

The Real Dirt on Diatomaceous Earth Used for Worming Bison

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Increased public awareness of chemical and drug residues in meat and milk products has resulted in pressure on animal industry to reduce or eliminate these chemicals from food production. Bison meat products in particular are marketed as natural or sometimes “organic”, making the use of veterinary drugs for prevention or treatment of disease undesirable, or in some market streams, forbidden by bison meat marketers. This creates the need for alternative biological or natural treatments for microbial infections and common conditions such as external (lice, ticks) and internal (lung and intestinal) parasitism. Unfortunately most if not all of these alternative therapies are less effective and more expensive than conventional drugs and can be a waste of time. Treatment of ruminants with diatomaceous earth (DE) for external parasites has some merit (Iatrou 2010), but the use of DE for intestinal parasitism is unsupported by science.

Diatomaceous earth (DE) is a naturally occurring sedimentary mineral compound that can be crushed into a fine white powdery substance. It is mostly made of silica and has a highly porous physical structure, making it very light weight. Diatomaceous earth is the fossilized remains of diatoms; the skeletal remains of hard shelled algae that have settled out from geologically ancient aquatic environments. The fossilized exoskeletons are microscopically sharp and, together with its porosity, make DE suitable for many industrial uses such as a mild abrasive, an absorbent for liquids, a filtration agent, and interestingly, the stabilizing component in the manufacture of dynamite from nitroglycerine.

Proponents of alternative and natural veterinary treatments often misunderstand the mechanism of action or the scientific basis for these remedies. In the case of DE, it is often thought that the physical nature of the product results in destruction of the parasites or insects targeted by treatment. It has been suggested that the abrasion resulting from contact with the microscopically fine sharp edges of the diatoms physically destroys the intestinal tract of parasites after ingestion of DE, or that these same abrasive qualities are responsible for slicing up the outer coverings of intestinal worms leading to death of the parasite. This is simply untrue, neither of these things occurs and DE is not effective against the intestinal parasites of bison and other ruminant animals.

Diatomaceous earth is widely used as an insecticide and appears to be effective in that role. The porous DE can absorb more than its own weight in water and exerts its effect through absorption of liquid from the waxy layer of the exoskeleton or outer covering of insects, causing them to dehydrate and die. Water moves according to Fick’s Law of diffusion, migrating from areas of high water concentration to areas of lower concentration. These conditions exist around pests such as fleas and lice in the external environment of animals but probably not in the intestinal tract where worms exist.

The proponents of diatomaceous earth treatment, and a great many other natural treatments, use testimonial and anecdotal evidence to support their claims of effectiveness. Such evidence is often reinforced by personal bias and as humans we tend to ignore cases of poor effectiveness in favor of

examples that support our belief. Fortunately, by following correct scientific methodology which compares treatment groups to a proper control group and then analyses the data with mathematics and statistics so we can separate coincidence and chance events from the true effects of the treatment. Peer review of research methods and results provides some assurance that the research has achieved some level of credibility. Articles appearing in trade magazines or on the World Wide Web often offer only unsubstantiated information and sometimes these articles are unreliable. In fact there have been very few peer reviewed scientific studies on the effects of DE on intestinal parasites (in any species). It may be a surprise to some, but DE has not shown favourable scientific results for controlling internal parasites. The search for potentially credible publications on the therapeutic effects of DE yielded only 3 publications from peer reviewed journals (Fernandez et al., 1998; Lartigue and Rossanigo, 2004; Ahmed et al., 2013;) and 3 probably non refereed reports from various academic or government organizations (Allen et al., 1998; Milton and Klopfenstein, 2000; Bernard et al., 2009).

In 1998, Fernandez and coworkers published the results of an experiment evaluating the anthelmintic effect of diatomaceous earth on internal parasites as well as its effect on the weight gain of beef steers in a feedlot. The DE group of steers was compared to a group of steers given the anthelmintic drug albendazole, and an untreated group. The group with the greatest gains and the lowest parasite egg counts was the albendazole treated group. There was no difference in gain or egg counts between the DE group and the group given no treatment (Fernandez et al., 1988). A similar experiment performed on goats used egg counts and weight gain to measure the effects of DE treatment at various DE dose rates (Bernard et al., 2009). An anthelmintic effect of DE was not observed at any of the dose rates used. There was greater weight gain in the lowest dose rate group than in the control (no treatment) group but if DE treatment was responsible for this, it was apparently not through a reduction in internal parasites. The weight gains in the highest dose DE group was not different than the control group. In 2004 Lartigue and Rossanigo compared the anthelmintic effect of DE in cattle against commercial anthelmintics as well as a control group. Measuring eggs per gram of feces at regular post treatment intervals, they determined that anti-parasitic efficacy of DE was significantly ($P < 0.01$) lower than that of the evaluated commercial products but no different than the control group. Most recently, Ahmed et al used sheep to examine biological control of nematode parasites (Ahmed 2013) and included DE along with bacterial products. Diatomaceous earth had no effect on fecal egg counts over time as an indicator of anthelmintic activity.

Research reports from various non-peer reviewed but potentially credible sources give similar findings. For instance, Milton and Klopfenstein from the Animal Science Department at the University of Nebraska reported in a Nebraska Beef Cattle Report, the results of a study comparing the effects of DE fed with and without commonly used antimicrobials on internal parasites in finishing cattle. Using fecal floatation and egg counts per gram of feces they found no advantage to feeding DE with regard to intestinal parasites and coccidia (Milton 2000). Allen et al., used a 1998 grant from the California-based Organic Farming Research Foundation to identify and test alternative parasiticides for use in the production of organic lamb. They compared the fecal egg counts and body weight of lambs given no treatment, a commercially available herbal preparation, garlic, pyrethrum and DE. The study failed to show any effectiveness in any of the tested alternative wormers. These results are not surprising given that there were only 3 lambs in each treatment group. Conventional experimental methods employ at least 6 individuals in each test group because statistical differences are difficult to determine with fewer

animals. This highlights the importance of correctly designed experiments and critical evaluation of the experimental results by suitably qualified people (peer review).

Diatomaceous earth does have some value for agricultural production. DE is widely used as an alternative over traditional grain protectants and a number of publications have reviewed its efficacy against stored-product insects (Iatrou 2010). A Google search for DE will turn up many websites with anecdotal information about the health benefits, to animals and humans alike, of consuming food grade DE (McLean et al., 2014). These are mostly generated by the manufacturers of these products and should be viewed with a critical eye, but the health benefits of some natural products are real and perhaps we should remain open minded about the therapeutic value of natural remedies for conditions like parasitism. In the case of DE used for intestinal worms however, it is not effective. Scientific evidence suggests that it is best used for insects and external parasites.

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