

# FEATURES

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## Babies know: a little dirt is good for you

*Accumulating evidence strongly suggests that eating dirt helps calibrate the immune system*

BY JANE E. BRODY  
NY TIMES NEWS SERVICE, NEW YORK



Ask mothers why babies are constantly picking things up from the floor or ground and putting them in their mouths, and chances are they'll say that it's instinctive — that that's how babies explore the world. But why the mouth, when sight, hearing, touch and even scent are far better at identifying things?

When my young sons were exploring the streets of Brooklyn, I couldn't help but wonder how good crushed rock or dried dog droppings could taste when delicious mashed potatoes were routinely rejected.

Since all instinctive behaviors have an evolutionary advantage or they would not have been retained for millions of years, chances are that this one too has helped us survive as a species. And, indeed, accumulating evidence strongly suggests that eating dirt is good for you.

In studies of what is called the hygiene hypothesis, researchers are concluding that organisms like the millions of bacteria, viruses and especially worms that enter the body along with "dirt" spur the development of a healthy immune system. Several continuing studies suggest that worms may help to redirect an immune system that has gone awry and resulted in autoimmune disorders, allergies and asthma.

These studies, along with epidemiological observations, seem to explain why immune system disorders like multiple sclerosis, Type 1 diabetes, inflammatory bowel disease, asthma and allergies have risen significantly in the US and other developed countries.

"What a child is doing when he puts things in his mouth is allowing his immune response to explore his environment," Mary Ruebush, a microbiology and immunology instructor, wrote in her new book, *Why Dirt Is Good* (Kaplan). "Not only does this allow for 'practice' of immune responses, which will be necessary for protection, but it also plays a critical role in teaching the immature immune response what is best ignored."

One leading researcher, Joel Weinstock, the director of gastroenterology and hepatology at Tufts Medical Center in Boston, said in an interview that the immune system at birth "is like an unprogrammed computer. It needs instruction."

He said that public health measures like cleaning up contaminated water and food have saved the lives of countless children, but they "also eliminated exposure to many organisms that are probably good for us."

"Children raised in an ultra-clean environment," he added, "are not being exposed to organisms that help them develop appropriate immune regulatory circuits."

Studies he has conducted with David Elliott, a gastroenterologist and immunologist at the University of Iowa, indicate that intestinal worms, which have been all but eliminated in developed countries, are "likely to be the biggest player" in regulating the immune system to respond appropriately, Elliott said in an interview. He added that bacterial and viral infections seem to influence the immune system in the same way, but not as forcefully.

Most worms are harmless, especially in well-nourished people, Weinstock said.

"There are very few diseases that people get from worms," he said. "Humans have adapted to the presence of most of them."

In studies in mice, Weinstock and Elliott have used worms to both prevent and reverse autoimmune disease. Elliott said that in Argentina, researchers found that patients with multiple sclerosis who were infected with the human whipworm had milder cases

and fewer flare-ups of their disease over a period of four and a half years. At the University of Wisconsin, Madison, John Fleming, a neurologist, is testing whether the pig whipworm can temper the effects of multiple sclerosis.

In Gambia, the eradication of worms in some villages led to children's having increased skin reactions to allergens, Elliott said. And pig whipworms, which reside only briefly in the human intestinal tract, have had "good effects" in treating the inflammatory bowel diseases, Crohn's disease and ulcerative colitis, he said.

How may worms affect the immune system? Elliott explained that immune regulation is now known to be more complex than scientists thought when the hygiene hypothesis was first introduced by a British epidemiologist, David Strachan, in 1989. Strachan noted an association between large family size and reduced rates of asthma and allergies. Immunologists now recognize a four-point response system of helper T cells: Th 1, Th 2, Th 17 and regulatory T cells. Th 1 inhibits Th 2 and Th 17; Th 2 inhibits Th 1 and Th 17; and regulatory T cells inhibit all three, Elliott said.

"A lot of inflammatory diseases — multiple sclerosis, Crohn's disease, ulcerative colitis and asthma — are due to the activity of Th 17," he explained. "If you infect mice with worms, Th 17 drops dramatically, and the activity of regulatory T cells is augmented."

In answer to the question, "Are we too clean?" Elliott said: "Dirtiness comes with a price. We're not proposing a return to the germ-filled environment of the 1850s. But if we properly understand how organisms in the environment protect us, maybe we can give a vaccine or mimic their effects with some innocuous stimulus."

Ruebush, the *Why Dirt Is Good* author, does not suggest a return to filth, either. But she correctly points out that bacteria are everywhere: on us, in us and all around us. Most of these micro-organisms cause no problem, and many, like the ones that normally live in the digestive tract and produce life-sustaining nutrients, are essential to good health.

"The typical human probably harbors some 90 trillion microbes," she wrote. "The very fact that you have so many microbes of so many different kinds is what keeps you healthy most of the time."

