Delusions of parasitosis manifest in the patient's firm belief that he or she has pruritus due to an infestation with insects. Patients may present with clothing lint, pieces of skin, or other debris contained in plastic wrap, on adhesive tape, or in matchboxes. They typically state that these contain the parasites; however, these collections have no insects or parasites. This presentation is called the matchbox sign, or what the authors term the "Saran-wrap sign."

The patients have no obvious cognitive impairment, and abnormal organic factors are absent. True infestations and primary systemic diseases that cause pruritus are not involved. Primary skin lesions are not present. Physical examination may reveal no lesions, but only linear erosions with crusts, prurigo nodularis, and/or ulcers.

The classification of delusions of parasitosis is complicated. It is considered primarily a monosymptomatic hypochondriacal psychosis and has been associated with schizophrenia, obsessional states, bipolar disorder, depression, and anxiety disorders. Delusions of parasitosis occur primarily in white middle-aged or older women, although the condition has been reported in all age groups and in men.
Savely et al\textsuperscript{1} introduced the term Morgellon disease to describe a condition characterized by fibers attached to the skin. The entity appears to be little more than a new designation for delusions of parasitosis. Koblenzer\textsuperscript{2} and Waddell and Burke\textsuperscript{3} have discussed the utility of the term, with Murase et al\textsuperscript{4} finding the term useful for building a therapeutic alliance with patients with delusions of parasitosis. The Centers for Disease Control and Prevention is currently investigating Morgellon disease.\textsuperscript{5}

William Harvey\textsuperscript{6} of the Morgellons Research Foundation Medical Advisory Board states the following:

All patients with Morgellons carry elevated laboratory proinflammatory markers, elevated insulin levels, and verifiable serologic evidence of 3 bacterial pathogens. They also show easily found physical markers such as peripheral neuropathy, delayed capillary refill, abnormal Romberg's sign, decreased body temperature, and tachycardia. Most importantly they will improve, and most recover on antibiotics directed at the above pathogens.

The author of this article has not found reliable data to back up William Harvey's claims, but they are included here to comprehensively address this issue.

Walling and Swick\textsuperscript{7} suggest abandoning the diagnostic terms trichotillomania, delusions of parasitosis, and neurotic excoriation, which they believe have become barriers to treatment. Instead, they suggest using the alternative patient-centered nomenclature of neuromechanical alopecia, pseudoparasitic dysesthesia, and (simply) excoriation.

**Pathophysiology**

The cause of delusions of parasitosis is unknown. It appears related to neurochemical pathology. This concept is underlined by its induction by psychoactive agents (eg, amphetamines, cocaine, and methylphenidate) and its coincidence with depression, schizophrenia, social isolation, and sensory impairment.

**History**

Patients must be queried about their symptoms, the duration of symptoms, and their belief about the etiology. Notably, Goddard\textsuperscript{11} has described a seasonality to delusions of parasitosis, and Vila-Rodriguez et al discuss the facilitation of delusions of parasitosis resulting from
Internet-based dissemination of the condition.

The diagnosis and treatment of delusions of parasitosis can be an involved clinical activity. Patients with delusions of parasitosis can resist suggestions that their condition is psychiatric rather than physical and refuse referrals for psychiatric care. In fact, in 35% of patients, the belief of infestation is unshakable. In approximately 12% of patients, the delusion of infestation is shared by a significant other. This phenomenon is known as folie à deux (eg, craziness for 2) or folie partagé (ie, shared delusions). Variations in this are the conviction that a child, a spouse, or a pet is infested.

The condition of delusions of parasitosis is a monosymptomatic psychosis, a type of psychopathology relatively distinct from the remainder of the personality. If the condition has a defined pathologic or external cause (eg, scabies), it is not truly delusions of parasitosis. In investigating the history of a patient with such suspected delusions, other causes of itch must be investigated. To diagnose this condition, true infestations (eg, scabies), pediculosis, and primary systemic causes of pruritus must be excluded. Examples include hepatitis, HIV infection, dermatitis herpetiformis, thyroid disease, anemia, renal dysfunction, neurologic dysfunction, and lymphoma.

Delusions of parasitosis are distinct from formication. Formication involves the cutaneous sensation of crawling, biting, and stinging. Formication does not involve the fixed conception that skin sensations are induced by parasites. Patients with this condition can accept proof that they do not have an infestation. Many cases of formication remain idiopathic.

The diagnosis of delusions of parasitosis should be made carefully. Iatrogenic delusional parasitosis, a case of physician-patient folie a deux, has been noted in which a physician made the diagnosis of delusions of parasitosis that was then carried in the medical record, although the patient in fact did not have delusions of parasitosis or actual infestation.

