

# Pica: Common but Commonly Missed

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**Background:** Pica is the compulsive eating of nonnutritive substances and can have serious medical implications. Although it has been described since antiquity, there has been no single agreed-upon explanation of the cause of such behavior.

**Methods:** Databases from MEDLINE and PSYCH-Lit were searched from 1964 to the present to find relevant sources of information using the key words "pica," "obsessive-compulsive disorder," "iron-deficiency anemia," and "nutrition."

**Results and Conclusions:** Pica is observed most commonly in areas of low socioeconomic status and is more common in women (especially pregnant women) and in children. To our knowledge, the prevalence of pica is not known. Numerous complications of the disorder have been described, including iron-deficiency anemia, lead poisoning, and helminthic infestations. Pica is probably a behavior pattern driven by multiple factors. Some recent evidence supports including pica with the obsessive-compulsive spectrum of disorders. Many different treatment regimens have been described, with variable responses. It is important to be aware of this common, but commonly missed, condition. (J Am Board Fam Pract 2000;13:353-8.)

One of the many unsolved mysteries in medicine is the teleologic or physiologic basis of pica, the compulsive eating of nonfood substances. Many common problems encountered in daily practice can be caused by pica. Our purpose is to draw the attention of primary care physicians to the manifestations, potential screening methods, and potential treatment approaches for this eating disorder.

## Methods

We searched MEDLINE and PSYCH-Lit from 1964 to the present to find relevant sources of information, using the key words "pica," "obsessive-compulsive disorder," "iron-deficiency anemia," and "nutrition."

## Pica

*The Diagnostic and Statistical Manual of Mental Disorder: DSM - IV*<sup>1</sup> defines pica as "the persistent eating of nonnutritive substances for a period of at least one month, without an association with an aversion to food." The behavior must be developmentally inappropriate and not part of a culturally

sanctioned practice, and severe enough to warrant clinical attention. The DSM-IV manual states that the condition is frequently associated with mental retardation, but it has been seen in all ages and both sexes, and particularly in young children and pregnant women.<sup>1</sup>

Other authors describe variations on these themes. Parry-Jones and Parry-Jones<sup>2</sup> note that there are several references throughout history suggesting that pica can also include the compulsive eating of food substances, essentially normal food in abnormal quantities, blurring the distinction with such food cravings as those associated with premenstrual syndrome or pregnancy.<sup>2</sup> As this suggestion implies, it can be misleading to classify all pica as abnormal. In addition, pica might represent a symptom complex rather than a disease.<sup>2</sup>

Pica is most frequently observed in pregnant women, patients of lower socioeconomic status, and children.<sup>3</sup> It is also found in some cases of iron-deficiency anemia as well as in deficiencies of other nutrients such as zinc.<sup>4</sup> In some cultures pica is considered normal and even therapeutic,<sup>2</sup> falling outside of the DSM-IV definition of a disorder.<sup>1</sup> The types of substances ingested are listed in Table 1. The eating patterns are referred to as "-phagias," such as pagophagia for ice eaters, geophagia for clay eaters, and amylophagia for starch eaters. Interestingly, the range of reported items of con-

Submitted, revised, 16 February 2000.

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**Table 1. Substances Described as Objects of Pica.**

Nonfood		Food	Food—Nonfood*
Ashes	Metal	Carrots	Baking soda
Balloons	Newsprint	Celery	Chewing gum
Burnt matches	Pain chips	Croutons	Coca leaf
Chalk	Paper	Licorice	Coffee grounds
Cigarette butts	Plant leaves	Life Savers candy	Oyster shells
Clay	Pencil erasers	Milk	Tomato seeds
Cloth	Plastic	Parsley	
Crayons	Powder, baby		
Detergent	Powder puffs		
Dirt	Sand		
Feces	Soap		
Fuzz	Starch		
Grass	String, thread		
Ice from freezer, ice cubes	Toilet tissue		
Insects	Twigs		
Lavatory fresheners			

Adapted from Lacey<sup>4</sup> and Edwards et al.<sup>6</sup>

\*Items that can be either food or nonfood in different situations.

sumption has not changed much during the past 4 centuries.<sup>2</sup>

### History

The term *pica* comes from the Latin word meaning magpie, presumably named after this bird's peculiar eating behaviors. The magpie shows an indiscriminate preference for foods and nonfoods. Pica of dirt and clay was known to the Greeks and the Romans and was recorded in a 13th century Latin work. Pica was first addressed in a medical book in 1563, where geophagia was described in pregnant women and in children.<sup>2</sup>

