Weapons containing depleted uranium, or the never-ending war

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Imagine a military victory so decisive that the enemy's armour is just instantly vaporised. I mean, the battle is won in seconds, right? The troops go home. But the weapon you use to win that battle is going to continue fighting this like silent toxic war on that exact same soil for the next four and a half billion years.

Which is just wild. I mean, it completely shatters our conventional understanding of what a war actually is. Yeah.

We're so used to conflicts having a clear beginning, a peace treaty, and then, you know, a definitive end. Right. A closed chapter.

Exactly. But when you step into the world of modern ballistics and radioactive materials, that battlefield is never truly cleared. You are looking at a landscape that is terrifyingly permanent.

Yeah, it's definitely a heavy concept. It really is. And it's a concept that pulls you in.

So as the third person in today's conversation, just pull up a chair and grab a seat with us. Our focus for today's deep dive is on a weapon that represents an absolute triumph of physics on the battlefield, but leaves a legacy that literally outlives human civilisation. It's a huge topic.

Totally. And today's stack of notes comes from a comprehensive research thesis by Thierry Lamireau. It examines the impacts, the controversies, and the deep geopolitical implications of depleted uranium weapons.

Also known as DU. Right, DU. The fundamental contradiction we are exploring today is simple, but pretty chilling.

How do you reconcile a surgical, quote unquote, clean military victory with an invisible toxic footprint that basically lasts forever? Well, to even begin unpacking that contradiction, we really have to understand the intense obsession that militaries across the globe have with this specific material. Yeah. Like, we have to look at the underlying physics of depleted uranium and, I guess, starting with where it actually comes from.

Okay, let's unpack this, because the name itself is almost a misdirection. I mean, depleted uranium isn't something you just go out and dig out of the earth in its current form, right? Well, not at all. It's essentially the leftovers.

When natural uranium ore is mined, it contains a mix of isotopes. But the military, or the nuclear power industry, they really only want one highly radioactive isotope, which is uranium-235. Right, because that's the fuel for nuclear reactors.

And atomic bombs. Exactly. But uranium-235 makes up, like, less than 1% of the natural ore.

Yeah, it's a tiny fraction. So you have to run all of this raw material through these massive centrifuge cascades. It's this incredibly complex enrichment process just to extract that tiny fraction of the valuable isotope.

And what you are left with at the end of that whole process is just a mountain of byproduct. A literal mountain. And that leftover material is what we call depleted uranium, which is about 99.8% uranium-238.

Right. So it's depleted of the stuff needed for a nuclear chain reaction. Exactly.

But what it lacks in fissile energy, it completely makes up for in pure, devastating physical mass. Yeah. Like, the density of depleted uranium is staggering.

It's 18.95 grammes per cubic centimetre. Which is hard to visualise. Yeah.

So to give that some real-world context for you listening, if you were to hold a solid block of it in your hand, it would feel roughly 1.7 times heavier than a solid block of lead. Oh, wow. Yeah.

And, you know, in the realm of kinetic warfare, mass is everything. Militaries use this for what are known as kinetic energy penetrators. Okay.

Specifically, APFDS, which stands for Armour-Piercing Fin-Stabilised Discarding Sabot. I love military acronyms. They're so unnecessarily long.

Right. But basically, they fire a massive heavy metal dart. That is essentially it.

Yeah. Pretty much. You wrap this heavy, dense dart in a lightweight casing called a sabot.

Then you fire it out of a tank barrel at extreme supersonic speeds, and that outer casing just peels away midair. Okay. What's left is this very long, very thin needle of incredibly dense metal just flying toward heavy armour.

All of that kinetic force is concentrated into a microscopic point of impact. Which makes total sense from a physics standpoint. But wait, tungsten is also incredibly dense, right? It is, yeah.

And militaries have used tungsten for a long time, so why go through all the trouble of using nuclear byproducts when you have a perfectly good non-radioactive heavy metal just readily available? Well, it comes down to how those two metals behave under extreme violent pressure, like impacting heavily armoured steel. Okay. When a tungsten projectile hits modern composite tank armour at high speed, the tip of the metal tends to mushroom.

Oh, it flattens out. Exactly. It flattens.

And as it blunts, it distributes all its kinetic energy over a wider surface area, which slows its penetration down. Depleted uranium, however, exhibits this wild phenomenon called adiabatic shear. Right.

So it's like a dart that actually sharpens itself as it punches through a concrete wall. Yes. Instead of flattening out as the DU penetrator strikes the armour, the outer layers of the metal heat up and literally shear off.

Wow. They peel back almost like a banana, and that constantly exposes a fresh, razor-sharp point as it just tunnels its way through the steel. That is terrifying.

It really is. It maintains its aerodynamic point all the way through the armour plate. And then comes the second, and honestly, perhaps more terrifying physical property.

Depleted uranium is highly pyrophoric. Meaning it catches fire. Spontaneously.

The extreme friction of pushing through that heavy armour generates immense heat. It pushes the temperature of the metal way past 600 degrees Celsius. At that temperature, the exact moment the shattered, sheared fragments of the DU penetrator break through the armour and make contact with the oxygen inside the tank cabin.

