Herbalix Restoratives™

Therapeutic Balance for Skin and Hair

The Era of Aluminum Overuse
And Toxic Bio-accumulation

"The surprise today is not that aluminum should be a cause for concern but that we are so complacent about its potential role in the diseases of modern life … The skin is not a barrier to aluminum and we now need urgent investigation of the absorption of aluminum into and across skin when it is applied in a range of different, primarily cosmetic, preparations…"

"It is not difficult to argue the case for at least a few atoms of biologically reactive aluminium being present in every space or compartment of the human body. Every organelle, cell cytoplasm, systemic fluid, epithelial secretion and surface of the human body will be experiencing some biological chemistry with aluminium."

"Since aluminum has no known function in life the first manifestations of the evolution of human physiology in is presence will almost certainly be negative and most likely in the form of chronic disease."[1-3]

Introduction

It is not an easy task to convince someone that aluminum is all around us. Many of us believe that the use of antiperspirants is the sole source of aluminum exposure. The intention of this paper is to point out that aluminum is like an iceberg, only a small portion is revealed. Today scientists from all parts of the world are warning us of the dangers of aluminum, and its alum components. For the most part once aluminum enters the body fluids it is transported throughout the body via the fluids. Many methods of testing for aluminum do not accurately indicate the amount of aluminum that may be stored in the body. As an example, it has been shown that there is 25 times more aluminum remaining in body tissue than measured in the blood serum. Aluminum is an elusive metal and likes to "hang out" in the tissues of the brain, bone, organs, etc. Aluminum stores in plants, animals and humans. The uptake of natural and manmade aluminum into plants is transferred to our food supply which then ends up in our bodies. Proponents cannot argue that aluminum is an element without any benefit to the human body. This is a given.

Individually our ability to rid aluminum from our system is different based on our biological make up of genes as well as our life style. We may not be able to change our gene type (skin, eyes and hair) but a lifestyle avoiding aluminum can be an individual choice. Etiology tells us that our bodies are biologically adapting to our environment. Example – people living closer to the poles generally have lighter hair, eyes and skin and as a result may mean that they attract more sunlight, which is a mechanism believed to allow more thermodynamics which would improve the ability of aluminum ions to escape via the sweat. Conversely, someone living nearer the equator with darker eyes and skin and textured hair (which helps to deflect the sun), has less oils in the skin so will not retain as much heat. This is why traceability of aluminum differs in each of us.

One of the ways in which aluminum exits the body is via the underarms. In a clinical test sponsored by Herbalix Restoratives a sampling of aluminum measured from each individual was significantly different. However the pattern was the same in that one underarm showed significant amounts of accumulation versus the other. This was true in the base line as well as when the subjects used an antiperspirant. When the subjects used the company's Detox Cleansing Deodorant®, a common pattern developed that showed both left and right underarms were equal (symmetrical) and aluminum levels were significantly lower.

One might ask where was all this aluminum comes from, if none of the subjects used antiperspirants (as in the baseline). Also why a sharp spike of aluminum detected in one side over the other (whenever the antiperspirant was used)? The

answer lies in that the uses of aluminum are ubiquitous and unavoidable. It can enter the body via the air, food supply, water, body care and medical products. If the underarm is a distinct phenol type and we use suppressive products, where does the aluminum inside flow? The underarm is the most understudied part of the body in medical science. Intuitively and by connecting the dots from scientific studies, HR believes the interruption of the underarm sweat may contribute to health related issues. Simply put the use of synthetic chemicals, petroleums, aluminums and its components, including natural alums, may lead to DNA damage from trapped aluminum. Some aluminum fluids circulating in the body (head, neck, and breast) may be sequestering and stagnating in the tissues.

Exley said, "There exists a remarkable and difficult to explain complacency in respect of our relationship with the non-biologically essential aluminium. It would appear that we have been and that we remain happy to accept dogma which continues to purport such experimentally unproven concepts: (i) aluminium's chemical inertia presents its significant entry into the body..."[4]

After six years of carefully sourcing scientific data, we have concluded: 1. Most of us are unaware of the presence of aluminum. 2. Aluminum intrusion is part of our daily lives. It is found in a myriad of products and the only way to prevent aluminum from getting into our bodies is to avoid products containing aluminum, whenever possible. Simply being aware is a beginning. On a daily bases we are allowing too much excess aluminum into our lives. It is important to avoid products with manmade aluminum in them. If for no other reason but monitory gain, the use of aluminum or its components certainly contributes to the cost of health care.

Interesting note – most clinical tests are performed during the day. However, the underarm may have greater significance for physiological function during the night. For example, chemotherapy is not as effective when administered at night due to the reaction of certain cells (circadian rhythms).

Another note – the mass spectrometer, a device used to measure aluminum, detects aluminum and its components as the same. Natural alums and aluminum are of the same family.

Where would one go to find the sources of aluminum and its components and what products they are used in? The answer is in a general list of aluminum uses provided by aluminum manufacturers.

Exley concludes, "The phenomenal successes of aluminium and aluminium salts as effective materials in myriad applications will continue to ensure that the human body will be challenged by aluminium." [5].

Aluminum Facts

- Aluminum is a metallic element with no positive benefit to any living thing including humans.
- Aluminum comes in many forms and is the third most abundant element in the Earth's crust.
- It is ubiquitous, found in air, food, water, fertilizer, body care products, automobiles, medicines, etc.
- The aluminum cation acts as a pro-oxidant (Pro-oxidants are chemicals that exacerbate oxidative stress. They either inhibit antioxidant systems or create reactive oxygen species of molecule. The oxidative stress produced by these chemicals can damage tissues and inhibit cell growth.
- Human exposure to aluminium through myriad forms results in its accumulation in the body with age.
- Aluminum salts dissolve under physiological conditions and this is true for the 'alum' salts as it is for the chlorohydrate salts, though the latter are slightly more soluble.
- Once alum compounds are dissolved in an aqueous solution (sweat), they show all the chemical properties that their components show separately -- the aluminum frees from the potassium and exhibits the actions of aluminum and the potassium exhibits the actions of potassium.
- Aluminum is classified as a neurotoxin by the National Institute of Health, which adversely affects the blood-brain barrier and may cause DNA damage.
- There are over 2000 references in the National Library of Medicine on adverse effects of aluminum.
- 99 percent of all aluminum comes from the mineral bauxite, the mining of which has serious environmental and humanitarian impacts.

There seems to be significant confusion about aluminum – its safety, and if it is not safe, then why is so much allowed in the products used in everyday life? Of particular interest is the aluminum in antiperspirants and in what are called natural crystal deodorants with either Potassium alum or Ammonium Alum.