Pica behavior still occurs almost ritualistically in some modern cultures. Geophagia has been described as a common act during the 1800s in the southern United States, primarily among slaves, and is still an accepted behavior in many cultures. It has been practiced as part of religious ceremonies, magical beliefs, and attempts at healing.<sup>2</sup> Clay ingestion has been used for medicinal purposes by many cultures, possibly to affect the microorganisms in the gut or to help relieve intestinal spasms. During the 1950s and 1960s, geophagia was so common in the south that one could purchase small brown bags of clay outside bus stops. As members of the southern population moved north, it was not uncommon to have special local clays mailed from family members back home.<sup>5-7</sup>

Pica has frequently been described as a symptom of iron deficiency, although it occurs often in those who have normal hemoglobin levels.<sup>1-4,8,9</sup> In the late 1960s, articles in medical journals documented the association between ice eating and anemia and its subsequent relief with iron treatment, although whether pica caused the anemia or the anemia caused pica remained unclear.<sup>2</sup> Ice eating in particular seems most closely tied to iron deficiency and seems to be most consistently amenable to iron therapy. The other forms of pica, however, have been much more inconsistent in their response to iron or any other mineral therapy.

### Prevalence

There have been few epidemiologic studies detailing the prevalence of pica. Estimates have varied widely within a particular population, depending on the criteria used.<sup>1,8</sup> Pica behavior is more common in low socioeconomic and underdeveloped areas.<sup>2,4,8,9</sup> Edwards et al<sup>3</sup> studied pica in 553 urban, pregnant, otherwise healthy African-American women. She found that there was no reported geophagia in the sample studied, but that pagophagia occurred in 8.1% of respondents who also had low ferritin levels and mean corpuscular volumes. A similar rate of pica was found in a study of 321 pregnant Saudi Arabian women in 1995, with 8.8%

of women reporting pica, particularly geophagia and pagophagia.<sup>10</sup>

## Etiology

The cause of pica behavior has eluded researchers for centuries. Sayetta<sup>8</sup> describes several theoretical approaches that attempt to explain the etiology from nutritional, sensory, physiologic, neuropsychiatric, cultural, or psychosocial perspectives. Nutritional theories are most commonly cited, which attribute pica to specific deficiencies of minerals, such as iron and zinc. Many studies describe patients with low iron or zinc levels whose pica behavior diminishes with iron or zinc replacement, although the empiric evidence for zinc is less convincing than it is for iron. It is postulated that the red clay in southern United States is used because of its high iron content, although clay has been shown to be an iron chelator and can aggravate the problem.

The sensory and physiologic theories center on the finding that many patients with pica say that they just enjoy the taste, texture, or smell of the item they are eating. Geophagia has been used to alleviate nausea by some patients and can give a sense of fullness to patients who are trying to lose weight. A neuropsychiatric theory is supported by evidence that certain brain lesions in laboratory animals have been associated with abnormal eating behaviors, and it is postulated that pica might be associated with certain patterns of brain disorder in humans.<sup>8</sup>

Iron deficiency and pica have been reported in association with celiac disease in childhood.<sup>11,12</sup> Santos and Werlin<sup>11</sup> describe 4 patients who each complained of vague abdominal symptoms of intermittent pain and loose stools. All patients required biopsy to confirm the diagnosis of celiac disease. The gastrointestinal symptoms, pica symptoms, and anemia all resolved with institution of a gluten-free diet. The authors believed that, in these cases, the pica was secondary to the iron deficiency, and the anemia was due to malabsorption. Cases such as these lend support to the theory that pica results from a low iron state.

Psychosocial theories surrounding pica have described an association with family stress.<sup>3,8</sup> Edwards et al<sup>3</sup> found that pagophagia was associated with a smaller social support network, and they hypothesized the behavior to be a method of alle-

viating stress. In addition, many pregnant women in that study stated that eating freezer frost or ice helped during stressful times.

Addiction or addictive behavior has also been suggested as one possible explanation for pica behavior in some patients. The evidence to support this view is that pica often persists after the physiologic cause is alleviated.<sup>2</sup> If iron deficiency leads to pica, the pica behavior should cease once iron is replaced. Cessation of pica behavior with iron replacement does not happen often, however. Whether continued pica behavior constitutes an addiction or simply a learned pattern of behavior<sup>13</sup> is unclear.

