Smoking kills …. it really does!
-Nirupama Sensharma

I wonder what is it about cigarettes that even after more than 480,000* deaths every year, it still is a trend and never seems to lose its charm.

Smoking isn't something that would make you look cool. It brings with it a deadly byproduct. And by the time that byproduct is identified, it is almost always too late to act. According to a fact sheet released by the Centers for Disease Control prevention in 2015, about 15 of every 100 US. adults aged 18 years or older (15.1%) smoked cigarettes. This means an estimated 36.5 million adults in the United States were smoking cigarettes in 2015*.

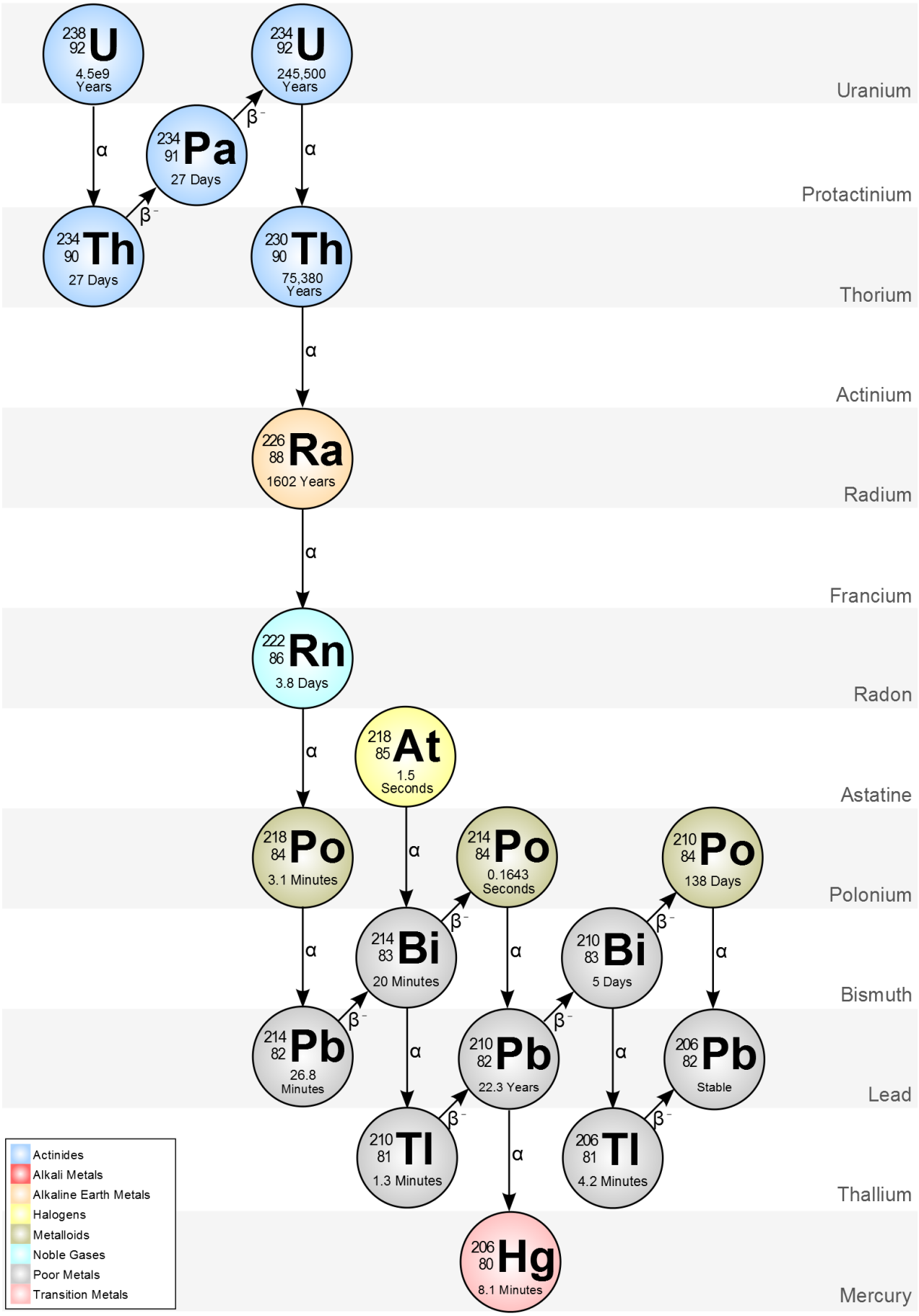
Okay, but let's not make it an anti-smoking propaganda. Let's just start with some facts and I will then leave it on you to make the final decision. It is a well known fact that tobacco causes cancer. However, very few people know the root cause of it. To understand that, we will have to overcome our fear factor and once again make a dive into the ocean of radioactivity.