According to Dr. Christopher Exley, *"There is no difference in 'safety' between antiperspirants made of Aluminium chlorohydrate (and related salts) and those made of alum (potassium aluminum sulphate), the so-called crystal 'natural' products."* He also confirms, "*We know from research that aluminum applied under the arm appears in the urine, so it does permeate through the skin."*
(Source: http://www.dailymail.co.uk/health/article-481134/The-deodorant-safety-guide-How-picking-right-brand-save-life.html)

Discussion

Aluminum is the third most prevalent element and the most abundant metal in the earth's crust. The symbol is Al and the atomic number is 13. Due to its reactivity, aluminum in nature is found only in combination with other elements. It occurs in ores, feldspar, mica, and kaolin but most abundantly in bauxite. It is considered a neurotoxin with over2000 references in the National Library of Medicine on adverse effects of aluminum.

There is a considerable amount of ambiguous and misleading information regarding the compounds Potassium alum and Ammonium alum when used in 'natural' products, particularly in relationship to their use in deodorants. Possibly due to misunderstanding or maybe just marketing, many people believe that neither are actually components of aluminum.

A couple of other misconceptions include the fact that the molecule has a different charge and that it is also too big to be absorbed.

1. The alum in crystal deodorants is either Potassium alum or Ammonium alum -- both alums are aluminum in that they are potassium or ammonium salts of aluminum sulphate.
2. Potassium alum and Ammonium alum used in crystal deodorants are compounds that dissociate/break down with water and/or sweat and will be absorbed under the arm if applied. According to Dr. Exley, "the evidence we have is that a very small proportion of applied Al, probably <0.01percent of that applied will be absorbed into the bloodstream."
3. Once dissolved in the aqueous solution (sweat) the molecule is no longer too big to penetrate the skin. The aluminum frees from the potassium and exhibits the actions of aluminum and potassium exhibits the actions of potassium. When these alums dissolve they form their constituent parts as was indicated above. The $Al^{3+}_{(aq)}$ could reprecipitate, for example in sweat ducts, as aluminum hydroxide, the form in which the Al is absorbed and enters the bloodstream is not known.
4. Aluminum bio-accumulates so small amounts do add up and is implicated in a variety of diseased states.
5. The aluminum charge can change but it still can be absorbed. Some Al will remain as monomeric charged forms while other might form small particles of aluminum hydroxide with little or no charge.
6. "In recent years, the crystal deodorant market has become increasingly saturated with artificial potassium alum and ammonium alum made from synthesizing aluminum hydroxide with sulfuric acid," according to Verdan, makers of private label crystal deodorants.

Deodorants and Antiperspirants

Common (active) Ingredients

(Aluminums chloride, Aluminum chlorohydrate, Aluminum zirconium, Potassium alum or Ammonium alum etc.) Some are added and some are naturally occurring. Commercial antiperspirants tend to add Aluminum chloride, Aluminum chlorohydrate or several derivatives therein. Many of the 'natural' deodorants contain naturally occurring alum in the form of Potassium alum or Ammonium alum.)

Antiperspirants

Antiperspirants are *designed to be absorbed* into the pores of the skin and prevent odor from escaping to the outside however, in doing so bacteria and toxins are trapped within. That means that the uptake of aluminum and many other chemicals into the body may affect the endocrine and lymphatic systems, as well as being a potential risk factor in breast cancer.

Antiperspirants are actually over-the-counter (OTC) drugs because they affect the physiology of the body. They work by closing and blocking pores with aluminum salts, thereby stopping the perspiration process.
According to the Environmental Working Group, Aluminum chlorohydrate, commonly used in antiperspirants is classified: "Strong evidence of human neurotoxicity" Health Hazard: "TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death, from *"The Chemical Book."*

Deodorants work differently than antiperspirants. They don't actually prevent sweat but an effective deodorant will neutralize the smell of sweat by eradicating the bacteria. However, even those that tout themselves as organic, natural or aluminum-free deodorants may have ingredients that include Potassium alum, Ammonium alum, propylene glycol, alcohol, polyethylene glycol (PEG) and synthetic fragrances, which can irritate the sensitive skin of the underarm. Even worse, commercial deodorants may contain triclosan known to have toxic physiological effects, as well as being one of the top 10 persistent contaminants in our waterways.

Since both Potassium alum and Ammonium alum are aluminums and aluminums are used in deodorants to create antiperspirant action, then it bears asking the question as to whether the crystal style deodorants work as well as they do because they work as antiperspirants. In this case, could they then possibly be construed as drugs?

Aluminum Data

Short Aluminum History

Aluminum, extracted from bauxite, is the third most abundant element in the earth's crust, behind oxygen and silicon. It was discovered in the early 1800's, but it has a high affinity for oxygen and occurs in nature only in compounds, never in its metallic form, so it proved difficult to isolate. It wasn't until 1854 that the first commercial process was developed but the result was more expensive than platinum or gold. Several people improved on the process and in 1886 two unknown young scientists, Paul Louis Toussaint Heroult (France) and Charles Martin Hall (USA), working separately and unaware of each other's work, simultaneously invented a new electrolytic process. The Hall-Heroult process is the basis for all aluminium production today. However, it was Freidrich Bayer, son of the founder of the Bayer chemical company, from Austria, who invented the Bayer Process, able to do large scale production of alumina from bauxite.

The name *aluminum* was derived from *alume*n, the Latin name for alum (an aluminum sulfate mineral). The metal was called *aluminium* with the *-ium* ending being the accepted ending for most elements at the time. This usage persists in most of the world except the United States and Canada, where the last *i* has been dropped from the name.

Abundant as it is, aluminum is an inorganic transitory metal with no benefit to the human body. Mounting research is providing evidence that aluminum is ubiquitous throughout all aspects of society and as a result humans are being inadvertently exposed to this toxic element in all its forms. From fertilizers to antacids, vaccines and many other medications, to cosmetics, deodorants, numerous food goods as well as packaging of all sorts – we are entangled in aluminum to such an extent that the obvious has become almost invisible to us like the proverbial 'elephant in the room'. One of the main reasons is that the necessary safety standards to protect the general population are limited or non-existing.

Aluminum Safety

Action of Aluminum on the Body

There are over 30 known diseases that are attributed in some aspect to aluminum. There is a true conundrum with regard to the safety issues concerning aluminum, which is why most people are not cognizant of the real issues. According to Pub Med.gov, US National Library of Medicine, National Institutes of Health: "Aluminum is a neurotoxin which affects diverse metabolic reactions."

