

Health Effects Of UF₆ Exposure

The health effects of exposure to UF₆ depend on many factors, including: the level of U235 enrichment, whether or not the UF₆ has been made from reprocessed spent fuel, concentration and its spatial distribution (floor level or roof level), duration of exposure, ability to escape quickly, physical activity level at time of exposure, and the individual's, age, sex and general health. In addition, the presence of other toxicants will have an influence.

Biological effects of exposure to UF₆ can be divided into five main categories:

- 1) radiological effects, primarily through inhalation, from uranium and other radionuclides that may be present;
- 2) chemical effects of uranium as a heavy metal from intake of UO₂F₂, primarily kidney damage;
- 3) chemical effects of hydrofluoric acid (HF) such as skin burns and lung damage from inhalation;
- 4) fluoride (F) poisoning from HF and UO₂F₂;
- 5) and the combined effects of all of the above with each other and any other pollutants.

Radiation, uranium as a heavy metal, hydrofluoric acid, and fluoride each have very different biological effects. Each primarily affects a different organ, causes a different type of injury, and can cause health effects at different quantities and lengths of time after exposure. Therefore, discussion of the health and environmental effects of UF₆ exposure has been divided into the topics of the relative chemical toxicity and radiotoxicity of UF₆; the chemical hazards of each of uranium, HF, and F; and finally the radiological hazard. In practice however, the effects cannot be clearly separated. For example, the effects of directly inhaling UF₆ are the combined effects of UO₂F₂ and HF, as hydrolysis occurs in the lungs.³⁰

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ON CONTACT WITH AIR, SOLID, LIQUID, OR GASEOUS UF₆ QUICKLY FORMS A HIGHLY TOXIC CLOUD MADE UP IN PART OF HYDROFLUORIC ACID.

THE ENTIRE CONTENTS OF A FULL UF₆ CYLINDER CAN LEAK OUT AND VAPORIZE IN MINUTES.

AT COOL ENOUGH TEMPERATURES, A SLIGHT LEAK THROUGH A UF₆ CYLINDER WALL OR VALVE WILL NATURALLY PLUG UP WITH SOLID URANIUM, STOPPING LEAKAGE.

CYLINDERS CAN BE EASILY OVERFILLED SINCE SOME LIQUID UF₆ SOLIDIFIES DURING FILLING, AND THE VOLUME OF LIQUID UF₆ IS ONE-THIRD GREATER THAN THE VOLUME OF SOLID UF₆.

THE RISK OF CRITICALITY BEING REACHED IN A UF₆ RELEASE, AND THUS THERE BEING A NUCLEAR EXPLOSION, IS POSSIBLE UNDER CERTAIN CONDITIONS. STANDARD PRACTICES, HOWEVER, ARE SUCH THAT THE NECESSARY COMBINATION OF FACTORS SHOULD NEVER OCCUR.

³⁰ Ringot and Hamard, 1988, p. 30; in: Strunk and Thornton (eds), undated.