

TECHNICAL REPORT for VETERINARIAN USE ONLY

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Rx Clay

FORMULA SUMMARY:

Hydrated Calcium Aluminosilicate Clay

$(Al_{3.15}Ca_{0.85})(Si_0)O_{20}(OH)_4X_{0.85n}H_2O$

Particle size <80 microns

Sterile

500 mg per 1/8th teaspoon scoop

100 grams per container

150 doses per bottle

Rx CLAY USES:

1. Acute diarrhoea
 - a. Infectious
 - b. Antibiotic-associated diarrhoea
 - c. Bacterial Enterotoxins and Endotoxins
 - d. Toxicosis
2. Chronic diarrhoea from a variety of etiologies
 - a. Chemotherapy
 - b. Inflammatory bowel disease
 - c. Giardiasis
 - d. Colitis
3. Aflatoxicosis
4. Leaky Gut Syndrome

BACKGROUND:

RxClay is a clinically-proven mineral powder (geological nanomaterial) that when given orally in small amounts 2-4 times daily has been shown to control diarrhea that has been unresponsive to conventional treatments. It is effective in improving stool quality for most causes of acute and chronic diarrhea. RxClay is similar in some ways, but chemically and structurally different, and unique, from other clays that historically have been used in the management of diarrhea.

RxClay is a naturally-occurring, finely ground, heat-sterilized clay of the “Bentonite” mineral category. It is further sub-classified as a “Smectite” clay, which is further subclassified into the “Montmorillonite” group of clay minerals. Smectites, which are also known as “phyllosilicates” have a three-layer crystalline structure (one alumina and two silica layers) that exhibit the common characteristic of hydrational swelling when

exposed to water. Montmorillonite is a well-known smectite clay mineral. It is a member of the class of smectites known as “Diosmectites”, which contain Aluminum, Aluminum-Iron or Iron. RxClay is a unique type of montmorillonite clay that is free of heavy metals and dioxins and will not release its aluminum ions.

The physical structure of the calcium aluminum silicate (CAS) that comprises 100% of RxClay is made up of large flat “plates” of aluminosilicate that are separated by calcium ions. The separation of these plates by the positively charged calcium ions creates a highly-charged inner layer between the plates that can attract and literally trap materials *inside* the equidistant inner layers. The other clays studied to prevent or treat diarrhea electrostatically bind these materials to their *exterior* surfaces. Historically, it has been observed that many animals, including primates, and manycultures from the “undeveloped” world will intentionally eat earth materials, such as clays, as an adjunct to eating certain medicinal herbs or with certain types of illnesses. This ingestion of soil minerals is termed: “Geophagy” (Dominy 2004) (Haydel 2008). Geophagy was first reported by Aristotle, and later described by Dioscorides in 40 BC. Geophagy is considered an adaptive behavior by human and non-human primates and a wide variety of mammals. It is suggested that the two main functions of “dirt eating” are:

- 1) Mineral nutrient supplementation
- 2) Adsorption of intestinal insults such as secondary plant metabolites and diarrhea causing enterotoxins.

The adsorption of plant toxins and plant tannins and the adsorption of bacterial enterotoxins by clays are thought to be the reasons for geophagy amongst animals, nonhuman and human primates. (Dominy, 2004)

MECHANISMS OF ACTION for RxClay (Hydrated Calcium Aluminosilicate clay):

1) Adsorption of Bacterial Enterotoxins

In a study comparing the effectiveness of smectite versus kaolin clay, it was found that smectite clay adsorbed enterotoxins produced by *Escherichia coli* and by *Vibrio cholerae* more efficiently than kaolin clay at the pH of intestinal chyme. (Brouillard 1989) In an *in vitro* study using a toxicogenic equine-origin strain of *Clostridium difficile* and *Clostridium perfringens* found that smectite clay is able to bind to the enterotoxins of each of these strains of Clostridium. Additionally, it was found that smectite clay did not interfere with the effects of metronidazole. (Weese 2002)

