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Scientific Backgrounders

Germanium

Scientific Name(s): (bis(2-carboxyethylgermanium sesquioxide), Ge-132)

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INTRODUCTION

The purpose of this Backgrounder is to present the position of the National Nutritional Foods Association, based on the current state of scientific support, regarding the use of Germanium as a dietary supplement.

HISTORY OF USE

During the 1980s germanium was listed as a possible anti-cancer drug, and sold as either germanium sesquioxide (Ge-132) or spirogermanium. However, a decade of human clinical trials has failed to conclusively show such a benefit (1A). There was a recently published report of a complete remission following germanium sesquioxide use by a patient with a rare type of lung cancer. This tumor, a pulmonary spindle cell carcinoma, is usually associated with a poor prognosis and this patient had not responded to conventional chemotherapy (2A). The report was accompanied by an editorial calling for rigorous research on alternative therapies (3B). This case study does not provide adequate evidence for the widespread use of Ge-132 in cancer therapy.

Claims of beneficial effects on galactose-induced cataracts and perhaps glycation of proteins have been reported (4A, 5A)) as well as analgesic (6A) and anti-viral (7A, 8A) activities, all observed in studies with animals. A germanium compound, propagermanium (3-oxygermylpropionic acid polymer) has been reported to act as an immune system activator in mice and in that species provides protection against liver damage caused by herpes virus or chemicals (9A, 10A, 11A).

CHEMISTRY AND PHARMACOLOGY

The concern with use of Ge-132 is not primarily the organic compound itself, but rather the potential for contamination

of a product with the toxic inorganic forms of various germanium salts, such as the highly toxic germanium dioxide.

TOXICOLOGY

The toxicity of germanium dioxide has been well documented in animal studies and in humans. In humans, the use of germanium dioxide has been associated with nervous system pathology and kidney damage (12A, 13A, 14A, 15A, 16A,), muscle damage (13A, 14A, 15A) and anemia (15A). Irreversible changes, and several deaths, are included among these cases. The progressive kidney failure caused by germanium dioxide (GeO₂) is associated with a characteristic pathology that persists even after use of GeO₂ is stopped. This pathology involves white blood cell invasion, formation of collagen and fibrosis of parts of the kidney. It has been recently reported that treatment of rats with L-arginine can prevent this terminal effect of GeO₂ (17A).

Germanium dioxide was shown to prevent changes in gap junctional intercellular communication (GJIC) caused by tumor promoters. GJIC depends on channels that connect neighboring cells and is believed to be important in controlling cell functioning, growth and differentiation. This study indicated an anticarcinogenic role for GeO₂, but the report made no mention of its toxicity or of any similar work planned with Ge-132 (18A).

Human toxicity has also been reported for germanium-lactate-citrate, including kidney, liver and nervous system effects and several deaths (16A, 19A, 20A, 21A). One case history reported multi-organ pathology in a man after consumption of 426g of germanium-lactate-citrate over a six month period. Nausea, vomiting, kidney dysfunction and peripheral neuropathy persisted six months after discontinuation of germanium (22A).

There are few adverse effects reported for germanium sesquioxide (Ge-132, prosigermanium, carboxyethyl germanium sesquioxide) (23B, 24A).

Reviews of germanium toxicity (exclusive of industrial health studies relating mainly to germanium metal) include articles by Tao and Bolger (1A) and Schauss (25A, 26A).

CONCLUSION

Scientific data and information published to date do not at this time substantiate the use of Germanium as a dietary supplement.

In the absence of evidence that germanium is an essential nutrient for humans (1A, 25A) the known toxicity of germanium dioxide makes the purity of Ge-132 a critical factor in determining propriety of its use as a dietary supplement. Existing evidence for the value of germanium is not adequate to overcome the burden of the possible

toxicity of Ge-132 itself or, what is more likely, the possibility of contamination with germanium dioxide. The NNFA continues to support a voluntary ban on the sale of germanium.

A recent article in Archives of Family Medicine reported on a survey of health food store personnel as sources of recommended products for breast cancer patients. In 36 of the 40 stores involved, a total of 38 products were recommended. Germanium was mentioned in four stores. This type of survey and its subsequent publication (and inclusion on the journal's Web site) show the need for caution on the part of the industry, both to protect the public and remain within the law (28A).

NOTICE

By furnishing this backgrounder, NNFA does not provide any opinion as to:

- " The efficacy of any product containing this ingredient;
- " The use of any specific brand of product; or
- " The level of substantiation for efficacy of any such product.

Neither this backgrounder nor any portion of this backgrounder may be used in advertising or promotional materials. In addition, this backgrounder does not constitute, and is not to be used as, "third party literature" as that term is used in connection with section 5 of the Dietary Supplement Health and Education Act (DSHEA).

As with any health-related product, consumers should discuss the use of any products with a health care practitioner.