Recently, there has been some evidence that pica is a part of the obsessive-compulsive disorder (OCD) spectrum of diseases,<sup>4</sup> which would lend support to neuropsychiatric theories. Case reports describe patients with severe mental retardation and OCD patterns,<sup>14</sup> as well as patients of normal intelligence with OCD.<sup>15,16</sup> Stein et al<sup>15</sup> describe 5 patients who were examined at outpatient anxiety disorder and OCD clinics. These patients described their pica behavior as one of the ritualistic behaviors they were compelled to carry out, and that eating the substance led to relief of tension or anxiety. Patients were treated with traditional therapy for OCD, which consisted primarily of psychotherapy, although the effect on pica was variable. Four of the five cases responded to selective serotonin reuptake inhibitors. Neurobiologic testing results (decreased serotonin metabolite concentration in cerebral spinal fluid and frontal lobe hypoactivity on SPECT [single photon emission computed tomography]) for 2 of the patients were more consistent with problems with impulse control, part of the spectrum of disorders in the OCD category. These case reports lend support to the concept that, in some patients, pica might be a manifestation of OCD.

## Complications

The effects of pica have been classified into five groups:<sup>4</sup> (1) inherent toxicity, including direct toxic effects of substances such as lead or other heavy metals; (2) obstruction, such as may be seen in trichophagia (hair eating); (3) excessive calorie intake, generally related to amylophagia (starch eating); (4) nutritional deprivation, such as eating clay instead of nutritive foods; and (5) other, such as parasitic infections and dental injury (Table 2).

**Table 2. Potential Complications of Pica.**

Type of Complication	Specific Examples
Inherent toxicity	Metabolic abnormalities, such as heavy metal poisoning, hypokalemia or hyperkalemia, iron and zinc deficiency, other vitamin deficiency
Obstruction	Gastric or intestinal obstruction from bezoar, foreign body, feces, or parasites, with subsequent perforation, peritonitis, and death
Excessive caloric intake	Starch eating, excessive cravings for food items
Nutritional deprivation	Failure to thrive, achlorhydria
Other	Dental injury, parasitic infestations

Adapted from Sayetta.<sup>8</sup>

Other metabolic abnormalities associated with pica include zinc deficiency, as described above.<sup>2</sup> Hyperkalemia was noted in a renal failure patient who ate sandstone.<sup>17</sup> Ergun et al<sup>18</sup> explored the possibility of a relation between geophagia and liver damage, because early reports of a pica syndrome included hepatosplenomegaly. Of the 38 patients with pica in the Ergun et al report, none had liver abnormalities. In children, a common problem associated with pica is lead poisoning re-

lated to unintentionally eating lead-based paint chips or the soil surrounding a home painted with lead-based paint.<sup>19</sup> Helminthic infection, causing eosinophilia and gastrointestinal symptoms, has been described as well. In fact, in a study of Jamaican children with pica, worm infestation was found in more than 70%.<sup>20</sup>

Intestinal obstruction can be caused by pica, either as a result of numerous parasites<sup>9</sup> or more commonly trichobezoars.<sup>21</sup> Patients with trichobezoars are typically women younger than 30 years, most of whom do not have a psychiatric disorder. A summary of several clinical studies of pica is displayed in Table 3.

**Diagnosis**

Discovery of pica behavior in a particular patient can be difficult. In the absence of complications that might signal such eating patterns, diagnosis depends on self-reporting. Patients are likely to underreport pica behavior because of embarrassment or because they are not aware that such behavior might be worth reporting. More often, the diagnosis is made when the patient has complications, such as anemia, lead poisoning, intestinal obstructions, or other metabolic conditions.<sup>8</sup> Even in patients who have these complications, the diagnosis could easily be missed without a high degree of suspicion. In a study of 38 cases of pica, certain

**Table 3. Summaries of Clinical Studies on Pica.**

Author	Number	Study Sample	Findings
al-Kanhal & Bani <sup>10</sup>	321	Pregnant women	8.8% with pica, mostly pagophagia
Danford et al <sup>22</sup>	66 (6 with pica)	Mentally retarded adults	Low iron and zinc levels in patients
Edwards et al <sup>2</sup>	553 unselected patients	Pregnant, urban, African-American women	8.1% with pagophagia. Lower iron levels. Birth outcomes not different except babies had small head circumference
Ergun et al <sup>18</sup>	38	Patients with pica	Mean hematocrit 25%, low iron levels. No evidence of liver damage
Robinson et al <sup>20</sup>	158 (108 with pica)	Children in Jamaica	46% with poor nutritional status, 70% with intestinal parasites, 35% severely anemic
Smulian et al <sup>23</sup>	125	Pregnant, rural women	14.4% reported pica, more than 50% practiced pica before pregnancy. No increase in anemia. No differences in age, race
Stein et al <sup>15</sup>	5	Outpatients at anxiety and OCD clinics	3 had OCD, 2 had impulse control disorder

OCD = obsessive-compulsive disorder.

