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Germanium

DESCRIPTION

Germanium is a metalloid element with atomic number 32 and atomic symbol Ge. Germanium is found in the earth's crust, in certain minerals and in living matter such as plants and the human body. Germanium is not an essential nutrient for humans.

A germanium-deficient diet fed to rats has been found to alter the mineral composition of bone and liver and decrease DNA in the tibia. Little more is known about the biologic role of this element.

Typical daily dietary intakes of germanium range from about 0.4 to 1.5 milligrams. Plant foods, such as wheat, vegetables, bran and leguminous seeds, are rich sources of germanium. Animal foods are low in germanium.

Some organic complexes of germanium are reported to inhibit tumor growth in animals. Some humans who consumed high amounts of these organic germanium supplements, which were contaminated with germanium dioxide (which is nephrotoxic), died from renal failure.

The main nutritional supplement form of germanium is known as Ge-132, Germanium-132, germanium sesquioxide or bis-carboxyethyl germanium sesquioxide. This is a synthetic organic product. It has not been found naturally. Noteworthy is that many of the clinical trials studying the effect of germanium on subjects with various cancers used another synthetic germanium compound, spirogermanium or 8,8-diethyl-N,N-dimethyl-2-aza-8-germaspiro (4,5) decane-2-propranamine dihydrochloride. Spirogermanium has great toxicity, especially neurotoxicity. Spirogermanium is not sold as a nutritional supplement.

Topical products containing inorganic germanium are marketed in Japan for relief of pain and swelling.

ACTIONS AND PHARMACOLOGY

ACTIONS

Bis-carboxyethyl germanium sesquioxide, Ge-132, may have antiproliterative activity. Ge-132 may also have antioxidant activity.

MECHANISM OF ACTION

The mechanism of the possible antiproliferative activity is unknown. Ge-132 is not effective in cell culture. It is speculated that Ge-132's possible antiproliferative activity is due to immune enhancement. There are reports that Ge-132 stimulates natural killer (NK) cell and cytotoxic T lymphocyte activity, as well as increased production of interferon.

Ge-132 was reported to prevent paraquat-induced hepatic oxidant injury in mice. The mechanism of this possible antioxidant effect is unknown.

PHARMACOKINETICS

Reported studies indicate that about 30% of an ingested dose of Ge-132 is absorbed from the small intestine. Little metabolism of Ge-132 appears to occur, and the substance is mainly excreted by the kidneys.

INDICATIONS AND USAGE

There are no indications for the use of supplemental germanium. Some inorganic forms of germanium, such as germanium dioxide, have been shown to be severely toxic to the liver and kidneys, resulting in some fatalities. Some organic forms of germanium, notably germanium lactate citrate, have also been shown to be severely toxic. The risk of contamination in putatively non-toxic forms of supplemental germanium outweighs any possible benefits, none of which, in any case, is yet well established.

RESEARCH SUMMARY

The Food and Drug Administration reported in 1997 that at least 31 human cases linked intake of germanium products

with renal failure and, in some cases, death. Other adverse effects noted included anemia, muscle weakness and peripheral neuropathy. The total dose (not the daily dose) ingested in the cases reported on varied from 15 to more than 300 grams. Exposure varied from two to 36 months.

The Center For Food Safety and Applied Nutrition concluded: "Based on the evidence of persistent renal toxicity associated with germanium dioxide, the lack of conclusive findings of differential nephrotoxicity of organic germanium compounds, and the possibility of contamination of the organic germanium products with inorganic germanium, it is clear that germanium products present a potential human health hazard."

Some case histories are instructive. Based upon claims that germanium is an "anti-cancer" and "immunostimulatory" agent, a 25-year-old woman with stage II HIV disease consumed a total of 47 grams of germanium-lactate-citrate 18%. She developed severe renal insufficiency and hepatomegaly. A 55-year-old woman who consumed a similar amount of germanium compounds over a 19-month period was admitted to a hospital with general malaise, muscular weakness, anorexia and weight loss. She was found to have renal failure and muscular and nerve damage. Her decline soon ended in death. Other deaths have been reported in those who used germanium compounds as a general elixir, as well as in attempts to treat specific disorders.

A recent report described complete remission of pulmonary spindle cell carcinoma in a patient taking large doses of germanium sesquioxide. However, this would be considered pharmaceutical, not nutritional usage of this substance.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

CONTRAINDICATIONS

Those with renal failure or those who are at risk for renal problems (for example, those with diabetes and those on potentially nephrotoxic drugs).

PRECAUTIONS

Because of the possibility of contamination of Ge-132 with germanium-containing compounds known to be toxic, including germanium dioxide and germanium lactate citrate, use of Ge-132 supplements requires extreme caution and is not recommended. Although pure Ge-132 has not yet been associated with renal failure, this possibility has not been ruled out.

Children, pregnant women, nursing mothers, those with renal failure and those with diabetes should absolutely avoid Ge-132 supplements. Also, those taking potentially nephrotoxic drugs should avoid Ge-132.