REFERENCES*

1A Tao, SH & PM Bolger. Hazard assessment of germanium supplements. *Regul Toxicol Pharmacol* 25, 211-9 (1997)

2A Mainwaring, MG et al. Complete remission of pulmonary spindle cell carcinoma after treatment with oral germanium sesquioxide. *Chest* 117, 591-3 (2000)

3B Ernst, E. Unconventional cancer therapies. What we need is rigorous research, not closed minds. *Chest* 117, 307-8 (2000)

4A Unakar, NJ et al. Effect of pretreatment of germanium-132 on Na(+)-K(+)-ATPase and galactose cataracts. *Curr Eye Res* 16, 832-7 (1997)

5A Unakar, NJ et al. Effect of germanium-132 on galactose cataracts and glycation in rats. *Exp Eye Res* 61, 155-64 (1995)

6A Hachisu, M et al. Analgesic effect of novel organogermanium compound, Ge-132. *J Pharmacobiodyn* 11, 814-20 (1983)

7A Aso, H et al. Antiviral activity of carboxyethylgermanium sesquioxide (Ge-132) in mice infected with influenza virus. *J Biol Response Mod* 8, 180-9 (1989)

8A Ishiwata, Y et al. Effects of proxigermanium on interferon production and 2',5'-oligoadenylate synthetase activity in the lung of influenza virus-infected mice and in virus-infected human peripheral blood mononuclear cell cultures. *Arzneimittelforschung* 40, 896-9 (1990)

9A Ishiwata, Y et al. Studies on the antiviral activity of propagermanium with immuno-stimulating action. *Arzneimittelforschung* 44, 357-61 (1994)

10A Ishiwata, Y et al. Protection against concanavalin A-induced murine liver injury by the organic germanium compound, propagermanium. *Scand J Immunol* 48, 605-14 (1998)

11A Yokochi, S et al. Hepatoprotective effect of propagermanium on *Corynebacterium parvum* and lipopolysaccharide-induced liver injury in mice. *Scand J Immunol* 48, 183-91 (1998)

12A Fujimoto, M. A patient with liver cirrhosis manifesting various symptoms including cerebellar ataxia due to germanium intoxication. *Fukuoka Igaku Zasshi* 83, 139-43 (1992) (in Japanese)

13A Obara, K. Germanium poisoning: clinical symptoms and renal damage caused by long-term intake of germanium. *Jpn J Med* 30, 67-72 (1991)

14A Kamijo, M et al. An autopsy case of chronic germanium intoxication presenting peripheral neuropathy, spinal ataxia, and chronic renal failure. *Rinsho Shinkeigaku* 31, 191-6 (1991) (in Japanese)

15A Iijima, M et al. A case of inorganic germanium poisoning with peripheral and cranial neuropathy, myopathy and autonomic dysfunction. *No To Shinkei* 42, 851-6 (1990)

16A Asaka, T et al. Germanium intoxication with sensory ataxia. *J Neurol Sci* 130, 220-3 (1995)

17A Yanagisawa, H et al. L-Arginine treatment may prevent tubulointerstitial nephropathy caused by germanium dioxide. *Kidney Intl* 57, 2275-84 (2000)

18A Kany, K-A et al. Preventive effect of germanium dioxide on the inhibition of gap junctional intercellular communication by TPA. *Cancer Letters* 166, 147-53 (2001)

19A Krapf, R et al. Abuse of germanium associated with fatal lactic acidosis. *Nephron* 62, 351-6 (1992)

20A Raisin, J et al. Toxicity of an organic germanium compound: deleterious consequences of a "natural remedy". *Schweiz Med Wochenschr* 122, 11-13 (1992) (in German)

21A Van der Spoel, JR et al. Toxic damage of kidney, liver and muscle attributed to the administration of germanium-lactate-citrate. *Ned Tijdschr Geneesk* 135, 1134-7 (1991) (in Dutch)

22A Luck, BE et al. Renal and other organ failure caused by germanium intoxication. *Nephrol Dial Transplant* 14, 2464-8 (1999)

23B Stricker, BH. Dietary germanium supplements. *Lancet* 336, 117 (1990); 337, 864 (1991) (Letters)

24A Anger, F et al. Subacute and subchronic oral toxicity of beta-bis carboxyethyl sesquioxide of germanium in the rat. *J Toxicol Clin Exp* 11, 421-36 (1991) (in French)

25A Schauss, AG. Nephrotoxicity and neurotoxicity in humans from organogermanium compounds and germanium dioxide. *Biol Trace Elem Res* 29, 267-80 (1991)

26A Schauss, AG. Nephrotoxicity in humans by the ultratrace element germanium. *Renal Failure* 13, 1-4 (1991)

27A Nielsen, FH. How should dietary guidance be given for mineral elements with beneficial actions or suspected of being essential? *J Nutr* 126 (Suppl), 2377S-2385S (1996)

28A Gotay, CC & D Dumitriu. Health food store recommendations for breast cancer patients. *Arch Fam Med* 9, 692-8 (2000)

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