illness (including chronic lead poisoning) or obvious mental deficiency, whose growth and development had been normal.

METHODS AND PROCEDURE

The hemoglobin concentration, using the cyanmethemoglobin method with the Coleman-Junior spectrophotometer, and the fasting plasma level of ascorbic acid, using the colorimetric titration method of Roe and Kuether,¹⁰ were obtained for each child.

A detailed history of pica was taken by the psychiatrist (F. K. M.) during a twenty to thirty minute interview with the mother. This investigator had seven years of previous experience in working with patients with pica. Information was obtained concerning the onset and duration of sucking, chewing and ingestion of unsuitable materials; the substances sucked, chewed and ingested; possible proof of ingestion such as particles in the stools; and the presence of pica in other members of the family.

A pica rating was devised for each child. Four

TABLE I
Method of Scoring Pica in Order to Obtain Pica Rating

A. Duration (after 18 months of age)	
0	Less than 3 months
1	3-6 months
2	7-12 months
3	13-18 months
4	More than 18 months
B. Frequency	
0	Less than once a week
1	More than once a week but not daily
2	One to three times a day
3	Frequently each day but not constantly
4	Practically all the time
C. Intensity	
0	Not present
1	Ingests nonedible substances if favorites are available
2	Seeks out certain nonedible substances which are preferred
3	Unselective in eating nonedible substances when foods unavailable
4	Prefers nonedible materials to food
D. Resistance to Control	
0	Stops when told, does not resume
1	Stops when reproved, resumes in other situation
2	Stops when reproved but resumes in a few minutes
3	Stops when reproved but resumes immediately
4	Does not stop
Scores	
A. Duration	_____
B. Frequency	_____
C. Intensity	_____
D. Resistance	_____
Total	_____

factors from the pica history—duration, frequency, intensity and resistance to control—were each rated on a scale of 0 to 4 (Table I). The maximal total rating possible was 16; those with severe pica usually scored between 10 to 14. The scores remained constant over a period of weeks, a fact which was demonstrated in another series in which the pica was rated in ten cases, first by the medical social worker at the time of screening and again several weeks later by the psychiatrist.⁹

The medical social worker secured socioeconomic data on each family. Further work-up included a complete history and physical examination, anthropometry, standard urinalysis and stool examination for ova and occult blood.

TABLE II
General Information on Twenty-Four Children with Pica

Case	Age (mo.) and Sex	Hemo- globin (gm./100 ml.)	Ascorbic Acid Blood Level (mg./100 ml.)	Pica		Substances Ingested
				Duration (mo.)	Frequency (per wk.)	
1	27,F	10.7	0.55	18	3-6	Dirt, starch
2	30,M	12.6	0.75	20	1-2	Crayons, ashes
3	42,F	10.4	0.50	35	1-2	Plaster, dirt
4	36,M	11.6	1.05	26	35+	Paster, paper, dirt, ashes
5	39,M	11.9	0.48	27	Constant	Plaster, dirt
6	31,F	9.9	...	22	35+	Paper, dirt, matches, cigarettes
7	31,M	9.9	0.50	22	35+	Paper, starch
8	23,F	7.9	0.92	15	7-21	Plaster, paper, dirt, starch, matches, ashes
9	24,F	11.3	0.38	18	35+	Plaster, paint, paper, cigarettes, stones, sticks
10	23,M	10.4	0.83	10	35+	Dirt, matches, soap
11	31,M	12.3	0.60	13	3-6	Paper, dirt, matches, crayons, ciga- rettes, pencils, sticks
12	40,F	12.3	1.00	31	Constant	Plaster, paint, dirt, "anything"
13	37,M	8.8	0.90	25	35+	Paper, crayons, chalk, string
14	27,F	12.0	...	15	7-21	Paint, paper, stones, string
15	33,M	12.3	0.31	26	7-21	Plaster, paper, dirt
16	29,F	9.9	0.15	22	Constant	Plaster, paper, starch
17	46,F	10.1	0.40	39	35+	Plaster, paper, dirt, starch
18	36,F	8.1	1.36	29	Constant	Plaster, dirt, ashes
19	27,M	7.0	1.05	16	7-21	Plaster, paper, dirt
20	25,F	11.3	1.60	19	21+	Paper, erasers
21	24,F	9.9	1.00	16	35	Plaster, paper, dirt, starch, chalk, matches, cigarettes
22	24,M	10.9	...	15	35+	Plaster, paper, paint, dirt, matches, cigarettes
23	27,M	10.9	0.77	15	21+	Plaster, paper
24	27,M	10.0	0.40	15	21+	Plaster, paper
Mean	30.8	10.52	0.738	21.2		