**Table 4. Contrast Between Obsessive-Compulsive and Impulse Control Disorders.**

Disorder	Characteristic Behavior	Neurobiology	Response to SSRI
Obsessive-compulsive disorder	Harm avoidance	Serotonergic hypersensitivity	Gradual
Impulse control disorder	Risk seeking	Serotonergic hyposensitivity	Rapid

Adapted from Stein et al.<sup>15</sup>

SSRI = selective serotonin-reuptake inhibitor.

clinical findings were frequent, such as anemia, splenomegaly, spoon nail, and growth retardation.<sup>18</sup> Physicians should give patients suspected of pica behavior a thorough physical examination, looking for the above findings, and should obtain blood tests, such as complete blood count, peripheral smear for eosinophilia,<sup>19</sup> iron level, ferritin level, lead level, electrolytes, and liver function tests. Abdominal radiographs might be necessary to evaluate for intestinal obstructions from either bezoars or parasites. Stool samples can be used to rule out ova and parasites.<sup>8</sup> Even armed with all these tests, the diagnosis of pica requires that the patient (or parent of the patient) admit to the behavior, because all these clinical findings are non-specific.

As described, recent reports have suggested a relation between pica and the spectrum of OCDs.<sup>4,15</sup> In adult and child patients with OCD symptomatology or features, it is likely that the compulsive eating of nonfood substances will be secretive and thus difficult to elicit as part of a dietary history. Physicians must ask directly about the ingestion of nonfood substances that are common to pica.

When evaluating children, parents should be interviewed about dietary habits and pica behaviors. An open discussion with the child about favorite foods, followed by specific questions about ingestion of nonfood substances, might aid in the diagnosis. If pica is suspected, but parents are unaware of such behaviors, the physician can ask them to keep an observational log of the child's solitary outdoor play. This log can reveal possible pica behaviors as well as give the physician some idea of the degree of parental involvement with the child. It might also help to rule out a pattern of neglect that has been speculated by some investigators to be associated with pica in children.<sup>24</sup>

If OCD (or impulse control) symptoms occur in an adult or child patient, an assessment of pica

symptoms is advised. Similarly, patients with pica should be assessed for DSM-IV OCD and impulse control symptomatology (Table 4). OCD is characterized as obsessive risk avoidance, with ritualistic behaviors aimed at avoiding injury or illness. Impulse control disorders are typified as increased risk-seeking behaviors, with increasing tensions before the behavior and relief of tension and gratification after the behavior.<sup>15</sup>

#### **Treatment**

Physicians must be prepared for cases of pica in their daily practice. Education about nutrition, along with iron therapy or transfusions, might be the first wave of intervention. Psychological counseling or behavior therapy can also be useful adjuncts. Behavioral interventions, such as reinforcement for eating from a plate or punishment for engaging in pica, have been effective in children with developmental disabilities.<sup>25</sup> Parents can be instructed to provide closer supervision of children during play and to child-proof their homes (eg, remove lead-based paints) and play environments (eg, remove sand boxes that contain animal feces). Although pica in adults and children tends to remit with time, physicians should treat the condition when it occurs and causes complications. Appropriate treatment first involves screening for comorbid conditions and complications, then possibly using a combination of psychotherapy and selective serotonin-reuptake inhibitors. Not all forms of pica are dangerous, and some might not require intervention. A high index of suspicion is required to make the diagnosis. Severe or recalcitrant cases could require referral to a mental health specialist.

#### **Conclusions**

Review of the literature on pica confirms just how little is known about this common but commonly missed condition. Its cause is related to many fac-

tors, and there are questions about whether pica is a cause of or an effect of metabolic or behavioral states. Accurate diagnosis is hindered by the need for self-reporting on the part of the patient and for a high index of suspicion on the part of the clinician. No specific screening tests for pica exist, but accurate and timely diagnosis can help to avoid some of the many nutritional and psychological complications. Finally, when pica is diagnosed, there are no proven treatments. Although selective serotonin-reuptake inhibitors can be helpful in some cases, diagnosis and treatment must be individualized, and the practicing physician will most likely need to rely on help from mental health professionals.

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