"It been shown to adversely affect the blood-brain barrier, cause DNA damage, and have adverse epigenetic effects. Research has shown that the aluminum salts used in antiperspirants have detrimental effects to a number of species such as non-human primates, mice, dogs and others."

It was first recognized as a neurotoxin in 1886. According to Mosby's Medical Dictionary, a neurotoxin is a toxin that acts directly on the tissues of the central nervous system, traveling along the axis cylinders of the motor nerves to the brain. The *Gale Encyclopedia of Medicine* classifies a neurotoxin as, "A substance that damages, destroys, or impairs the functioning of nerve tissue."

Aluminum irritates the eyes, the skin and the respiratory tract, and is corrosive on ingestion, according to the International Chemical Safety Card from the Centers for Disease Control and Prevention. It can be a dangerous substance when not used properly. Ingestion of 30 grams (1 ounce) has killed adults.

The FDA warns "that people with renal dysfunction may not be aware that the daily use of antiperspirant drug products containing aluminum may put them at a higher risk because of exposure to aluminum in the product according to the. U.S. Food and Drug Administration. The agency warns people with renal dysfunction to consult a doctor before using antiperspirants containing aluminum.

There are over 2000 references in the National Library of Medicine on adverse effects of aluminum.

Dr. Exley: "The apparent confusion has reconciled individuals to the potentially erroneous opinion that the topical application of aluminum salts contained within, for example, antiperspirants, sunblocks/sunscreens and other cosmetics will not result in any of the aluminum being absorbed into or across the skin. Once again, the convenient view point, that aluminum compounds found in such cosmetic preparations will not cross the skin, has been perpetuated by both suppliers and users alike without any scientific evidence to support such a claim." 6.

"When I was first asked to review the potential toxicologic consequences of exposure to aluminum via antiperspirants, I was more concerned with the risks associated with inhalation of antiperspirant. We now know that transdermal uptake of aluminum is not only possible but may also be important. I am now concerned that we are guilty of being complacent about exposure to aluminum."

We inhale aluminum by breathing and ingest aluminum through our food and water. However, aluminum is poorly absorbed in the gastrointestinal tract; roughly 0.1percent the dietary intake is absorbed. Studies have shown that high level exposure to aluminum affects the lungs, and causes neurological damage. However, this article will focus on aluminum absorption by the skin through the use of antiperspirant, cosmetics and skin and hair care products." (Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2782734/)

Aluminum Research Findings

- "Aluminium as a Cause of Breast Cancer? Aluminium salts contained in many underarm deodorants could increase a woman's breast cancer risk. Metals including aluminum salts and cadmium have been shown to exert estrogen-like effects, while some also promote the growth of breast cancer cells in the laboratory. Aluminium salts increase estrogen-related gene expression in human breast cancer cells grown in the laboratory. Given the wide variety of

other substances that can mimic estrogen, including certain pesticides, cosmetics and detergents, it is possible that aluminium salts and other inorganic estrogen-related compounds called "metalloestrogens" can further disrupt normal hormonal signaling within the breast. What is particularly concerning about aluminium is the fact that it is applied to the underarm, close to the breast, and left on the skin. Deodorants also are frequently used after shaving, making it easier for aluminium salts to enter the blood stream. Studies also have demonstrated that aluminium salts can penetrate human underarm skin even if it is unbroken," according to Dr. Ray Sanhelian, in the *Journal of Applied Toxicology*, March, 2006.

- A potential link between aluminum - commonly found in the form of aluminum salts in antiperspirants - and breast cancer was found in the study by Dr. Chris Exley, at Keele University in England. In September 2007, Exley, and his team, found "a statistically higher concentration of aluminum in the outer as compared with the inner region of the breast. The report, published in the Journal of Inorganic Biochemistry, goes on: "We have confirmed the presence of aluminum in breast tissue and its possible regional distribution within the breast. Higher content of aluminium in the outer breast might be explained by this region's closer proximity to the underarm where the highest density of application of antiperspirants could be assumed. There is evidence that skin is permeable to aluminum when applied as antiperspirant." (Source: Aluminum in Breast Tissue; A Possible Factor in the Cause of Breast Cancer. Keele University (2007, September 2)
- A higher content of aluminum was found in breast tissue samples - taken from 17 women with breast cancer who had mastectomies at Wythenshawe Hospital in Manchester - near the underarm area where antiperspirants and deodorants are applied.
- Professor Robert Thomas, a leading breast cancer specialist, suggested that women who had breast cancer, as well as those who were otherwise healthy, should think twice about using an antiperspirant or deodorant every day.
- Dr Philippa Darbre, a senior lecturer in oncology at the University of Reading said, "if you do use a deodorant, use as little as possible and avoid shaving first as any tiny nicks in the skin will mean easier access for the chemicals." The data from this study are consistent with the hypothesis that the degree of antiperspirant/deodorant usage and axillary shaving is associated with an earlier age of breast cancer diagnosis. (Source: National institute of Cancer.)
- In a separate study Darbre also notes that "aluminium could be detected in all of the samples of human breast cyst fluids assayed and that aluminium levels are significantly higher by up to 50- fold in breast cyst fluid then in the blood serum which support this." Concentration of aluminium breast cyst fluids collected from women affected by gross cystic breast disease. (Source: *Journal of Applied Toxicology*. July 2008
- In 1993, the World Health Organization said, "There is a suspected link between Alzheimer's disease and the toxicity of aluminum."
- The Agency for Toxic Substances and & Disease Registry reports that "Exposure to high levels of aluminum may result in respiratory and neurological problems."
- The main source of aluminum in people with chronic renal failure was in the high aluminum content of the water for the dialysate used for dialysis in the 1970's. Even though this problem was recognized and corrected, aluminum toxicity continues to occur in some individuals with renal who chronically ingest aluminum-containing phosphate binders or antacids. (Source: Science Lab.com Chemicals & Laboratory Equipment Aluminum MSDS.)
- Inhalation: Chronic exposure to aluminum dust may cause dyspnea, cough, asthma, chronic obstructive lung disease, pulmonary fibrosis, pneumothorax, pneumoconiosis, encephalopathy, weakness, incoordination and epileptiform seizures and other neurological symptoms similar to that described for chronic ingestion. Hepatic necrosis is also a reported effect of exposure to airborne particulates carrying aluminum. (Source: Science Lab.com Chemicals & Laboratory Equipment Aluminum MSDS.)
- Chronic ingestion of aluminum may cause aluminum related bone disease or aluminum-induced Osteomalacia with fracturing osteodystrophy, microcytic anemia, weakness, fatigue, visual and auditory hallucinations, memory loss, speech and language impairment (dysarthria, stuttering, stammering, anomia, hypofluency, aphasia and eventually, mutism), epileptic seizures (focal or grand mal), motor disturbance (tremors, myoclonic jerks, ataxia, convulsions, asterixis, motor apraxia, muscle fatigue), and dementia (personality changes, altered mood, depression, diminished alertness, lethargy, 'clouding of the sensorium', intellectual deterioration, obtundation, coma), and altered EEG. (Source: Science Lab.com Chemicals & Laboratory Equipment Aluminum MSDS.)
- Studies on mice have found that the absorption of aluminum through the skin causes a greater burden on the body than oral ingestion. (Source: Anane, Rachid, Michelle Bonini, Jean-Marie Grafeille, and Edmond E. Creppy.