The multiple vitamin and mineral preparation chosen for the treatment of pica was Delectavites^{®*}. This foil-wrapped preparation of chocolate was considered generally acceptable to children and easy to handle. At the time of study Delectavites contained all the usual vitamins and minerals used in such preparations with the exception of iron: vitamin A, 5,000 U.S.P. units; vitamin D, 1,000 U.S.P. units; vitamin C, 75 mg.; vitamin E, 2 I.U.; vitamin B₁, 2.5 mg.; vitamin B₂, 2.5 mg.; vitamin B₆, 1.0 mg.; vitamin B₁₂ activity = 3.0 µg.; pantothenol, 5.0 mg.; nicotinamide, 20.0 mg.; folic acid, 0.1 mg.; biotin, 30.0 µg.; rutin, 12.0 mg.; calcium carbonate, 125.0 mg.; boron, 0.1 mg.; cobalt, 0.1 mg.; fluorine, 0.1 mg.; iodine, 0.2 mg.; magnesium, 3.0 mg.; manganese, 1.0 mg.; molybdenum, 1.0

* Supplied by White Laboratories, Inc.

mg.; and potassium, 2.5 mg. The vitamin C content (75 mg.) was unusually high. Placebos,* identical in appearance and similar in taste, were used for the control children.

The twenty-four patients were divided into two groups using a table of random numbers. The first group received the mineral and vitamin preparation, one each day with a meal. The second group received one placebo daily. Preparations were given out by code number known to one investigator only.

In order to check on the regularity with which the preparations were taken, the nurse from the Visiting Nurse Association of Washington who was assigned to the area in which the patient lived visited the home once a week. She made a note of the number of chocolate pieces remaining, if any, and left seven more for the following week. Each week she gave the mother a slip of paper on which she

was to check the days on which the patient took the preparation.

The available evidence, including a statistically significant rise in plasma levels of vitamin C in the treated patients, indicated that, with two exceptions (Cases 7 and 22), the patients took the prescribed preparations regularly. These children (Cases 7 and 22) did not like candy but took the preparation most of the time; both were receiving placebos.

The preparations were given daily for a period of six to seven weeks, which was considered adequate to saturate body stores with vitamin C.¹¹ At the end of this time the patients were seen again so that the blood levels of ascorbic acid could be determined and the pica re-evaluated. At a final re-evaluation, three to thirteen months after the period of treatment, the status of pica was investigated but the levels of ascorbic acid in the blood were not determined.

STATISTICAL PROCEDURES

Differences are reported as statistically significant at the 5 per cent level of confidence or better ($P < 0.05$). In testing for significance the two-tailed *t* test was used for measurements and scores. The difference between the number of cures in each series was also checked for significance by the chi-square test with Yate's correction for continuity.

RESULTS

Table II shows the series of twenty-four patients in order of study giving age, sex, hemoglobin concentration, fasting blood level of ascorbic acid, duration of pica, frequency of pica per week and the unsuitable substances ingested.

There were twelve boys and twelve girls with an average age of 30.8 months. The mean hemoglobin level was 10.52 per 100 ml. with a range from 7.0 to 12.6 gm. The mean plasma level of ascorbic acid was 0.738 mg. per 100 ml. with a range from 0.15 to 1.60 mg. The pica had been present for an average of 21.2 months and for more than a year in all but one case (Case 10). Of the substances ingested paper was the most popular, followed by plaster, dirt, laundry starch, matches and cigarettes in order of decreasing frequency.

The fasting blood levels of ascorbic acid and the pica ratings both before treatment and six to seven weeks later, at the end of treatment, for the twelve children who received the multi-

TABLE III
Fasting Blood Levels of Ascorbic Acid and Pica Ratings for Twelve Children with Pica Before and After Six to Seven Weeks of Treatment with Multiple Vitamin and Mineral Preparation, and Final Status of Pica

Case	Before Treatment		After Treatment		Status of Pica 3 to 13 Months after Treatment
	Ascorbic Acid (mg./100 ml.)	Pica Rating	Ascorbic Acid (mg./100 ml.)	Pica Rating	
2	0.75	5	1.17	0	1+ relapse (mild)
4	1.05	10	*	10	0
5	0.48	9	1.80	0	1+ relapse (mild)
8	0.92	9	1.00	7	0
9	0.38	8	1.50	0	0
11	0.60	8	1.80	7	± improved
12	1.00	10	1.50	9	2+
14	...	11	1.02	7	2+
15	0.31	11	1.45	6	2+
19	1.05	6	1.70	0	0
23	0.77	10	2.30	9	± improved
24	0.40	12	1.80	8	± improved
Mean	0.701	9.1	1.549	5.2	

* Patient unable to return but pica history obtained from mother.

ple vitamin and mineral preparation are given in Table III. A final check on pica is also recorded. The same information for the twelve patients who received placebos is given in Table IV.

The mean blood level of ascorbic acid in the twelve children who received treatment was 0.701 mg. per 100 ml. initially, and 1.549 mg. per 100 ml. at the end of treatment. This rise was found to be highly significant ($P < 0.001$). The mean pica rating decreased from 9.1 to 5.2. Four children were reported as being without pica, three markedly improved and five remained about the same.

In the twelve children who served as controls there was no rise in the mean blood level of ascorbic acid, which was 0.779 mg. per 100 ml. initially and 0.744 mg. per 100 ml. at the end of the treatment period. The mean pica rating decreased from 10.2 to 4.4. Six children were reported as being without pica, one was markedly improved and five remained about the same.

