

## Why do horses eat dirt?

Dr. Christine King

I always considered dirt eating to be an abnormal behavior in horses and other animals—until I had my eyes opened by a book on how wild animals take care of themselves. *Wild Health: lessons in natural health from the animal kingdom* is a wonderful book by biologist Cindy Engel, PhD, in which she discusses scientific observations of self-medication in wild animals. After reading that book, I paid more attention to when the horses in my practice ate dirt, and to where, how, and why. Here's what I've learned.

Dirt eating is almost always a normal behavior in horses. That's not to say that every horse should eat dirt every day (although they do, in trace amounts). It's simply to note that deliberately seeking and eating larger amounts of dirt is a normal behavioral response to some physiological need. In other words, in most cases it seems to be a form of self-supplementation or self-medication.

But before I go on, let me make a correction to our collective view about dirt. "Dirt" is much more than an inert brown substance that messes up our clothes and gets stuck under our fingernails. Healthy dirt—or *soil*, as it should be called—is a living, dynamic ecosystem of organic matter, a veritable universe of microbes (bacteria, fungi, other tiny organisms), minerals, water, and plant roots, to name just the things we're interested in here. And the naturally occurring mineral licks that are frequented by wild animals often turn out to be mineral-rich clay deposits or salt pans.

### **The Salt Myth**

Salt is a bit of a red herring here, because we humans tend to think that everything needs salt. I confess to being a salt junkie myself. I love the taste of salt! Many animals do, too, although salt-seeking and salt-eating doesn't necessarily argue for salt deficiency. Rather, it muddies the waters of our investigation by confusing need with want or desire.

We *need* more salt when we've lost more sodium in urine, sweat, and other secretions or excretions than we've gotten from our diets, or when we've drunk an excess of water (or tea, in my case). However, under ordinary circumstances, we get sufficient sodium in our food.

We *want* more salt because we like the taste of it. However, then we have to drink more water, often not stopping until we've taken in too much, which makes us crave salt. So, around and around we go, always in need of something because we indulged a want. (Some interesting parallels with other aspects of life...)

Anyway, salt—or sodium, to be precise—is an exceptional mineral when one is talking about appetite and how the body meets its mineral needs by seeking out specific foods. Mineral-seeking behavior seems to be quite *specific*, in that if a body is low in calcium, then it goes looking for calcium, not carbon. But specific appetite as a regulator of body mineral balance appears not to be very *sensitive*, in that the animal may not go actively looking for more of a particular mineral until body stores of that mineral are quite low. Sodium is a notable exception, probably because it is tied to body water.

Sodium has been described as the body's "water skeleton." That rather garbled metaphor came into being because the amount of sodium in the body is one of the prime determinants of the amount of water in the body, as cells function optimally within a very narrow range of concentration for the various solutes in and around them. (Solute: elements in solution, of which sodium is a major player in the body.) Too high or too low a concentration, and processes start to fail and cells start to die. So, to use the skeleton metaphor, the water component of the system "hangs on" the number and distribution of sodium atoms in the system. For this reason, the body's appetite for sodium (and water, while we're at it) is both specific and sensitive. In fact, it is so finely tuned that both salt and water are best provided free-choice (except in some medical situations).

So, are horses looking for salt when they eat dirt? Probably not in most instances. Sodium does not form a major component of most topsoils. The sodium-deficient horse would have better luck licking his owner. What, then, are they looking for? The various other reasons a horse may eat dirt are summarized in the box on the last page, but we'll go through the most likely ones in detail below.

## **Minerals**

Even seemingly well-fed horses may go looking for supplemental minerals if their diets contain insufficient quantities of bioavailable minerals. The horse doesn't just need a sufficient amount of the necessary minerals, the minerals must also be in a form the body can absorb and put to good use. Not to take you unwillingly back to chemistry class, but if the mineral is bound to another element or molecule with a very stable chemical bond, then much of the ingested mineral passes right on through the gut, to be discarded onto the manure pile or into a heap on the pasture. That is the fate of some common mineral supplements, whose bioavailability may be less than 30%.