"Bioaccumulation of Water Soluble Aluminium Chloride in the Hippocampus after transdermal uptake in mice. Archives of Toxicology 69 (1995): 568-57. Pubmed 22 Jan. 2008.)

- Humans also absorb aluminum through the skin: a 2001 study showed that aluminum was still present in blood samples 15 days after one application of aluminum to the armpit. Consequently, applying aluminum to the skin is a very effective way to get aluminum in your system, and in your brain.
  (Source: http://www.controlyourimpact.com/articles/antiperspirant-aluminum-and-alzheimers-disease/)

Aluminum, a neurotoxin which affects diverse metabolic reactions. Abstract
Experimental evidence is summarized to support the hypothesis that chronic exposure to low levels of aluminum may lead to neurological disorders. These disorders result from defective phosphorylation--dephosphorylation reactions, reduced glucose utilization and site-specific damage inflicted by free radicals produced by altered iron metabolism. The brain is a highly compartmentalized organ. Therefore, a co-localization of critical mass of metabolic errors rather than a single event may be essential to precipitate a neural disease. Aluminum appears to participate in formulating this critical mass. Patients with dialysis dementia get partial relief by desferroxamine which chelates aluminum. However, it also chelates iron and therefore limits its applicability.
(Source: http://www.ncbi.nlm.nih.gov/pubmed/2198876)

Aluminum Regulation

What FDA Regulates - FDA is the federal agency responsible for ensuring that foods are safe, wholesome and sanitary; human and veterinary drugs, biological products, and medical devices are safe and effective; cosmetics are safe; and electronic products that emit radiation are safe. PDA also ensure that these products are honestly, accurately and informatively represented to the public. (Source: U.S. Department of Health & Human Services; http://www.fda.gov/AboutFDA/WhatWeDo/WhatFDARegulates)

Aluminum in Vaccines – Adjuvant - The amount of aluminum being injected into infants as recommended by the Advisory Committee on Immunization Practices is a jaw dropper.

The average birth weight for a baby is 7.4 lbs. (3.4 kg.) They receive soon after birth a hepatitis B vaccine that, if it happens to be Recombivax Hepatitis B from Merck, contains 500 mcg. of aluminum or 147 mcg. of aluminum per kg. of body weight. If the Energix vaccine from GlaxoSmithKline is administered, the pediatric dose is 250 mcg. of aluminum as aluminum hydroxide totaling 73.5 mcg. of aluminum per kg. of body weight.

The amount of time for these doses of aluminum to be eliminated by an infant's immature kidneys is unknown, as is the time it takes for aluminum to transfer from muscular tissue to the bloodstream and, ultimately, into the brain. Meanwhile, the infant is continually dosed with aluminum through infant formula, and even in breast milk but to a lesser degree.

The average baby visiting their pediatrician for the two-month, well-baby checkup weighs 9.25 lbs. (4.2 kg.) and could receive as much as 1475 mcg. of injected aluminum within 30 min. or 351 mcg. of aluminum per kg. of body weight. The breakdown of vaccines the pediatrician is supposed to administer follows: Hep B (250 to 500 mcg Al); Rotateq® (oral); DTaP (Infanrix® - 625 mcg Al and DAPTACEL® - 330 mcg Al); PCV - pneumococcal vaccine with 8 antigens (125 mcg. Al); Hib – haemophilus influenza type b (225 mcg. Al) and; IPV – inactivated polio vaccine. Then, at four and six months of age, the bolus doses of aluminum continue to be injected.

What are the risks of this accumulating aluminum considering the constant exposure in utero, while feeding, breathing the air outside, and through baby products such as baby powder? Maybe you will want to minimize the number of injections your baby will receive by giving Pediarix®, a five in one shot. Think again. This shot contains as much as 850 mcg. of aluminum. What is most shocking is the fact that an infant's body systems are all so immature and dependent on his mother's "raw, enzyme-rich" milk (and love) for proper development. How can such a developing human withstand this toxic assault? http://s11.invisionfree.com/Health_411/index.php?showtopic=1071

FDA Aluminum-Containing Antiperspirant Renal Warning – Mandated by FDA – Antiperspirants containing aluminum will be required to carry a renal dysfunction warning due to risks associated with possible increased absorption of the ingredient, according to the OTC Antiperspirant Drug Products Final Monograph. FDA "is concerned that people with renal dysfunction may not be aware that the daily use of antiperspirant drug products containing aluminum may put them at a higher risk because of exposure to aluminum in the products," the monograph notes. (Source: http://www.viviforyou.com/herbal_clear_deodorant/herbal_clear_aluminum.html)

Discussion about parenterals - Bethesda, MD, 06 April 2004 – In an effort to limit patients' exposure to aluminum, beginning July 26, FDA is requiring manufacturers of large-volume parenterals (LVP's) small-volume (SVP's) and pharmacy bulk packages (PBPs) used in total parenteral nutrition (TPN) to add certain information to component products' labeling.

The agency has specified a maximum aluminum concentration of 25 mcg/L in LVP's use in TPN. FDA's regulation applies to all LVP's used in TPN, including but not limited to parenteral amino acid solutions, highly concentrated dextrose solutions, parenteral lipid emulsions, sodium chloride and electrolyte solutions, and sterile water for injection, according to FDA.

Manufacturers are required to state in the package inserts of LVP's used in TPN that the component product contains no more than 25 mcg/L of aluminum.

There is no limit for the aluminum content in SVP's and PBP's, but manufacturers are required to include in the labeling of those products the maximum level of aluminum at expiry.

The rule allows makers of SVP's and PBP's used in TPN therapy, to state in the labeling that the product "contains no more than 25 mcg/L" of aluminum, rather than declare the exact amount.

The rule does not require pharmacists to calculate a patient's total aluminum exposure, according to Jane Axelrad, director of FDA's Office of Regulatory Policy for the Center of Drug Evaluation and Research. The rule applies to drug manufacturers, not to pharmacists, she affirmed.

