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Re: By what mechanism does hydrofluoric acid cause death?

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Area of science: **Medicine**
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Message:

Bob,

Hydrogen fluoride is a gas which when in solution with water forms hydrofluoric acid,HF. Although a weak acid, i.e., it is not strongly disassociated, is used to etch glass. Like it's sister, HCl acid, it reacts with water with the release of heat and can cause burns on the skin. Hydrofluoric acid has an even more detrimental effect which can affect many internal structures. Fatalities have been reported from a skin exposure to as little as 2.5% of body surface area. The weak disassociation allowsit to be absorbed through the skin as the intact molecule.

Once it penetrates the skin it slowly disassociates into the hydrogen ion and fluoride ion. The fluoride ion affects tissue integrity and metabolism by liquefaction necrosis, decalcification and destruction of bone, and production of insoluble salts. Loss of calcium, hypocalcemia, results from precipitation of calcium form the blood as CaF_2. This will eventually result in loss of calcium from the bones to try to equilibrate the decreased serum calcium. This may be a delayed fatal event. The rapid development of hypocalcemia can be rapidly fatal because calcium is important for muscles, including cardiac muscle, to function properly. Without calcium, many metabolic pathways breakdown.

Fluoride from any source has the same toxicity. A mass poisoning occurred at a state hospital many years ago when a bug poison containing NaF was mistaken for powdered milk and added to scrambled eggs. There were reported to be 47 deaths. In some regions of the country the levels of fluoride in the water are too high and this causes mottling of the teeth and loss of calcium from the bones.

Inhalation of HF produces an immediate injury to the lining of the lungs with hemorrhage pulmonary edema and death. It may take only about 5 minutes of exposure to inhaled HF to produce death in a couple of hours.

All in all, fluoride from whatever source can be very dangerous.

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