

Zeolite molecular sieves for the removal of toxins

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Abstract:

Medical use of natural and synthetic zeolites for treatment, prevention, and palliation in humans or animals of deleterious concentrations of ammonia, mercaptans, heavy metals and other toxins by oral administration. ....

[0121] The zeolites may be used for treating the following food-borne toxin-induced diseases: cholera, botulism and food poisoning due to *Bacillus cereus* and staphylococcal poisons and *Escherichia coli*; the following toxic marine ingestions: (1) paralytic shellfish poisoning from the ingestion of mussels (*Mytilus edulis* and *Mytilus californianus*), clams (*Saxidomus gigantus* [the Alaskan butter clam] and *Mya arenaria* [the "soft-shell clam"]), scallops (*Placopecten magellanicus*), oysters which had previously fed upon certain *Gonyaulax* species (which comprise the so-called "red tide") and elaborate saxitoxin 1, neosaxitoxin 2, gonyautoxin 3, gonyautoxin 4 and gonyautoxin 5; (2) pufferfish poisoning ("fugu" in Japan, tambore puffer in China); and (3) ciguatera, from certain fish (such as barracuda, amberjack, kingfish and dolphin) exposed to the benthic dinoflagellate *Gambierdiscus toxicus*; and minimization, mitigation and treatment of any one of the several syndromes arising from the ingestion of toxic mushrooms including stages I, II and III gastroenteritis and hepatorenal syndrome, the anti-cholinergic syndrome, delayed gastroenteritis with CNS abnormalities, cholinergic syndrome, the disulfiram-like reaction with alcohol, hallucinations, delayed gastritis and renal failure and the general gastroenteritis syndromes of nausea, vomiting, abdominal cramping and diarrhea; binding of one or more of the following mushroom poisonous substances including the cyclopeptides amatoxins and phallotoxins, muscimol, ibotenic acid [2552-55-8], gyromitrin monomethyl hydrazine, muscarine, coprine, indole species, orelline, orellanine, psilocin, psilocybin; for one or more of several different mushroom species including *Amanita muscaria* (also known as "fly agaric"), *pantherina*, *gemata*, *cokeri*, *cothurnata*, *phalloides* (also known as the "death cap"), *verna* (also known as the "death angel"), *virosa* (also known as the "destroying angel"), *bisporigera*, *ocreata*, *suballiaceae*, *tenuifolia*; *Galerina autumnalis*, *marginata*, *venerata*; *Lepiota helveola*, *vosse-randii*, *Conocybe filaris*, *Gyromitra esculenta* (also known as the "false morel"), *gigas*, *ambigua*, *infula*, *cardiniana*, *brunnea*; *Paxina* species; *Sarcosphaera coronaria*; *Boletus calopus*, *luridus*, *pulcherimus*, *satanas*; *Clitocybe clavipes*, *cerrusata*, *dealbata*, *illudens*, *riuulosa*; *Inocybe fastigiata*, *geophylla*, *lilocina*, *patuoillaridi*, *purica*, *rimosis*; *Psilocybe cubensis*, *caerulescens*, *cyanescens*, *baeocystis*, *fimentaria*, *mexicana*, *pellulolosa*, *semilanceata*, *silvatica*; *Conocybe cyanopus*; *Gymnopilus aeruginosa*, *spectabilis*, *validipes*; *Panaeolus subbalteatus* and *foenisecii* (also known as the "mowers' mushroom"); *Stropharia coronilla*; *Cortinarius orellanus*, *speciosissimus*, *splendoma*, *gentilis*; *Chlorophyllum molybdites*; and *Orphalates illudens* (also known as the "jack-o-lantern" mushroom).

[0122] Dosage and Administration

[0123] Preferred dosages are 100-1000 mg sodium aluminosilicate zeolite to a 5-20 kg weight of the human for treating lead poisoning. If the drug is administered to children, the preferred formulation would be as a gelatin capsule with minimal to no water. The number of times it would be administered could be up to 4.times. per day and could go on daily for more than 1 year. Actual dosage amounts could vary substantially depending on conventional criteria.

[0124] For treating excess ammonia, preferred dosages may be about 10 grams to a 70 kg human. This could be up to 4.times. per day and would be used for up to about 7 days per episode of ammonia-induced encephalopathy. Actual dosage amounts could vary substantially depending on conventional criteria. Preferably, a zeolite formulation would be administered between meals.

[0125] The particle size graphs of FIGS. 1-2 show the binding of ammonia using the same mass of sodium aluminosilicate, but with different particle size distributions. It shows that the smaller the particle, the poorer the ammonia binding. Hence, the larger the particle, the more active the drug in binding ammonia. However, there is a practical upper limit for particle size, and that upper limit is palatability. One must strike the right balance that optimizes the trade-off between ammonia binding palatability. Preferably, at least 90% of the particles are of particle size from about 90 .mu.m to about 150 .mu.m. More preferably, at least 95% of the particles are in that range.