All going well, the expelled mineral eventually ends up being of some use to the horse—but only once it's been processed by the microbes in the soil and by the plants who so rely on these microbes for their own minerals. Soil microbes are essential in rendering inorganic minerals of maximum use to larger organisms, plants and animals alike. Without them, the minerals may just sit there in the soil. Those little creatures are the powerhouse of healthy soil, and thus the foundation of a healthy pasture or garden, and from there a healthy horse or human.

Another aspect of healthy soil is its water content. Healthy, well-hydrated soil is more a gel or a complex of globules than a solid or a loose collection of disparate parts. It holds together, and it holds water by virtue of its organic content (its humus). The water component is important because some portion of the minerals in healthy soil can slip their bonds and form ionic solutions or colloidal suspensions within the soil's water, both forms being more readily absorbed by cells than mineral complexes of any sort.

One remarkable thing I noticed once I started looking closely at the healthy, well-fed horses in my practice who occasionally eat dirt is that they repeatedly went back to a very specific area of the pasture and they dug or bit down until they exposed the roots of the grass or the moss that was growing there. They didn't go any deeper, and they didn't dig in the bare areas of the field; they went for the rich, moist soil around the plant's roots.

Were they after microbes or minerals? Or both? Who can say? For now, it's simply a good reminder that Mother (nature, that is) knows best. We think we know what horses need in their diets in the way of minerals, and we diligently follow the advice of equine nutritionists and others who have studied these matters. But at the end of the day, it's all just an educated guess, and all recommendations are based on averages.

“The average horse of this size, performing this activity, needs this much of this mineral to avoid signs of deficiency.” That’s the basis of the National Research Council (NRC) recommendations for formulating horse feeds, although in the most recent update, performance parameters were also considered. But what isn’t often discussed is the form of the minerals used in the feeding trials on which most of the NRC recommendations are based, most of which have used inorganic forms of minerals. Also what isn’t always considered is the mineral balance of the test horses at the time of mineral supplementation. One would expect that, even with a fairly stable mineral complex such as an oxide, a depleted body might absorb more of that mineral than a body that is replete in that mineral.

So, as you can see, the field of equine nutrition is not as cut-and-dried as we’re in the habit of thinking. Horses themselves illustrate this fact every day in their individual responses to the diets we formulate for them. There is no such thing as an average horse. There is this horse and that horse, and this horse needs this much, whereas that horse needs that much. It is all, as I have said, merely an educated guess, and only a starting point. We feed what we *think* the horse needs, what should avoid deficiency, and then, if we are wise, we’ll offer various opportunities for the horse to fill in the blanks from there. Eating a wide variety of plants grown in healthy soils, and even eating the soil itself, are two such ways. They are also nature’s ways, which certainly recommends them to me, nature’s apprentice that I am.

One note of caution, however. Even the USDA acknowledges that our topsoils have steadily become depleted of minerals and other nutrients through decades of commercial farming. Also, some areas of the country are deficient in certain minerals, not from farming, but simply from geological variations. The Pacific northwest is one such example, being historically deficient in selenium and a number of other nutritionally important trace minerals, including copper and zinc. Soils, pastures and hay fields, and livestock themselves all need to be supplemented accordingly. As a long-range plan, feeding trace minerals to the soil may be the best strategy; but in the meantime, the plants and the herbivores need their own supplementation.

## **Microbes**

In my view, horses may also eat soil to replenish or supplement their gut microbes. Horses rely heavily on the huge and diverse population of bacteria, protozoa, fungi, and other microbes in their digestive tracts, particularly those in the large intestine. These organisms are essential for

the breakdown of dietary fiber, which is such an important component of the herbivore's diet. Fiber is food for horses and other herbivores. The horse gets about 70% of its daily calorie needs for maintenance from the microbial breakdown of dietary fiber. That's how important the gut microbes are to the horse.