ADVERSE REACTIONS

Adverse reactions reported for those taking Ge-132—supposedly 100% pure—include nausea, diarrhea and skin eruptions. Germanium dioxide and germanium lactate citrate are nephrotoxic. Spirogermanium causes neurotoxicity and pulmonary toxicity.

Adverse effects reported for germanium dioxide and germanium lactate citrate, in addition to nephrotoxicity, include anemia, muscle weakness and peripheral neuropathy.

INTERACTIONS

There are no known interactions with Ge-132. There is always the possibility that Ge-132 might potentiate the nephrotoxicity of potentially nephrotoxic drugs.

OVERDOSAGE

Overdosage with pure Ge-132 has not been reported. However, overdosage with other forms of germanium has; in at least one case, multiple organ dysfunction, shock and death occurred.

DOSAGE AND ADMINISTRATION

No recommended dose. Germanium, in the form of Ge-132, also known as Germanium-132, germanium sesquioxide and bis-carboxyethyl germanium sesquioxide, is available as a nutritional supplement in capsules containing 30 to 150 milligrams. It is also available as a powder. Those who decide to use these supplements are cautioned to dose only under strict medical supervision and to be certain that the supplement (Ge-132) they are taking is 100% pure. Germanium may also be present in colloidal or liquid mineral preparations.

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Glandulars

DESCRIPTION

The term glandulars as used in the nutritional supplement marketplace refers to dried and ground-up raw animal glandular and nonglandular tissues or extracts of these tissues. The tissues include those from the following glands and organs: adrenal, thyroid, thymus, testis, ovary, pituitary, liver, pancreas, spleen, kidney, lung, heart, brain, uterus and prostate. Glandulars are believed by some to improve the function of the gland or organ from which the extract was produced. Most of these substances are derived from bovine sources; some are derived from ovine sources and some from porcine sources.

Glandulars and other tissue extracts have had roles in traditional medicine. At one time, extract of bone marrow was used as a hematinic agent for the treatment of iron-deficiency anemia. Desiccated thyroid is still used by many physicians in the management of hypothyroidism. Desiccated thyroid is the cleaned, dried and powdered thyroid gland, purified of fat and connective tissue; it is derived principally from hogs, but also from cows and sheep. Thymus extracts are being studied for their possible immunomodulatory activity.

ACTIONS AND PHARMACOLOGY

ACTIONS

The different glandulars and glandular extracts have various putative activities. Thymus and spleen extracts have putative immunomodulatory activities. Thyroid extracts have putative activity in managing hypothyroidism. Adrenal extracts have putative antiallergic and anti-inflammatory activities. Testis extracts have putative androgenic activity, and ovary extracts have putative estrogenic activity.

MECHANISM OF ACTION

For the most part, the various putative actions of the glandulars may be explained by the hormones and other factors that these tissue extracts contain. However, most of the glandulars marketed as nutritional supplements are unlikely to have physiologically meaningful levels of these bioactive substances. Some immune-modulatory substances have been isolated from thymus extracts as well as spleen extracts. Desiccated natural thyroid is available as a prescription drug for the management of hypothyroidism. The pharmaceutical preparation is standardized and contains both thyroxine and triiodothyronine. Thyroid extracts marketed as nutritional supplements are not allowed to have these hormones in them. Adrenal extracts may contain some cortisol. Cortisol does have anti-inflammatory and anti-allergic activities, but the amount of cortisol in the supplements is likely to be too low to have meaningful physiological activity. Testis extracts and ovary extracts contain testosterone and estrogen, respectively, but again, the amount of these hormones in the glandular supplements are unlikely to be physiologically significant.

PHARMACOKINETICS

The components of the various glandular supplements are digested, absorbed and metabolized by normal physiological processes.

INDICATIONS AND USAGE

Glandulars are said to have gland-restorative activity, immunomodulatory effects, androgenic and estrogenic properties and various rejuvenating qualities. A pharmaceutical thyroid preparation is used to treat hypothyroidism, but supplemental thyroid products are not useful for this purpose and should not be substituted for pharmaceutical therapy. Testis and ovary supplements, similarly, should not be substituted for androgen and estrogen therapies recommended by physicians. Claims, including antiallergy and anti-inflammatory claims, made for glandular supplements are not supported by credible evidence.

RESEARCH SUMMARY

There is no credible evidence showing that supplemental glandulars rejuvenate glands.

Most clinical trials, which have been few in number, have produced non-significant results using glandulars. Some have shown immunomodulatory effects, but these findings are inconclusive.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

CONTRAINDICATIONS

Glandulars are contraindicated in those who are hypersensitive to any component of a glandular-containing supplement.

Supplemental testis extracts are contraindicated in those with cancer of the prostate or benign prostatic hypertrophy (BPH).

Supplemental ovary extracts are contraindicated in those with breast cancer, ovarian cancer and uterine cancer and in those at risk for these cancers.