But pharmacist Lawrence A. Trissel, director of clinical pharmaceutics research for the University of Texas M.D. Anderson Cancer Center in Houston, said not exceeding the 5-mcg/kg/day limit for a patient will be a difficult demand for pharmacists to meet if not impossible. "Because of the amount of aluminum present in the essential components (of TPN), you just can't get it down to that level," he said. "I think the FDA, when they first proposed this (in 1998), expected that the industry would just somehow be able to make the aluminum go away, and then all these products would be very clean and without aluminum, and so all they have to do is pass this rule and everybody would go into compliance. It's not that simple" (Source: FDA Aluminum Rule Poses Challenges for Industry, Pharmacists (April 15, 2004 AJHP News) American Society of Health-System Pharmacists – Donna Young; www.ashp.org/import/news/HealthSystemPharmacyNews)

Pub Med Abstract – Assessment of daily aluminum intake by food consumption – Aluminum is naturally present in foods; the contents of aluminum may increase during cooking or technological processes, or during conditioning! The average aluminum intake for humans is 10 mg/day. In case of drug administration, the normal average intake may reach 50-1000 mg/day. Foods represent the major source of aluminum for humans.
(Source: http://www.ncbi.nlm.nih.gov/pbmed/12089908)

Infant Formula And High Levels of Aluminum – A new study finds that the aluminum content of infant formula remains unacceptably high… The study, which was published in BMC Pediatrics, examined 15 infant formulas, including powdered and ready-made liquid formulas based on cow's milk and a soy-based product, for babies at various ages. The researchers found that concentrations of aluminum in the milk formulas varied from 2000 – 700 micrograms per liter and would cause up to 600 ug of aluminium to be ingested per day. Put another way, the aluminium content was

between 10 and 40 times higher than the aluminium content of breast milk, which is usually 15 to 3 micrograms per liter.

"These concentrations are all several times higher than are allowed in drinking water," say the Keele University researchers who authored the paper, in a statement." They are clearly too high for human consumption and certainly too high for consumption by such a vulnerable group as pre-term and term infants."

Chris Exley – "I am the lead author of this research. What…infant formula manufacturers are not saying is that there are no international guidelines for how much aluminium there should be in infant formulas. What remains unusual is that despite our role in demonstrating that there is a significant problem there has not been any comment at all from any of the food regulatory bodies such as the FSA in the UK or the FDA in the US. The levels of aluminium we found in all infant formulas and especially that of a formula for preterm infants are too high for human consumption. It is time that someone take responsibility for reducing them to more acceptable levels." (Source: www.pharmalot.com/2010/09/pfizer-infant-formula-and-high-levelsofaluminum)

Aluminum in Vaccines – Adjuvant - The average baby visiting their pediatrician for the two-month, well-baby checkup weighs 9.25 lbs. (4.2 kg.) and could receive as much as 1475 mcg. of injected aluminum within 30 min. or 351 mcg. of aluminum per kg. of body weight. The breakdown of vaccines the pediatrician is supposed to administer follows: Hep B (250 to 500 mcg Al); Rotateq® (oral); DTaP (Infanrix® - 625 mcg Al and DAPTACEL® - 330 mcg Al); PCV - pneumococcal vaccine with 8 antigens (125 mcg. Al); Hib – haemophilus influenza type b (225 mcg. Al) and; IPV – inactivated polio vaccine. Then, at four and six months of age, the bolus doses of aluminum continue to be injected.

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(Source: http://s11.invisionfree.com/Health_411/index.php?showtopic=1071)

Products with Aluminum Risk Factors to our Daily Lives

Commonly found in Drugs, Foods, Personal Care and Water

There is some confusion about various forms of aluminum compounds. What follows is intended to clarify:

Potassium alum and Ammonium alum – these aluminum compounds are often used in cosmetics and deodorant. According to aluminum suppliers, aluminium ammonium sulfate known as ammonium alum responds to tests for aluminum and for sulfate. They are salts of aluminum sulfate and should be treated with the same caution as all aluminums. Alum is both a specific chemical compound and a class of chemical compounds. Alum is both a specific chemical compound and a class of chemical compounds.
Potassium aluminum – or potash alum is the most common form. The specific compound is the hydrated potassium aluminum sulfate with the formula $KAl(SO_4)_2 \cdot 12H_2O$.
Potassium alum contains aluminum. Alum is aluminum sulfate – Al2(SO4)3. Potassium alum is potassium aluminum sulfate – AlK(SO4)2. It is used in bleached flour.
Ammonia alum – ammonium alum is a white crystalline double sulfate of aluminum: the ammonium double sulfate of aluminum. $(NH_4)Al(SO_4)_2 \cdot 12H_2O$
Both Potassium alum and Ammonium alum are salts of aluminium sulphate. They are also used in tanning leather, and in dye making. They are ingredients of some baking powders and even certain types of fire extinguishers contain alum. These two aluminum salts are commonly used in vaccines as adjuvants in vaccines.

Sodium aluminum phosphate –a leavening agent or acid for mixing baking powders. It is particularly toxic to aquatic life.
Aluminum chlorohydrate – the hydrate of aluminum chloride hydroxide, astringent and anhidrotic; used as an antiperspirant and as an anhidrotic in the treatment of hyperhidrosis. It can also be found naturally in bauxite or made in a laboratory.
Aluminum magnesium silicate – it is used in anti-diarrhea products. According to the Cosmetic Database, Magnesium Aluminum Silicate is approved by the CIR Expert Panel, but only in limited concentrations. The CIR's concern stems from the known risk of any ingredient that contains aluminum compounds, which are known neurotoxins.
Aluminum hydroxide – the gelatinous flocking agent to filter out particulates in the water.
Aluminum hydroxide is used in antiacids to treat symptoms of increased stomach acid, such as heartburn, upset stomach, sour stomach, or acid indigestion. Aluminum hydroxide is found in buffered aspirins. Aluminum hydroxide as well as Aluminum phosphate and Potassium aluminum sulfate (often called "Alum") are used in many vaccines. Vaccines that contain aluminum hydroxide are used as an absorbing agent in many vaccines and hypo-sensitization preparations causes hypersensitivity reactions
Aluminum Lakes – is aluminum hydroxide. Lakes are produced from the absorption of water soluble dye and hydrated aluminium substrate. They are oil dispersible (but generally not oil soluble) rendering the color insoluble in water. They can be mixed with oils and fats. They can also be dispersed or suspended in other carriers such as propylene glycol, glycerin and sucrose (water and sugar).They is the base for all the FD&C Dyes for candy and colored candy coating.
Aluminum oxide and aluminum silicate – are often used in mineral make-up.
Aluminum stearate salts – are used mainly in the formulation of makeup products such as eyeliner, eye shadow, mascara, lipsticks, blushers, face powders and foundations. Even 'natural' mineral makeup may contain this form of aluminum.
Sodium aluminum sulfate – is used in baking powders.
Aluminum calcium silicate – is table salt
Sodium aluminum phosphate – for most people, the greatest aluminum intake comes from food additives. This form is an emulsifier processed added to common table salt to help it run freely and not cake. Processed cheese and Food additives in cake mixes, frozen dough, self-rising flour in the average diet, 40-50 mg. a day may come from foods.
Sodium silicoaluminate – is a series of hydrated sodium aluminum silicates used in acne treatment mascara, anti-aging eye cream sunscreen: makeup, facial cleanser, exfoliant/scrub; foundation, eye shadow adjuvents One or more animal studies show kidney or renal system effects at high doses (low dose studies may be unavailable for this ingredient)
Aluminum calcium silicate – is used as an anti-caking agent in food.
Aluminum glycinate – is often used in analgesics and buffered aspirin.
Aluminum lauryl sulfate – used in many shampoos.
Magnesium aluminum silicate – anti-dandruff shampoos.
Aluminum phosphate – used in cake mixes and some baking powders and as a high temperature dehydrating agent. Also used in vaccinations.