The gut microbes also supply the horse with vitamins (several of those in the B complex), amino acids, growth factors, and probably other valuable substances we haven't given any attention to yet. Furthermore, the normal resident population of microbes form a very important component of the body's defense against potentially harmful (*i.e.*, pathogenic) bacteria such as *E. coli* and *Salmonella*.

The gut microbes are primarily derived from the manure of other herbivores, plants the horse eats, and the soil in which the plants grew. Once a healthy population of gut microbes has been established in the young foal, it is maintained throughout the life of the horse by the simple cycle of bacterial replication within the gut—as long as suitable substrate (food) is supplied and conditions within the gut favor the “good” bugs over the “bad” bugs. And because the gut is forever emptying, the resident microbial population is replenished as needed through healthy grazing.

However, a high-grain diet, digestive disorder, antibiotic therapy, chronic physical or psychological stress, excessive intake of starches or simple sugars in grain or grass, and any number of other challenges may alter conditions in the large intestine enough to compromise the population of gut microbes. Under such circumstances, the horse may go in search of a source of microbes to replenish its disordered or depleted gut microbes.

I suspect that eating soil, especially the microbe-rich soil surrounding the plant's roots, is very often an attempt to consume beneficial microbes in order to maintain or restore gut health. In fact, I'm so convinced this concept is valid that I typically recommend access to healthy soil over the use of commercial probiotic therapy in almost all situations in which I might advise probiotics. I do occasionally use commercial probiotic or “direct-fed-microbial” products in horses, but I much prefer to let nature dictate the what, when, and how of it. I haven't yet found a probiotic product on the market that is as good as healthy plants and healthy soil for setting a disordered gut right. Options include grazing healthy pastures, hand-grazing along the edges of healthy meadows or woodlands, and offering whole plants with their roots still attached.

## Clay

At times, horses may eat soil or bare earth primarily for its absorbent properties. Clays in particular contain very absorbent particles which can bind up bacterial toxins, organic acids such as those produced by sugar fermentation, certain viruses, and other potentially harmful substances in the gut. The bound toxins are then harmlessly removed from the body in the manure.

This effect has been documented in equine studies using a commercially available smectite (Bio-Sponge® by [Platinum Performance](#), Inc.). In one study, smectite was shown to effectively absorb the clostridial toxins commonly associated with enteritis (inflammation of the small intestine) in adult horses and foals. In another study, smectite decreased the incidence of diarrhea following colic surgery in horses.

An added benefit is that natural clay deposits such as bentonite and montmorillonite tend to contain a wide assortment of trace minerals. Azomite, for example, which has been my hands-down favorite clay for a few years now, is a loose acronym for “A to Z of minerals and trace elements.” It has been analyzed and documented to contain over 70 different trace minerals. That can be very important in immune system function and tissue repair in a sick horse.

Long before Bio-Sponge appeared on the market, farmers, feed merchants, and vets were using clays such as bentonite for the treatment and prevention of digestive problems in horses and other livestock. I learned the value of these clays first-hand very early in my career, particularly in racehorses and show horses on high-grain diets.

But perhaps the most memorable and instructive instance for me was when I visited a vet friend whose hospital is devoted primarily to the treatment of horses with severe laminitis. We pulled up some fresh clumps of grass to offer to one of the patients and stood amazed as he ignored the green parts and devoured the roots, clods of dirt and all. In fact, he seemed to be going for the dirt that clung to the roots, and couldn't get enough of it. Was he after microbes, minerals, clay? Who knows. But he eloquently makes my point about the remedial power of dirt.

*“Got dirt?”*

**Horses may eat dirt for several different reasons:**

needing salt (specifically, the sodium in salt)

needing other minerals

needing beneficial microbes from the soil to aid digestion

needing the absorbent activity of clay to settle a digestive upset

boredom, habit

presence of a disease which alters mental function

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