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Soil Salvation: The Antidepressant Properties of Dirt

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Soil Salvation

The Antidepressant Properties of Dirt

Written by Ania Ocasio

Illustrated by Megan Tiffany

A mou Haji, a hermit from Iran who held the title of "world's dirtiest man," passed away earlier this year at age 94, mere months after taking his first shower in decades. Haji claimed to have avoided bathing for fear of getting ill. He managed to go over 60 years without using soap, breaking his streak only when villagers washed him.

While extreme, Haji's embrace of the grime world represents a far-neglected aspect of immune strength: soil. Soil hosts an ecosystem of probiotics that can strengthen the microbiome, a part of the immune system found in the skin and gut. Although some people swear by hand sanitizer and flaunt their stubborn germaphobia, avoiding soil's immune-boosting properties can perpetuate a weaker immune system by stripping away a protective microbiome layer.

This microbiome is the collective mixture of protective bacteria, protozoa, and fungi that live within the human body. While human cells cannot typically change their genes, the organisms making up the microbiome can swap genes with the harmful and protective bacteria that increase their resistance against disease. This cocktail of organisms in the microbiome assists with bodily

functioning. It provides humans with a fully-staffed immune system, as their supplemental genetic material aids digestion, protection against harmful viruses, and vitamin extraction necessary for blood coagulation.

Bacteria are one of Earth's oldest organisms; since mammalian genomes have constantly been exposed to these bacteria, they never needed to be independent. This relationship is understood under the "Old Friends" hypothesis: the theory that the constant presence of bacteria allows mammals to build their

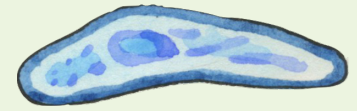
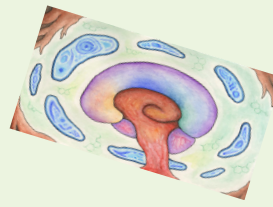
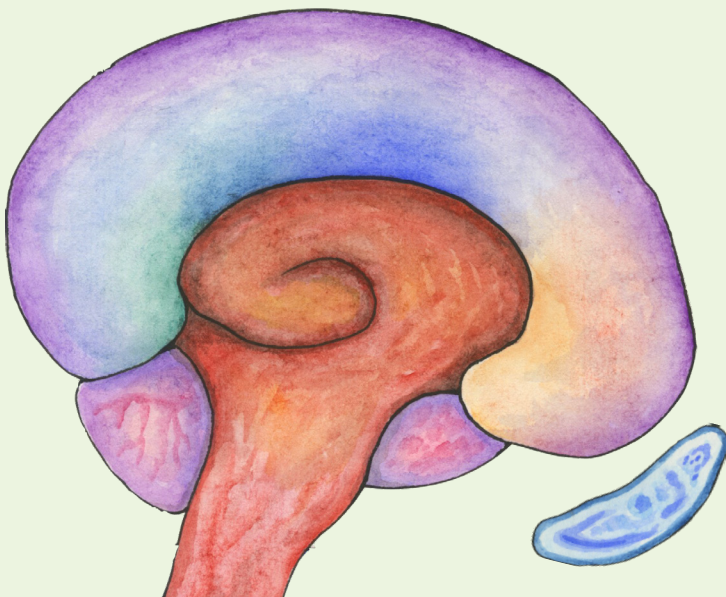
He managed to go over 60 years without using soap, breaking his streak only when villagers washed him.

microbiomes after birth. This would be evolutionarily advantageous to the mammal by enabling them to construct an environment-specific microbiome that protects against specific conditions. In this instance of evolved dependence, bacteria, and mammalian cells share an endosymbiotic relationship where an organism lives

inside or on its mutual partner. The University of Washington Center for Ecogenetics and Environmental Health describes the organisms that make up this microscopic world as "not invaders but beneficial colonizers." The human microbiome is a defense against harmful illnesses and is essential in maintaining homeostasis. Habits like over showering can be counterproductive to avoiding sickness, for they can disrupt the microbiome and throw the body's immune system into a state of imbalance. Hygiene is critical for preventing sickness, but only within reason; over-cleanliness eradicates harmful bacteria along with the good.