Other Uses of Aluminum

The most popular brands of infant formulas are known to be contaminated with various aluminums.
An excerpt from Science Daily, on September 2, 2010, states, "A study by a team at Keele University in Staffordshire, led by Dr Chris Exley with Shelle-Ann M Burrell, demonstrating the vulnerability of infants to early exposure to aluminum serves to highlight an urgent need to reduce the aluminum content of infant formulas to as-low-a-level as is practically possible. The research has been published in the journal *BMC Pediatrics*."

Additional sources of aluminum: Canned goods, cooking utensils, deodorants and douches may contain aluminum salts. Containers, aluminum coated waxed containers, used especially for orange and pineapple juices, cause juices inside to absorb aluminum. Beer and soft drinks that are stored in aluminum cans also absorb small quantities of aluminum. Food starch modifiers and anti-caking agents also contain varying levels of aluminum compounds. Tartar sauce, tobacco smoke may also have high levels. Aluminum may also be used in allergy testing, intravenous solutions, allergens, wound and antacid irrigation, ulcer treatment, blood oxygenation, bone or joint replacement and burn treatment. Municipal

water supplies are treated with both aluminum sulfate and aluminum fluoride. The role of aluminum from toothpastes with sodium fluoride may be even just as important as the drinking water.

Most of these types of aluminum will be found in ground water and toxic to aquatic life:
Aluminum acetate, aluminum bicarbonate, aluminum caprylate, aluminum chloride, aluminum diacetate, aluminum hydroxide, aluminum oxide. Urban water supplies may contain a greater concentration because water is usually treated with aluminum before becoming part of the supply. Subsequent purification processes that remove organic compounds, take away many of the same compounds that bind the element in its free state, further increasing aluminum concentration. According to Chris Exley "It is worth recalling that all the problems which come under the umbrella of "acid rain" are related to an increase in the biological availability of aluminium and that the concentration of aluminium which under EU Legislation is allowed in drinking water, 0.200 mg/L, will kill salmon fry within 48 hours."[7].

Sourcing Aluminum

- 99 percent of all aluminum comes from Bauxite.
- Less than 1 percent of aluminum in the U.S. comes from domestic bauxite.
- Bauxite mining is environmentally destructive.
- Bauxite mining has exploited the population in the mining regions.
- Mining wastes make up the largest waste stream in the world.

99 percent of all aluminum comes from Bauxite which is a clay-like mineral; the chief ore of aluminum; composed of aluminum oxides and aluminum hydroxides. Bauxite is the most common naturally occurring form of aluminum ore. It consists of 45-60percent aluminum oxide, 12-30 percent water, and various other impurities. Bauxite is typically mined in open-pits and either processed into alumina near the mining operation, or shipped to smelting markets around the world for processing. Less than 1percent of aluminum in the U.S. comes from domestic bauxite. Major bauxite producing countries include Australia, Guinea, Brazil, Jamaica, and the former U.S.S.R.

Dr. Exley: *"The majority of potassium alum today is made via the reaction of bauxite with sulphuric acid. Alum is precipitated from this mixture by the addition of K_2SO_4. If this is how the alum used in the crystal product is made then it is no more 'natural' than aluminium chloride or aluminium chlorohydrate, the usual salts of Al antiperspirants." (Source: http://notdabblinginnormal.wordpress.com/2009/04/22/mineral-rock-deodorant/)*

Environmental Impact of Bauxite Mining and Processing

According to the Organic Consumers Association, "… the deodorant stones are manufactured in this less-than-environmentally-friendly way, shipping ore from overseas and using toxic chemicals like Sulfuric acid."

The mining process is very energy intensive, requiring a tremendous amount of power and water.
Aluminum sulfate is the result of the refining process of bauxite which is the raw state of aluminum ore. During this refining process sulfuric acid is used to remove most of the iron and silica present in bauxite. Further purification with potassium yields an aluminum sulfate with fewer impurities, According to the Mineral Information Institute Aluminum is a reactive metal, and does not occur in the metallic state in nature. The main ore of aluminum is *bauxite,* the source of over 99percent of metallic aluminum. Bauxite is the name for a mixture of similar minerals that contain hydrated aluminum oxides.

The reason aluminum is so destructive has little to do with the actual mine. Bauxite mining is environmentally destructive and has exploited the population and lands associated with the mines. More than 100 million tons of bauxite is mined each year. According to Rainforest Relief, aluminum only occurs in aluminum ore (bauxite) in densities of 3 – 5 percent (meaning that for every ton of aluminum metal produced, 20 to 30 tons of ore are mined and dumped).

The major locations of deposits are found in a wide belt around the equator. Bauxite is currently being extracted in Australia (in excess of 40 million tons per year), Central and South America (Jamaica, Brazil, Surinam, Venezuela, and Guyana), Africa (Guinea), Asia (India, China), Russia, Kazakhstan and Europe (Greece). Australia is still the largest producer.

China is driving aluminum mining to eclipse some of the most verdant land in Vietnam – land that is currently and successfully producing coffee and other cash crops in the central highland's fertile plateau.
In addition, an increasing concern is the loss of habitat for Jamaica's unique plant and animal species.