Mimics of delusions of parasitosis

Other forms of psychiatric illness can mimic delusions of parasitosis. Such psychiatric illnesses are accompanied by signs of mental illness. Delusional parasitosis can be the presenting feature of dementia, in which case the delusions of parasitosis is actually secondary.

For example, patients with schizophrenia may think they are being attacked by insects as a manifestation of their paranoia.

A type of severe depression termed psychotic depression may cause the patient to believe he or she is contaminated or "dirty" because of insect infestation. Such a patient may have a depressed mood and a sense of helplessness, hopelessness, worthlessness, or excessive guilt. Often, these feelings are obvious at clinical presentation.

Drug-induced delusions of parasitosis have been reported during treatment for Parkinson disease. Gabapentin-induced delusions of parasitosis has been noted.
Steinert and Studemund\textsuperscript{19} reported a 45-year-old man who did not have a history of psychological pathology, who, after ingesting ciprofloxacin to treat an infection, was overcome with acute delusional parasitosis. He stopped taking the ciprofloxacin, and the delusions of parasitosis resolved altogether without utilization of an antipsychotic agent. Tran et al reported a patient who had delusions of parasitosis after receiving a therapeutic dose of mefloquine,\textsuperscript{20} and Krauseneck and Soyka reported an association of delusions of parasitosis with pemoline drug therapy.\textsuperscript{21}

Cases in which an etiology is defined are best classified as secondary delusions of parasitosis. Guarneri et al\textsuperscript{22} noted a patient who was thought to have delusions of parasitosis but who, in fact, had infestation with \textit{Limothrips cerealium}; they termed the condition pseudo-delusory syndrome (ie, infestation with an uncommon insect).

Ghaffari-Nejad and Toofani\textsuperscript{23} noted a case of secondary delusions of parasitosis in a patient with major depressive disorder who had delusions of oral parasitosis; the patient sensed lizards and small organisms in her mouth.\textsuperscript{24}

**Physical**

Patients with delusions of parasitosis create their rash. They can present with no findings, erosions or ulcers with or without crusts or prurigo nodularis. They may evidence a dermatitis related to attempted treatments, which may include irritating or corrosive cleansers or harsh abrasive devices. Delusions of parasitosis involving the eyelids has been reported.\textsuperscript{25}

**Laboratory Studies**

No laboratory test can help in diagnosing delusions of parasitosis; however, laboratory tests can help identify other diseases that can mimic delusions of parasitosis. Note the following:

- To exclude infestation, a mineral oil preparation should be used to eliminate scabies, and a microscopic examination of skin and hair should be performed to exclude louse infestation.

- Neurologic pathology due to toxins or vitamin deficiencies can be evaluated with the appropriate tests.

- Tests to assess other causes of pruritus (eg, low iron level, liver or kidney disease) can be performed if clinically indicated. Examples include evaluation of the complete blood cell count;
urinalysis; liver function tests; thyroid function tests; and determinations of levels of serum electrolytes and glucose, blood urea nitrogen, serum creatinine, serum vitamin B-12, folate, and iron.

- Unless dermatitis herpetiformis needs to be excluded, skin biopsy is usually more useful to reassure patients of the lack of pathology than to diagnose delusions of parasitosis.
- Use of cocaine, methylphenidate, or amphetamines must be ascertained, and if occurring, it should be stopped.
- It is useful to examine the "proof" that the patient brings in so that one may truthfully say that the material was examined and no parasites were found. One authority anecdotally relates how he found ants in the debris and, after explaining that these arthropods did not live on or in humans, was able to give practical advice to reduce the problem.

**Imaging Studies**

Huber et al found striatal lesions in patients with secondary delusions of parasitosis, but not in cases of primary delusions of parasitosis. In rare cases, neurologic impairment (e.g., tumors, neuritis, multiple sclerosis) can mimic the symptoms of delusions of parasitosis. Causes of such impairment should be excluded with MRI or CT scanning if they are strongly suspected on the basis of the clinical findings.

**Histologic Findings**

Delusions of parasitosis have no specific histologic findings. All skin changes are secondary to rubbing, scratching, picking, or other treatment attempts.

**Treatment**

**Medical Care**

The only clear method to clear the delusion that underlies delusions of parasitosis is the administration of psychotropic medications. However, delusions of parasitosis can remit on its own. If the sensation of itch is related to some actual disease or substance use rather than a monosymptomatic hypochondriacal psychosis, the disease can be treated, or the substance inducing the sensation can be eliminated.