All the discussions and recurring debates on nuclear power and weapons program has brought the infamous Uranium to the forefront. Uranium is an element denoted by the symbol *U* having atomic number 92. Naturally occurring Uranium often denoted by ^{238}U, has 92 protons and 146 neutrons. Uranium has various other isotopes (meaning same no. of protons but different neutron numbers) most of which are radioactive and decay into lighter products. This constant decay process leads to something called a *decay chain of Uranium*. A decay chain refers to the decay of a radioactive nucleus into a stable nucleus through various stages. Uranium decay chain starts with the decay of Uranium-238 to Thorium-234 which further decays to Protactinium-234 and goes on to decay further until it reaches its end point with stable Lead-208. The complete decay chain can be viewed in the figure on the next page. [Figure adapted from http://metadata.berkeley.edu/nuclear-forensics/Decay%20Chains.html.]

A closer inspection of the figure rings a bell. The seventh decay product in the chain is an element called Radon. The problem with Radon is that it is a radioactive gas that can escape from the location of the decay (soil) to the atmosphere. As can be seen from the figure, Radon is a decay product of Radium and itself decays into Polonium with a half life of about 4 days. Half life is the time taken by the nucleus to radioactively decay into half of its original amount. Looking at the half-life number, we might want to let out a sigh of relief thinking it wouldn't be as bad. However the issue comes up because unlike radon which is a gas, polonium and the rest of the decay products are solids and are mostly alpha emitters.

These solid daughter products can stick to surfaces, such as dust particles in the air and can enter the human body via simple processes like inhalation and ingestion. A prolonged radon exposure can lead to lung cancer. Often times, radon gets trapped in areas like mines and basements where the air flow is limited. It is therefore advised to ensure proper ventilation in such areas to minimize the risk posed by inhalation of radon.

Smoking, however, increases the chances of radon accumulation in the human body substantially. Tobacco has a property to absorb radon from the atmosphere. Radon along with the smoke is hence inhaled by the smoker. This gaseous radon enters the respiratory tract and soon decays into solid radioactive products. These solids can then get stuck in the respiratory tract and lungs and stay there for


238 92 U 4.5e9 Years
234 92 U 245,500 Years
234 91 Pa 27 Days
234 90 Th 27 Days
230 90 Th 75,380 Years
226 88 Ra 1602 Years
222 86 Rn 3.8 Days
218 85 At 1.5 Seconds
218 84 Po 3.1 Minutes
214 84 Po 0.1643 Seconds
210 84 Po 138 Days
214 83 Bi 20 Minutes
210 83 Bi 5 Days
214 82 Pb 26.8 Minutes
210 82 Pb 22.3 Years
206 82 Pb Stable
210 81 Tl 1.3 Minutes
206 81 Tl 4.2 Minutes
206 80 Hg 8.1 Minutes
α
β⁻
Uranium
Protactinium
Thorium
Actinium
Radium
Francium
Radon
Astatine
Polonium
Bismuth
Lead
Thallium
Mercury
Actinides
Alkali Metals
Alkaline Earth Metals
Halogens
Metalloids
Noble Gases
Poor Metals
Transition Metals

a very long time continuously decaying into other radioactive products. Over the years, this accumulation can prove seriously dangerous and often times even fatal.

This will not only just affect the smoker but also anyone and everyone near the smoker who is knowingly/unknowingly inhaling the contaminated smoke. The risk posed by radon on getting trapped in the basement areas is small. The greater risk is from smoking, for active and passive smokers alike. Without smoking, this effect can safely be called insignificant at best. By far, smoking is the prime cause of *Preventable deaths* all over the world. While atmospheric radon is a natural occurrence and we can't do much about it, we certainly can make an informed decision about our smoking habits and drastically reduce the chances of radioactive radon accumulation within our systems.

So, if you are in an age group where most of your peers smoke and you too feel inclined to do it, now is the time to make a wise decision.

* *All data taken from the CDC (Centers for Disease Control and Prevention) website.*
https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm

Disclaimer: There are also other factors that make smoking dangerous, for example, chemical dangers posed by carcinogens. Tobacco’s ability to absorb radon and the harm it causes is an additional factor that increases the danger level manifold.