2) Adsorption of plant toxins and metabolic by-products of plant toxins (specifically aflatoxin A & B

Calcium aluminosilicate (CAS) clay adsorbs plant toxins such as aflatoxins and the byproducts of aflatoxin metabolism. The aflatoxin molecule adsorbs at interplate and side plate binding sites to the clay. In toxicity studies in animal models the addition of CAS to experimental diets contaminated with aflatoxins significantly reduced or eliminated death and liver damage in treatment groups. (Phillips 1999) (Sarr 1995) (Bingham 2004)

3) Crosslinkages with glycoproteins in intestinal mucosal epithelial cells

CAS clay protects the gastrointestinal epithelium by cross-linking with glycoproteins in the intestinal mucosa, thus reinforcing the barrier properties of the mucosa. It is thought that this will also reduce intestinal permeability and Leaky Gut syndrome. The clay has also been shown to modify the viscoelastic properties of intestinal mucus as well as to reduce the degranulation of goblet cells triggered by experimental infection in the rabbit small intestine. (Rateau 1979) (Allen 1985) (Droy 1985) (Rateau 1982) (More 1987)

4) Restores intestinal mucosal barrier function (Leaky gut syndrome)

In an experimental *in vitro* model of intestinal barrier function, Tumor Necrosis Factor- (TNF-) and Interferon- (IFN-) were used to create inflammation, which then disrupted intestinal mucosal cell tight junctions resulting in increased paracellular permeability. Treatment with diosmectite clay effectively counteracted this increase in intestinal mucosal epithelial cell permeability. (Mahraoui 1997)

5) Effectively treats experimentally-induced colitis in rats.

Diosmectite clay was administered as a post-treatment to rats with chronic experimentally-induced colitis. Statistically significant improvement of morphological signs of colitis and biochemical markers of inflammation (myeloperoxidase activity, glutathione levels, MUC2 expression, inducible nitric oxide synthase [iNOS], IL-1 levels and leukotriene B₄ synthesis) as well as resolution of the diarrhea was observed in the treatment group as compared to controls. (Gonzalez 2004)

6) Down-regulates the intestinal inflammatory response.

Gonzalez (2004) found significant decreases in glutathione depletion after 2 weeks on diosmectite clay in rats with experimentally-induced colitis. In addition, levels of IL-1 and iNOS were both significantly lower after 1 week of treatment with clay.

7) Comparable to sulfasalazine in the treatment of experimentally-induced colitis.

Gonzalez (2004) postulates that the mechanisms of action of diosmectite clay in treating colitis includes adsorption of inflammatory proteins, increased secretion of mucopolysaccharides that comprise the glycocalyx mucus barrier of the colon (MUC2), and a direct modulation of the production of proinflammatory mediators by the colonic mucosa.

8) Decreases bacterial mucolysis and pathogenic destruction of mucosal barrier system

In an experimental diarrhea model in the rabbit, *E. coli* created an invasive and toxicogenic effect that was effectively countered by the administration of diosmectite clay. The clay was found to promote the reabsorption of water from the bowel without altering electrolyte absorption. Enzyme levels of alkaline phosphatase and disaccharidase were both elevated in this study, which are indications of the protective effect of the clay on the epithelial mucosal luminal surface of the bowel. (Rateau 1982)

9) Treats pediatric diarrhea in human patients

Several controlled clinical studies in human pediatric patients found that the use of smectite clay produced significant remediation of acute diarrhea from infectious causes. (Madkour 1993) (Narkeviciute 2000)

