Survival 101-Fallout Fundamentals

Courtesy Ken Seger's BBS

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Fallout consists of dust particles that have been coated with radioactive

by-products from atomic explosions. This occurs when the nuclear or atomic

blast is a ground rather than air-burst (air-burst meaning that the fireball

is far enough from the earth's surface that there is no ground material

uptake into the high temperature portion of the mushroom cloud). In an air-burst

the particles condensate into such very small particles that they are aloft

for such a long time that they are most non-radioactive by the time they come

down. The fission process gives off dozens of different radioactive elements

and isotopes. The fussion portion of nuclear bombs is clean and gives off

only helium, the atomic bomb trigger (fission) which starts the nuclear bomb

(fussion) is the portion of the bomb that leaves radioactive by-products.

These by-products can be classified by their characteristics. One

characteristic is half-life. The half-life is the length of time it takes for

a given quanity of an element to give off one-half of its radioactivity. An

unstable isotope only emits radioactivity when one atom decays to another

isotope or element (which may or not be stable, stable being non-radioactive).

Therefore the portions of the element that are not decaying are not giving off

any radioactivity. If you have Avagadro's number of atoms (1 mole) of a radioactive element

if you have a short half-life like Iodine 131 of 8 days most of the radioactivity

(99+%) will be emitted in two months. In a long half-life like plutonium 239

of 24,400 years 1 mole the amount would be less than 4/1,00th of 1%.

Another characteristic is the type of radiation given off, Alpha, Beta, Gamma,

or neutron radiation. Alpha radiation (helium nucleus, 2 protrons and 2 neutrons)

, like from plutonium, can be shielded with one layer of Cellophane or

newspaper or several inches of air. Beta radiation(an electron) can be

shielded say a layer of drywall, or several feet of air. Gamma radiation is

electromagnetic radiation. Neutron radiation is a neutron. Gamma and neutron

are harder to stop, you need several feet of dirt or concrete to absorb them.

One factor that most people don't realize about fallout is how fast it

decays. Fallout follows the t-1.2 law which states that for every sevenfold

increase in time since detonation there is a tenfold drop in radiation output.

This is accurate for 2,500 hours following the explosion, thereafter the dose

is lower than t-1.2 would predict. Example, if a dose rate of 100 REM/hr was

found at 1 hour after detonation(this assumes all significant fallout from the

bomb has fallen, therefore starting with the seven hour point is probably more

realistic) would be 10 REM/hr at 7 hours, 1 REM/hr at 49 hours(~2 days), .1

REM/hr at 343 hours(~2 weeks), .01 REM/hr at 2401 hours (14 weeks). A

"survival safe" dose of radiation (this being defined as no short term effects

or disability) is 3 to 12 Rads/day. This would occur (assume 6 Rads/day) in

this example at 150 hours for 24 hour exposure, or 49 hours for a 6 hours per

day outside of shelter. If you increase the radiation by a factor of 10 for

another example where you would have 1,000 Rem/hr at 1 hr, 100 Rem/hr at 7 hrs.

, 1 Rem/hr at 343 hrs., .1 Rem/hr at 2401 hrs. the 24 hour exposure would be at

1,000 hours(41 days) and 6 hour work day outside of shelter at 300 hours(12

days).

For shelter from Gamma radiation the standard rule of thumb is 150 pounds

of mass per square foot of cross section of shelter wall yields a protection

factor of 40. This means if you had two shelters on a flat contaminated field

one had walls of one layer of cellophane and the other of walls and ceiling of

something that had for its thickness 150 lbs/sq. ft.( note this would be a

thickness of 2.5" of lead, 4" of steel, 12" of concrete, 18" of soil, 30" of

water, 200' of air) you would recieve 1/40th the dose in the 150 lb/sq.ft.

walled shelter. This effect can be multiplied. If the sq. ft. cross section

was 300 lbs. that would be 1/40th of 1/40th or 1/1,600th of a dose.

Take for example a dose rate starting at 100 Rem/hr at 1 hr.,1 Rem/hr at 49

hours, etc. If exposure started at 1 hour the total dose would be 240 R in 1

day, 310 R in 1 week, 350 R in 4 weeks. The same in a PF 40 shelter would be

6 R in 1 day, 7.7 R in 1 week, 8.7 R in 4 weeks.

Another example with a dose rate starting at 1,000 Rem/hr at 1 hr., 10

Rem/hr at 49 hours, etc. If exposure started at 1 hour the total dose would be

2,400 R in 1 day, 3,100 R in 1 week, 3,500 R in 4 weeks, 3,900 R in 15 weeks.

This in a 40 PF shelter would be 60 R in 1 day, 77 R in a week, 87 R in 4

weeks. In a 1,600 PF shelter this would be 1.5 R in 1 day, about 2 R in 2

weeks, about 2.5 R in 15 weeks.

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