There are many incidents of mining travesties. Most recently, On June 16, 2010, Queensland Alumina , Limited was fined AU $90,000 ($78,000) for an industrial incident that released caustic vapors within 6km of their Gladstone alumina refinery last year. The company pleaded guilty to the charge of causing serious environmental harm.

As cited in Case #131 Bauxite and Jamaica, "The environmental impact of Jamaica's bauxite mining symbolizes the majority of mining or heavy industrial operations. Bauxite mining, which is considered as surface mining, is land extensive, noisy and dusty. Mining pits are often interspersed with small rural communities, thereby requiring companies relocate the people and/or to monetarily compensate them."

Red Sludge

Bauxite is converted through a toxic process to alumina, the raw material for making aluminum. Known by environmentalists as "red sludge", the waste product, if not properly managed, can contaminate water supplies and choke off vegetation. For every ton of alumina produced, three tons of red sludge is given off, according to international experts.

A very recent sample of the dangerous aspects of this red sludge is evident in the Hungary where there was an aluminum sludge flood that was called an ecological disaster. A flood of toxic waste from a burst reservoir at a chemical plant has killed at least four people in Western Hungary. About 35.3 million cubic feet of sludge had leaked from the reservoir and was seeping into an area spread over 16 square miles, according to the Environmental Ministry.

Human Cost

Mining pits are often interspersed with small rural communities, thereby requiring companies relocate the people and/or to monetarily compensate them. This happened in Jamaica Miners and those in surrounding communities are often exposed releasing caustic vapors.

Vedanta Resources, an India-based, partly British-owned mining firm, has been developing bauxite mining projects on tribal lands. An upcoming plan is to establish a mine on a hill which is considered crucial to local ecology, as well as the cultural and physical survival of local tribes. Vedanta has been accused of human rights abuses, as well as poisoning the local environment.

The protest of the tribes has been joined by Indian and international activist groups, such as Amnesty International and Survival International. As a result of the pressure the Church of England and the Norwegian state pension fund are withdrawing their investments from Vedanta due to ethical concerns.

The following information from an environmental impact study done for the Bauxite Institute:

- Noise and human presence
- Deforestation/habitat destruction
- Home range de-fragmentation due to roads
- Limited increase of erosion and turbidity
- Disturbance of hydrology
- Pollution, - eutrophication of streams
- Road kills

Deforestation/habitat destruction: threat to biodiversity

- Erosion and turbidity
- Disturbance hydrology, spongy bauxite cap: threat to aquatic biodiversity
- Acid soil drainage (coastal area)
- Dust

Energy: hydro-energy –reservoirs

- Caustic effluents and red-mud
- Other pollutants

In recent years, the crystal deodorant market has become increasingly saturated with artificial Potassium alum and Ammonium alum made from synthesizing Aluminum hydroxide with sulfuric acid," said Verdan. "In recent years, the crystal deodorant market has become increasingly saturated with artificial potassium alum and ammonium alum made from synthesizing aluminum hydroxide with sulfuric acid," according to Verdan, makers of private label crystal deodorants.

Conclusion

Even with substantial evidence regarding aluminum toxicity, the public is left without an integral framework to avoid aluminum. Establishing standards for aluminum allowance would reduce aluminum intrusion into plants, animals and humans. Unfortunately today we have unabated aluminum added to virtually every aspect of our everyday lives. We come in contact with metal particulates from exhaust fumes, water treatment chemicals, additives to soil, processed aluminum in cans, glass, food coloring, preservatives, as well as nanoparticles in the food chain. Cosmetics, body care products, medicines and sunscreens may contain immeasurable levels of aluminum without public knowledge due to the lack of labeling. The sum of aluminum from the array of products only becomes known when our biological system is inundated to illicit a response. Subsequently the inherent mechanism of protection against aluminum in the human body can be disrupted beyond cellular repair. In the future, we can only hope products with aluminum influence will be measured as is done for cholesterol, saturated fat and associated calories. It may be a surprise that soils may contribute the greatest harm to our food chain followed by the aluminum byproduct – fluoride – in our water on a mass scale.

There is a need for more accurate testing for aluminum in all age groups that reflects stored aluminum. The current measures to detoxify the body of aluminum are in its infancy. There exists a need for traceability of aluminum from all primary producers and a need to create avenues to prevent aluminum from proliferating at the scale it exists today. It is up to each individual to recognize that aluminum has no benefit to the human body and to reduce the use of products containing aluminum and participate in the reduction of the aluminum burden where others would have us accept the status quo. The use of products containing aluminum only leads to future pollution in humans, animals and the environment. HR is dedicated to reducing the exposure of the human body to aluminum from any source. At HR we accept the challenge that we cannot coexist with aluminum. In order to coexist with aluminum we must find parameters that will allow us to utilize this abundant metal without accumulating toxicity.

According to Dr. Exley, "We live in *The Aluminium Age* and, subsequently we are no longer able to avoid exposure to aluminum. However, it is also because of human activities on a global scale, such as the burning of fossil fuels and the widespread application of intensive agricultural practices, which are resulting in the acidification of the environment." 8.

As the third most abundant element in the earth's crust, aluminum has been all around us naturally throughout history, but it wasn't until 1886 when two scientists independent of each other, invented an electrolytic process called the Hall-Heroult process, that we were able to extract it from bauxite for commercial use. This was the beginning of the mass introduction of aluminum into society. Industry and government have found aluminum useful in substantial areas of life, employing it in an overabundance of products, processes and foods, as mentioned throughout this report. Using it in everything from pots to pastries, make up to medicine and machinery, and deodorants to drinking water it is difficult to escape it.

"Even though aluminum is non-essential for all forms of life and serves no known role, essential or otherwise, in human physiology this does not preclude its participation in a wide and varied biochemistry. It remains one of the

great paradoxes of life on Earth that the most abundant metal in the lithosphere, a metal which is unparalleled in the diversity of its chemical properties (cf. The Aluminum Age), has no biological function. 9.

There are few satisfactory theories to explain this paradox and the least satisfactory of these has attempted to define aluminum and its components as inert from a biochemical standpoint. Nothing could be further from the truth… We need to take our collective heads out of the sand and accept that at all times the body burden of aluminum will be participating in some form of biochemistry and that at some point the level at which this biological activity is taking place may be manifested as a change in physiology which in turn may take the form of disease." 10.

The FDA has a limit of 5-mcg/kg/day yet a typical adult ingests 2–5 mg of aluminum with his or her food per day, according to Kathleen M. Gura, Associate Professor of Pharmacy Practice, Mass. College of Pharmacy and Health Sciences. "You can't avoid it," she said. "We eat it, we drink it. It's in 8percent of the earth's crust. Accumulation of aluminum in tissues may even occur from exposure to less than 4 mcg/kg/day, according to the FDA."