Ruebush deplores the current fetish for the hundreds of antibacterial products that convey a false sense of security and may actually foster the development of antibiotic-resistant, disease-causing bacteria. Plain soap and water are all that are needed to become clean, she noted.

"I certainly recommend washing your hands after using the bathroom, before eating, after changing a diaper, before and after handling food," and whenever they're visibly soiled, she wrote. When no running water is available and cleaning hands is essential, she suggests an alcohol-based hand sanitizer.

Weinstock goes even further. "Children should be allowed to go barefoot in the dirt, play in the dirt, and not have to wash their hands when they come in to eat," he said. He and Elliott pointed out that children who grow up on farms and are frequently exposed to worms and other organisms from farm animals are much less likely to develop allergies and autoimmune diseases.

Also helpful, he said, is to "let kids have two dogs and a cat," which will expose them to intestinal worms that can promote a healthy immune system.

[ SOCIETY ]

## Enemies at the gate

*After Eritrean troops launched an incursion nine months ago, Djibouti soldiers are digging in for the long haul along a largely forgotten front line*

BY EMMANUEL GOUJON  
AFP, DJIBOUTI-ERITREA BORDER

Camped in dunes near the Eritrean border, Djibouti soldiers wait for the enemy on this largely forgotten front line between two small African states — on one of the world's busiest shipping lanes.

"It's the waiting game that kills you, the rest is easy," said Abdi Douksieh, a commander in Djibouti's paramilitary police.

"Our men are ready to fight. Either we beat them or they beat us, but just let it end," he said.

Nerves are on edge and eyes fixed on the frontier where Eritrean troops launched an incursion nine months ago.

Some 2,100 men from the Djibouti Armed Forces were rushed in to repel the advance. They never expected to stay the winter in this isolated stretch between desert and sea, fighting off bitter winds and biting dust — but not the enemy.

Last April, Eritrean troops crossed the border and dug trenches near Gabla point, a disputed promontory also known as Ras Doumeira that overlooks the mouth of the Red Sea, home to some of the globe's busiest shipping lanes.

On June 10, the two sides exchanged gunfire that Djibouti said killed nine of its soldiers. Eritrea gave no casualty toll.

The long-running row erupted twice before, in 1996 and again in 1999. But since then, tiny Djibouti's profile has inched up in global geopolitics.

Friends with both Washington and former

colonial master France, this country of 700,000 inhabitants is today a frontline state in the war on terrorism and the European Union's new anti-piracy mission in the Horn of Africa.

Some 1,200 US troops are stationed here on the sole US military base in sub-Saharan Africa. Djibouti also hosts Paris' biggest military base abroad.

And US ally Ethiopia — locked in its own border dispute with Eritrea — depends on Djibouti for more than 85 percent of its exports and imports after losing its coastline when Eritrea won independence in 1993 after a bitter liberation war.

With the region already one of Africa's most volatile, prone to famine, drought and conflict, both the UN and the African Union have stepped up pressure on Eritrea, which has trouble with most of its neighbors.

In a resolution drafted by France last week, the UN Security Council gave Asmara five weeks to withdraw its forces from Ras Doumeira and nearby Doumeira island and to start talks with Djibouti "to acknowledge its border dispute" and defuse tension.

In October, the US warned Eritrea that it faced "appropriate action" from the council if it refused to cooperate to resolve the dispute peacefully.

Eritrea quickly rejected the council's move, saying "it obviously cannot accept a resolution asking us to withdraw our forces from our own territory."

The Eritrea-Djibouti frontier was never legally defined, based more on old accords between former masters of Djibouti and

Eritrea — France and Ethiopia in 1897 and France and Italy in 1901.

And Eritrea insists there is no territorial conflict.

With the front line officially quiet, French troops sent in to provide intelligence, medical and logistical support withdrew from the border zone in October, leaving Djibouti troops to carry on the battle of nerves.

Tension flared again in December and Djibouti's troops were put on maximum alert when Eritrea said it wanted to get back deserters who fled across the front line, which stretches 100km long but at points only a few hundred meters wide.

"Deserters come through here nearly every day," an exasperated Djibouti army Colonel Abdourahmane Cher said. "But we cannot hand them over as they would be slaughtered there and then."

"Nobody really understands Eritrea's strategy, or goals, but it is sure that this country is acting more as a destabilizing force, also against Ethiopia and in Somalia, than a part of the international community," said an AU official who asked not to be named.

"These tensions are a growing challenge for the peace in the already fragile Horn of Africa." Djibouti troops, meanwhile, continue the tense waiting game.

"Eritrean forces are occupying a part of Djibouti territory and we cannot accept it," said Cher.

"We are ready to take our land back, but we will leave the door open to talks and negotiations with the UN," he said.



A French Atlantic plane flies over the French frigate *Le Floreal*, off the coast of Djibouti.

PHOTO AFP