Whether Amou Haji's death coming months after his first shower in decades is correlated with microbiome health, the longevity of his life goes to show that dirt certainly did not harm him. Haji's bathing avoidance was considered a coping mechanism for childhood troubles, and his solace in dirt points to the healing properties of soil. Soil is packed with bacteria called *Mycobacterium vaccae* that can trigger the production of serotonin: a type of neurotransmitter released by our brains that ease anxiety and symptoms of depression. On top of improving mental health, *M. vaccae* has also been found to improve immune system functioning and minimize symptoms of diseases like cancer and arthritis. Even our Midwestern region hosts communities that wield this immunoresilience from dirt. An American Academy of Allergy, Asthma, & Immunology experiment found that Amish children living on farms have a 50 percent less chance of developing autoimmune diseases like asthma, allergies, and digestive disorders than children who grow up in more hygienic environments.

The miraculous effects of this bacteria were discovered by cancer scientist Dr. Mary O'Brien, who initially administered a serum of *M. vaccae* to lung cancer patients to boost their immune systems. Not only did their immune strength improve, but Dr. O'Brien also observed a noticeable increase in the happiness and pain relief in patients that were exposed to the bacteria. To further examine these findings, a team of researchers led by Dr. Chris Lowry from Bristol University tested the effects of *Mycobacterium vaccae* on mice. They hypothesized that *M. vaccae* improved mood because it released serotonin. Serotonin has been correlated with improved cognitive functioning and happiness at balanced levels. Dr. Lowry's team tracked serotonin levels by measuring c-Fos, an amino acid released when neurons fired. Higher levels of this biochemical marker were found in the dorsal raphe nucleus, a part of the brain, and the gastrointestinal tract. Both of these areas are responsible for serotonin production. After exposure to *M. vaccae*, the mice in Lowry's experiment appeared more relaxed. The tea



concluded that exposure to the *M. vaccae* bacteria increases serotonin levels.

While serotonin is produced in the brain and gut, most are produced in the gastrointestinal tract, which hosts part of the body's microbiome. The microbiome is vital to immune system function because its medley of bacteria helps defend against disease. As a neurotransmitter, serotonin's job is to improve intercellular communication between the brain and the body. The brain gives the body directions on how to function, and an increase of serotonin aids in the reception of these directions. Therefore, the presence of serotonin in the gut effectively increases the functioning of the immune system by assisting in communication between the microbiome and the brain. *M. vaccae* increases the immune system's strength because it triggers the production of serotonin, which allows for microbiome-brain communication.

• The human microbiome is a defense
 • against harmful illnesses and is essential
 • in maintaining homeostasis.

Like serotonin increases the strength of the microbiome, the microbiome can increase the production of serotonin. The microbiome accounts for gut functioning, producing 90 percent of the serotonin in the human body. If an excess of antibiotics or over-cleanliness weakens the microbiome, serotonin production can drop. In this way, a strong immune system leads to improved mental health, and, conversely, how improved mental health can lead to a stronger immune system.

M. vaccae also increased serotonin levels in the prefrontal cortex, a part of the brain that controls mood. The prefrontal cortex creates the hormone corticosteroid, released under the same feelings of stress that serotonin helps mitigate. The corticosteroid hormone has also been found to suppress the function of T-cells and white blood cells, which account for immune strength. This symbiotic relationship between serotonin and the immune system demonstrates the importance of protecting the microbiome. Serotonin supports immune system functioning, which, in turn, supports serotonin production: a synergy dependent on the strength of the microbiome.

Soil is rich with *Mycobacterium vaccae*, and by getting your hands dirty, you too can improve your immune system and feel the antidepressant effects of this remarkable bacteria. Whether it be the joy a gardener feels after spending an afternoon in their backyard, the relaxation of the mice in Dr. Chris Lowry's lab, or the long life of the dirtiest man in the world, everyone should take advantage of the miracles of soil. •••