Scientific evidence for the connection between aluminums in various products and numerous diseases from Alzheimer's to breast cancer is mounting. Aluminum is known to cross the blood/brain barrier.

5.3 million people have Alzheimer's and it is the 7th leading cause of death, according to Alzheimer's Association, (Source: 2010 Alzheimer's disease Facts and Figures, *Alzheimer's & Dementia,* Volume 6.) Aluminum is now being found in breast tissue samples of women with breast cancer, in the underarm area where antiperspirants and deodorants are applied. Laboratory experiments have shown that it also promotes the growth of breast cancer cells.

Even though it is difficult to pinpoint exactly what product or process the aluminum is coming from we now know all aluminums can penetrate the skin barrier as well as be inhaled or ingested, yet transdermal absorption is known to be more significant than internal. . In addition, bio-accumulation in brain, bone and body tissues is now being cited as a possible reason for how seemingly small amounts in products can build up in the body to damage health.

"Living in *The Aluminium Age* is not about acute exposure, though this does still occur, it is about how the body's physiology responds to an increasing burden of biologically available aluminium, states Dr. Exley. "There is no evidence that human physiology is prepared for the challenge of biologically-reactive aluminium and it is naïve to assume that aluminium is a benign presence in the body. Aluminium is contributing human disease and will continue to do so if its accumulation in the body is not checked or reversed. 11.

In numerous areas of our world, such as food, and home products we are now testing for many different toxins and heavy metals such as mercury, lead, and cadmium to name a few, because they have been shown to have deleterious health effects. Aluminum is not a heavy metal and has escaped the scrutiny connected to other heavy metals.

We now know aluminum in all its forms is ubiquitous in air, food and water. It is often hidden to us because of contaminants and aluminum lakes named as FD&C colors. It may be very wise, when possible, to avoid products with any type of aluminum whether they be in cosmetics, deodorants, analgesics or other medications.

The environmental impact of aluminum mining must be taken into consideration when taking a position on its continuing role in our lives. The most recent aluminum sludge flood in Hungary is evidence of how aluminum mining can turn communities upside down. From the vast amounts of water and electricity to the deforestation and pollution while exploiting land and the peoples on it, there is a moral and ethical question emerging about the continued use of aluminum to the extent we are using it in our lives.

Since alums are a neurotoxin, and they bio-accumulate in the body, and because the body has no positive use for alums, we at Herbalix Restoratives, firmly believe that *any form* of aluminum is unnecessary in food, medicine or skin care products. It is wise to make choices for products that are aluminum-free.

Christopher Exley, PhD is one of the foremost authorities on aluminum and the myriad ways that it impacts life on earth. Currently he is a Reader in Bioinorganic Chemistry, The Birchall Centre, and Lenard-Jones Laboratories at Keele University in Staffordshire, England. He graduated from the University of Stirling in Scotland with Honours degree in Biology. It was during the 4th and final year of his degree that he undertook his first research on aluminium. Still at Stirling, he received his PhD at the Institute of Aquaculture, supervised by Professor JD Birchall FRS OBE. He went on to Keele University in Staffordshire, England to assist Professor Birchall in establishing The Unit of Inorganic Chemistry and Materials Science in the Department of Chemistry. In 1994 he was awarded a Royal Society University Research Fellowship in "The Bioinorganic Chemistry of Aluminium and Silicon."
Exley's areas of research interest include how physical, chemical and biological processes combine to determine the accumulation, distribution, metabolism and excretion of aluminum. He is studying neurodegenerative diseases such as Alzheimer's and multiple sclerosis, and has an ongoing interest in biosilicification.

This paper was compiled by Herbalix Restoratives (www.herbalix.com).

Footnotes 1 through 11: Dr. Christopher Exley, Keele University, England; In: Molecular and Supramolecular Bioinorganic Chemistry; 2008, Nova Science Publishers, Inc.

Additional resources include:

http://www.greenfudge.org/2010/06/15/bauxite-mines-highlight-environmental-and-human-consequences-of-aluminum-extraction/
http://www.energysolutionscenter.org/heattreat/metalsadvisor/aluminum/process_descriptions/bauxite_mining.htm
http://www.lenntech.com/periodic/elements/al.htm
http://www.bauxietinstituut.com/files/Environmentapercent20problemspercent20relatedpercent20topercent20bauxitepercent20miningpercent20andpercent20processing-Paulpercent20Ouboter.pdf
http://pubs.acs.org/doi/abs/10.1021/j150316a007
http://www.organicconsumers.org/articles/article_20105.cfm
http://science.jrank.org/pages/6602/Sulfuric-Acid.html
http://www.thaindian.com/newsportal/india-news/orissa-tribals-protest-against-setting-up-of-kalahandi-bauxite-mining-factory-2_100376387.html
http://www.jamaicancaves.org/cockpit-country-bauxite-mining.htm
http://www.ecplaza.net/tradeleads/seller/6625778/potash_alumpotassium.html
http://www.alibaba.com/member/th105593273.html
http://www.rainforestrelief.org/What_to_Avoid_and_Alternatives/Aluminum.html
http://maps.grida.no/go/graphic/mining_waste_generated_from_aluminium_production Mining waste chart
http://www.raysahelian.com/aluminum.html
http://www.sciencelab.com/xMSDS-Aluminum-9922844
http://www.ncbi.nlm.nih.gov/pubmed/2198876
http://www.mii.org/Minerals/photoal.html
http://truthinaging.com/ingredients/magnesium-aluminum-silicate
http://www.cosmeticdatabase.com/ingredient.php?ingred06=706187
http://linkinghub.elsevier.com/retrieve/pii/S0378-4274(05)00240-7.
http://us.asiancorrespondent.com/greenfudge/bauxite-mines-highlight-environmental-and-human-consequences-of-aluminum-extraction
http://www.drugs.com/mtm/aluminum-hydroxide.html#ixzz0yTjshB3P
http://www.dailymail.co.uk/health/article-481134/The-deodorant-safety-guide-How-picking-right-brand-save-life.html#ixzz0y8AXKYfk
http://www.made-in-china.com/products-search/hot-china-products/Natural_Crystal.html
http://www.intlfoodcraft.com/color_guide.html
McGraw-Hill Dictionary of Scientific & Technical Terms, 6E, Copyright © 2003 by The McGraw-Hill Companies, Inc. [a] [b] [c] "Antiperspirant Drug Products For Over-the-Counter Human Use; Final Monograph". U.S. Food and Drug Administration.
http://www.fda.gov/OHRMS/DOCKETS/98fr/03-14140.htm.