Thus, at the end of the treatment period, there were seven children in each group who were apparently cured or much improved and

TABLE IV
Fasting Blood Levels of Ascorbic Acid and Pica Ratings for Twelve Children with Pica Before and After Six to Seven Weeks of Placebos Given Daily, and Final Status of Pica

Case	Before Treatment		After Treatment		Status of Pica 3 to 13 Months after Treatment
	Ascorbic Acid (mg./100 ml.)	Pica Rating	Ascorbic Acid (mg./100 ml.)	Pica Rating	
1	0.55	8	1.00	9	*
3	0.50	12	0.45	0	0
6	...	9	0.48	8	± improved
7	0.50	13	0.60	9	2+
10	0.83	10	0.96	0	0
13	0.90	12	1.20	10	1+ improved
16	0.15	13	0.51	0	3+ relapse
17	0.40	11	0.43	0	0
18	1.36	10	1.50	8	1+ improved
20	1.60	7	...	0	0
21	1.00	7	0.75	0	0
22	...	10	0.30	9	2+
Mean	0.779	10.2	0.744	4.4	

* Lost to study.

five who did not improve. The pica ratings suggested that the improvement in the untreated group was somewhat greater than in the treated group, but the difference was not significant. Among the treated children, improvement in those whose blood levels of ascorbic acid were low initially was no greater than in those whose blood levels were high initially.

The final interview, which took place three to thirteen months after the treatment period, was completed for twelve treated patients and eleven control children. Four of the former and five of the latter were without pica, three in each group were markedly improved, and three in each group showed little or no improvement. Two treated children and one control child had relapses two to six months after apparent cures. The results of treatment are summarized in Table v. It is clear that Delectavites proved no more effective than placebos in curing or improving the habit of pica.

COMMENTS

The large number of cures observed in both the treated and control children can be ex-

plained partly as the result of spontaneous improvement which takes place with increasing age.⁵ It also has been shown that continued interest and nondirective support given to such families are factors in curing children with pica even when no advice is given on management of the pica.⁹

In evaluating the final results it is not considered of any importance that eight boys and four girls were assigned by chance to the treated group. In a large series of preschool children with pica no difference was found in distribution by sex,^{9,12} and this fact holds true for all age groups.⁵ Thus, there is no tendency for children of one sex to be cured more easily than those of the other sex.

Since it has been demonstrated that neither iron⁹ nor a vitamin and mineral supplement can cure pica any more successfully than placebos, there is a possibility that these medications given together might prove to be more effective than either one given alone. This seems most improbable. Table II shows that the hemoglobin concentration in five of the twelve children who received Delectavites was above 12 gm. per 100 ml., yet none of them was cured at the end of study; one had a temporary remission.

The present experiment indicates that even though poor nutrition may be associated with pica, it probably is not in itself an important cause of pica. At least a standard dietary supplement given for six or seven weeks offers no specific cure. Both pica and poor nutrition may result from other conditions which exist in the lowest socioeconomic groups of the Negro

TABLE V
Treatment of Pica with a Vitamin and Mineral Supplement and Summary of Results

Type of Preparation	No. of Patients	Cured or Much Improved			
		At End of Treatment		3-13 Months after Treatment	
		No.	%	No.	%
Medication.....	12	7	58	9	75
Placebo.....	12	7	58	8	73*

* One lost to study.

race in which pica is most prevalent.⁵ Some of these conditions have been pointed out in other studies.⁹ These children usually live in slum areas which lack play facilities.¹³ Supervision at home is frequently inadequate. Parents may be ignorant of the dangers of pica. Furthermore, the habit is often culturally acceptable in this population group.⁵ Psychologic problems in children with pica and their families are thought to be significantly more common than in comparable control groups.¹⁴⁻¹⁶

In the present series housing was extremely poor with the exception of four homes in government housing projects. The six families with the most satisfactory incomes included one living on disability benefits, three on public assistance and two families with working mothers. Seventeen mothers in the series had pica for laundry starch or clay during pregnancy, and in many of them the habit was not confined to pregnancy. Fourteen families had other children with a history of pica. At least twelve families were obviously seriously disturbed by such problems as separation of the parents, family quarrels or inability of the mother to cope with her responsibilities in the home. Thus the present experiment adds support to the hypothesis that the etiology of pica involves numerous environmental, cultural and psychologic factors.⁹

SUMMARY

In a double-blind experiment twelve Negro children with pica were given a multiple vitamin and mineral preparation daily, which contained 75 mg. of ascorbic acid, for a period of six to seven weeks. A comparable group of twelve Negro children with pica, who served as controls, were given placebos daily.

At the end of the treatment period seven children in each group were symptom-free or much improved. The plasma level of ascorbic acid rose significantly in the treated group but not in the control group. At a final check on pica three to thirteen months after the end of the treatment period, only three children in each group were reported to have frequent pica. Treatment with a multiple vitamin and mineral preparation was no more effective in curing or improving the habit of pica than placebos.

Results of this experiment are in accord with previous findings that pica is a complicated environmental, cultural and psychologic problem.

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