They spontaneously ignite. Exactly. It's instantaneous.

Okay, so to finish that analogy from earlier, it's a dart that sharpens itself as it punches through the wall and then immediately turns the inside of the room into a 600 degree furnace. Yeah, that's exactly what it does. The superheated metal just bursts into a storm of fire inside the target, instantly neutralising the crew and detonating any stored fuel or ammunition that happens to be in there.

And what's fascinating here is how military tacticians view this specific sequence of events. How do they view it? Well, for military planner in the post-Cold War era, this is the absolute ideal anti-tank weapon. They were facing next generation, heavily hardened bunkers, and these newly designed composite tank armours.

They needed a way to destroy those targets reliably without crossing the massive geopolitical red line of, you know, deploying actual tactical nuclear weapons. Because that would start World War III. Exactly.

So depleted uranium solved that problem perfectly for them. And they didn't just test it. They used it on an unprecedented scale.

I mean, during the 1991 Gulf War, coalition forces fired an estimated 940,000 projectiles from A-10 Warthog aircraft alone. Almost a million rounds. Just from the planes.

Add to that the 14,000 larger, heavier shells fired from Abrams tanks. They absolutely rained this material across the battlefield. And the tactical results were overwhelmingly effective against armour.

But here's the catch. There's always a catch. The exact physical properties that make depleted uranium so devastating to a metal tank are the very same properties that make it a long-term nightmare for biology.

Because it doesn't just disappear. Right. The moment that kinetic weapon impacts and ignites, its nature changes entirely.

It transforms from a solid ballistic threat into an aerosolised environmental threat. Because when a metal burns at 600 degrees, it doesn't just leave behind chunks of debris on the ground. Up to 60% of the penetrator's mass literally vaporises upon impact.

It turns into a microaerosol of uranium oxide particles. And we are talking about microscopic particulate matter here. Completely invisible to the naked eye.

Right. These particles measure between 2 and 10 microns in diameter. For scale, a human hair is about 70 microns thick.

Oh wow. So this uranium dust is finer than talcum powder. That's incredibly small.

Yeah. And it's so light, it just rides the thermal currents from the explosion. Yep.

It travels for miles on the wind. It aggregates with normal grains of sand in the desert. It settles into the topsoil.

And then when the rains come, it washes straight down into the local groundwater. It's everywhere. Everywhere.

And this brings us to the most staggering number in all of Lamireau's research. Yeah. Uranium-238 has a half-life of 4.51 billion years.

That is essentially the age of the planet Earth. Exactly. Once that dust settles into an ecosystem, the contamination is virtually ubiquitous.

And it's completely irreversible. Which introduces a completely new timeline to the conflict. The war for the humans may be over, but the biological threat is literally just beginning.

Yeah. The environment is forever changed. Once this microscopic dust is out in the environment, it inevitably finds its way into the human body.

Either through inhalation as it blows in the wind, or ingestion through contaminated water and local crops. Right. And it attacks human biology on two distinct fronts.

So let's start with the chemical threat, because that's often overlooked. Uranium is fundamentally a heavy metal. Like lead.

Much like lead or mercury poisoning, yeah. It is incredibly toxic to the human body, purely on a chemical level. It causes severe nephrotoxicity.

No kidney damage. Specifically, it attacks the kidney's filtration system. Your body tries to process this heavy metal out of the bloodstream, and the uranium compounds aggregate in the proximal convoluted tubules.

Those are the tiny microscopic tubes responsible for cleaning your blood. Exactly. Cleaning the blood and disposing of waste.

And the heavy metal essentially shreds those delicate structures, leading to rapid and severe kidney damage. Okay, so what does this all mean for the average person on the

ground, or even the soldier breathing that dust? Because if it's a heavy metal like lead, wouldn't the immediate chemical poisoning to the kidneys actually be a more proven immediate danger than the radioactive cancer risk everyone always focusses on? You're absolutely right. Chemical toxicity is scientifically undisputed.

Toxicologists agree completely on the mechanism of heavy metal kidney damage. Okay. But the radiological threat is where the intense public fear and honestly the most aggressive scientific controversy ultimately lie.

Because depleted uranium is an alpha emitter. Right. And alpha radiation behaves very differently than the gamma radiation we typically associate with, like a nuclear bomb fallout.

Gamma rays pass entirely through the body. Exactly. Alpha particles, on the other hand, are heavy and slow.

They don't travel far at all. A standard sheet of paper, or even just the dead layer of skin on the outside of your body, is enough to completely stop an alpha particle. Which means standing next to an intact, solid block of depleted uranium is actually a relatively low risk.

Yes. The danger only comes when you bypass the skin's barrier. Ah, I see.

When you inhale that microscopic 2-micron dust from an exploded tank shell, an insoluble radioactive particle lodges deep within your soft lung tissue. Because it's past the skin. Exactly.

It becomes trapped there. And for the next decade, it just sits in that one spot, constantly emitting short-range, incredibly high-energy alpha particles directly into the surrounding cells. That sounds horrific.