Safety

Several studies into the safety of short term and long term calcium aluminosilicate clay usage in humans and in rats have found no evidence of adverse effects. (Wang 2005) (Afriyie-Gyawu 2005). Another study determined that calcium aluminosilicate did not bind dietary nutrients nor adversely affect pregnant rats. (Wiles 2004)

a) Delays the onset of radiation-induced colitis in human patients

In a clinical trial involving 176 human patients receiving radiation therapy of the pelvis or abdomen, 85 patients received smectite clay daily and 91 patients received placebo. It was found that in the smectite treated patients the development of diarrhea was delayed from 18 days post treatment to 32 days post treatment. (Hombrink 2000)

b) Resolves chemotherapy-induced diarrhea in dogs

Twenty three (23) dogs with cancer that developed intractable diarrhea following chemotherapy were given 500 mg of sterile calcium aluminosilicate clay orally every six hours. These study subjects had persistent loose watery stools in spite of having received standard treatment measures such as metronidazole, sulfasalazine or dietary approaches for at least 48 hours. 15 out of the 23 dogs (65.2%) had complete resolution of their symptoms within 48-72 hours after starting the administration of the calcium alumina-silicate clay. Of the 23 dogs in this study, 6 dogs had diarrhea that was not treatment-induced (stress colitis, dietary indiscretion and tumor-related causes). Seventeen dogs developed diarrhea following administration of a variety of chemotherapy agents (doxorubicin, cyclophosphamide, vincristine, vinblastine, lomustine, carboplatin, and mechlorethamine)

For the 6 dogs in this study that did not have chemotherapy-induced diarrhea the average duration of symptoms prior to administration of the calcium aluminosilicate clay was 6 days (2-14 day range). Three of these dogs had at least a 14 day history of diarrhea prior to starting the clay. 83.3% of these dogs (5 out of 6) had resolution of their symptoms when treated with the clay. The mean time to resolution was 2.4 days (1-4 day range). The single non-responding subject in this cohort did experience a decrease in the number of stools per day, although the stool consistency did not normalize.

The average duration of symptoms for the seventeen (17) dogs with chemotherapy induced Diarrhoea was 6.8 days (2-30 day range) Ten (10) of the seventeen dogs (58.8%) had resolution of their diarrhoea. Two (2) of the 17 dogs saw a decrease in the number of stools per day without improvement of faecal consistency. The mean time to resolution of the diarrhoea was 2.9 days (2-8 day range).

Client observations of the 10 dogs in this cohort that responded to the clay with resolution of symptoms indicated symptomatic improvement within 48 hours. One dog experienced constipation as a result of treatment with the clay. Once the administration of the clay ceased, the constipation resolved. No other adverse reactions to the clay were reported during the study period.

Results: 65.2% (15/23) of the study subjects had complete resolution of symptoms within 48-72 hours after initiation of administration with the calcium aluminosilicate clay. (Hahn 2006)

SUMMARY of BENEFITS of CLAY:

1. Chemotherapy-associated diarrhoea
2. Acute infectious diarrhoea
3. Inflammatory bowel disease diarrhoea
4. Colitis
5. Aflatoxicosis prevention
6. Improves intestinal barrier function (Leaky Gut Syndrome)

RECOMMENDED DOSAGE:

The dosage is the same regardless of patient size, species or condition

Administer 1/8 teaspoon (or use enclosed 1/8 teaspoon scoop) of RxClay four times daily (QID) mixed with a small amount of food or mixed with a liquid and syringed PO for soft stools or diarrhoea of any origin.

For long term maintenance and control of chronic diarrhoea patients, once the stools have responded to the administration of RxClay which may take 24-96 hours, give 1 scoop (1/8 teaspoon) of RxClay twice daily (BID).

NOTE: In some rare cases, individuals may need higher doses than the label dose of 1/8 teaspoon 2-4 times daily. Increasing the amount of clay administered to as much as 1 teaspoon QID may improve product efficacy without risk of adverse events.

CONTRAINDICATIONS & CAUTIONS:

None.

SAFETY & QUALITY CONTROL:

Certificate of Analysis on file from the raw material manufacturer:

No heavy metal contamination

Sterile

No free aluminium availability

Finely ground to facilitate intestinal luminal dispersion.

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