

## What is half-life?

Half-life is a measure of how long a radioactive isotope will exist. All radioactive isotopes have a determined half-life. This is the amount of time it takes for half of the existing amount of that isotope to decay into some other element. The longer the half-life is the longer it takes for that isotope to decay completely away. An isotope with a short half-life will decay very quickly, but it is generally more radioactive than one with a long half-life.

An example is iodine 131 and strontium 90. The half-life of iodine 131 is 8.04 days. The half-life of strontium 90 is 29.1 years. They both emit beta radiation. If you look at how much radiation a gram of each isotope emits in a given amount of time, the iodine will emit half of the total radiation in 8.04 days. The strontium will only emit 0.00076 as much radiation in that time.

Now look at it a different way. In about 80 days, the Iodine will have decayed almost entirely away and would be considered to be gone. There would only be  $1/1024$  of it left (that math is  $\frac{1}{2}$  multiplied by itself 10 times.) There is very little radiation coming from that amount of material. However, almost the entire amount of strontium 90 is still present and emitting beta radiation. And only half of that radiation will be gone in 29 years. It will take 291 years for the strontium 90 to decay to the same radioactivity that the iodine 131 has after 80 days.