It is vitally important that the practitioner does not "use the delusion" to encourage the patient to accept certain treatments. While getting the patient to take a medication, such as risperidone,
may help the condition, telling them that it is a medication that "kills the parasites" reinforces and validates the delusion. Even giving the patient a course of topical permethrin "just in case" may strengthen the delusion and make it that much more difficult later on. Every delusions of parasitosis patient can recount the visit on which his or her suspicions of infestation were "confirmed."

Serotonergic antidepressants may have a role in the treatment of these patients.\textsuperscript{27,28} Reichenberg et al\textsuperscript{29} reported on a patient whose delusions of parasitosis was cured overnight by having him stop taking cetirizine and doxepin (25 mg), as well as any over-the-counter medications.

Rocha and Hara\textsuperscript{30} reported that aripiprazole at 15 mg for 8 weeks and then 7.5 mg/d was effective for delusions of parasitosis treatment. They stated:

Aripiprazole has a unique pharmacologic profile that is different from other atypical antipsychotic drugs. It is considered a partial dopaminergic agonist acting on both postsynaptic dopamine D2 receptors and presynaptic autoreceptors. It acts as a weak stimulator (so-called “partial” agonist) at dopamine D2 receptors, with the potential for exerting either antagonistic (inhibitory) or agonistic (stimulating) effects, depending on the sensitivity of the receptors and availability of dopamine, its natural agonist in the brain. In addition, aripiprazole displays partial agonism at serotonin (1A) receptors and antagonism at serotonin (2A) receptors.

Szepietowski et al\textsuperscript{31} sent out 172 specially designed questionnaires to dermatologists regarding delusions of parasitosis patients; 118 responded. The questions and resulting percentages are as follows:

- Had seen at least one patient with delusions of parasitosis - 84.7%
- Had 1-2 cases of delusions of parasitosis over the preceding 5 years - 33%
- Had seen 3-5 such patients over the preceding 5 years - 28%
- Had diagnosed no cases of delusions of parasitosis during the past 5 years - 23%
- Had more than 10 patients with delusions of parasitosis over the past 5 years - 7%
- Were currently treating a patient with delusions of parasitosis - 20%
- Always request a psychiatric opinion about their patients with delusions of parasitosis - 40.75%
- Often ask for a psychiatric opinion about their patients with delusions of parasitosis - 28.8%
- Use their own pharmacological treatment, mostly sedatives and anxiety-relieving drugs - 15.3%.

**Consultations**

A psychiatrist should be consulted if the dermatologist cannot or will not prescribe the necessary medications. Most patients with delusions of parasitosis are reluctant to see a psychiatrist, and the dermatologist may be more successful in giving the referral if they have
gained the patient's trust after several clinic visits instead of immediately after meeting the patient.

**Medication**

The current treatment of choice is risperidone or olanzapine. The older treatment of choice is pimozide. Several more recent articles have suggested other psychiatric medications can be used to treat delusions of parasitosis, including escitalopram (Lexapro, Forest Pharmaceuticals; New York, NY) and aripiprazole.

The most common adverse effects of pimozide are extrapyramidal symptoms, including stiffness and, occasionally, a special inner sense of restlessness called akathisia. Effective treatment of such extrapyramidal reactions includes benztropine 1-2 mg up to 4 times daily as needed or diphenhydramine 25 mg 3 times daily.

**Antipsychotics**

Used to treat psychoses.

**Risperidone (Risperdal)**

Binds to dopamine D2 receptor with 20 times lower affinity than for 5-HT2 receptor. Improves negative symptoms of psychoses and reduces incidence of extrapyramidal adverse effects.

**Adult**

1-2 mg qd initially

**Pediatric**

Not indicated

Coadministration with carbamazepine may decrease effects; risperidone may inhibit effects of levodopa; clozapine may increase risperidone levels.
Hypersensitivity

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus

Precautions

May cause extrapyramidal reactions, hypotension, tachycardia, and arrhythmias

Olanzapine (Zyprexa)

May inhibit serotonin, muscarinic and dopamine effects.

Adult

2.5 mg/d

Pediatric

Not indicated

Fluvoxamine may increase effects of olanzapine; antihypertensives may increase risk of hypotension and orthostatic hypotension; levodopa, pergolide, bromocriptine, charcoal, carbamazepine, omeprazole, rifampin, and cigarette smoking may decrease effects of olanzapine.

Documented hypersensitivity

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus
Precautions

Caution in narrow-angle glaucoma, cardiovascular disease, cerebrovascular disease, prostatic hypertrophy, seizure disorders, hypovolemia, and dehydration

Pimozide (Orap)

Antipsychotic of the diphenylbutylpiperidine class. Used to treat delusions of parasitosis and Tourette disorder.

Adult

1-12 mg/d

Pediatric

<12 years: Not established
>12 years: Administer as in adults