It acts like a microscopic bulldozer, just continuously smashing into the cellular DNA, causing mutations over a long period of time. And this chronic, localised internal radiation is what leads to the massive spikes in severe health crises. The source material documents the fallout perfectly.

It's what became known in the media as Gulf War Syndrome, or Balkan Syndrome. Right. We saw profound spikes in leukaemia, various cancers, neurodegenerative diseases.

And horrifying congenital malformations. And this wasn't just reported by the Western veterans who served in these conflicts. It was heavily documented among the local civilian populations living in places like Iraq and Kosovo, long after the tanks rolled away.

But proving the cause is an incredibly complex endeavour. And the author of the thesis introduces a fascinating concept here. The idea of impossible refutation.

Impossible refutation. Because the modern battlefield is not a controlled laboratory environment. Far from it.

It is a multi-toxic, chaotic environment. Soldier and civilians in these zones were exposed to the smoke from hundreds of burning oil wells. Right.

Industrial pesticides, multiple experimental vaccines given to troops, and just the profound physical stress of war itself. So imagine trying to conduct a pristine epidemiological study in that environment. It's a nightmare.

Trying to prove a direct, isolated, scientifically unquestionable link between a depleted uranium shell fired in 1991 and a specific leukaemia case in 2005 is almost impossible. It's like trying to solve a crime where the environment itself is compromised by a dozen different hazards. But that impossible refutation creates a very convenient scientific uncertainty for the militaries that want to keep using this weapon.

Extremely convenient. If the epidemiology is so muddy, they can just point to the burning oil wells or the vaccines and say, well, you can't prove it was our armour-piercing rounds. Yep.

Clausible deniability. But if the biological threat is this severe and the footprint lasts for billions of years, how do they legally justify continuing to use it? Well, they rely on a massive loophole in international law and a highly coordinated bureaucratic campaign of opacity. Which is wild, because you would assume a weapon that leaves a billion-year radioactive footprint would be explicitly banned by now.

You'd think so. Under international humanitarian law, specifically additional protocol of the 1977 Geneva Conventions. I mean, billions of years certainly covers the long-lasting part.

Yeah, it definitely does. But the legal criteria in that treaty are cumulative and they are incredibly vague. How so? Well, militaries deploy legions of lawyers to argue the semantics of the word widespread.

They argue that because a tank shell hits a specific target, the immediate contamination remains localised to the impact zone. Even though the dust blows in the wind. Exactly.

By their strict definition, it isn't widespread across a massive geographical area in the same way a chemical gas cloud might be. They use the precise ambiguity of the legal text to evade the threshold of prohibition entirely. Here's where it gets really interesting, though.

The active disinformation and semantic manipulation used to protect this weapon from public scrutiny. That's shocking. The very word depleted was deliberately chosen to downplay the nuclear nature of the weapon.

Right. It makes it sound exhausted. Weak.

Almost safe, yeah. But they go even further. Military catalogues and procurement documents often use code words.

They refer to the material as staballoy. Staballoy. Short for stabilised alloy.

It is a brilliant piece of linguistic camouflage. They literally rebranded a radioactive heavy metal. Calling it staballoy makes it sound like a harmless high-tech gadget out of a comic book, not a toxic legacy that causes kidney failure.

It's a masterclass in PR. And that PR strategy extends to actively erasing the evidence when the political heat gets too high. Give me an example.

Look at the French arms catalogue, BESAC. OK. In their 1998 edition, they proudly displayed their depleted uranium weapons, marketing their penetrative capabilities.

Sure, showing off the tech. Right. But by the year 2000, media scrutiny had intensified.

Public outrage over Balkan syndrome was making headlines across Europe. People were getting sick. Exactly.

Suddenly, in the 2000 edition of the catalogue, all depleted uranium weapons were completely erased. Right. They just scrubbed it from the record.

Literally erased it. Out of sight, out of mind. And if an individual tries to pierce that veil of secrecy, the system reacts aggressively.

The thesis highlights the disturbing case of whistleblowers, like U.S. Dr. Asof Durakovich. His story is incredible. He was a highly respected nuclear medicine specialist working within the military and veterans affair systems.

He started researching the unexplained illnesses of returning veterans. Right. Trying to find out what was causing Gulf War syndrome.

And he began finding undeniable traces of specific uranium isotopes in their urine samples. He was finding the physical evidence that connected the battlefield exposure directly to the internal contamination. But shortly after he began raising alarms, his research samples were mysteriously lost from highly secure facilities.

Just vanished. His access was revoked and he was eventually fired for insubordination. The institutional resistance to investigating this issue is just massive.

And this raises an important question regarding international ethics, specifically the precautionary principle. What's that? This is a foundational concept in environmental law. It states that if we lack absolute scientific certainty about the long term harm of a substance, but there is a credible risk of serious and irreversible damage, we shouldn't wait for complete, undeniable proof before taking protective action.

So basically, the burden of proof shouldn't be on the sick veteran or the local civilian with a congenital illness to prove beyond a shadow of a doubt that a specific weapon caused their exact cancer. Exactly. The burden of proof should be on the military to prove unequivocally that dispersing aerosolised uranium across a populated environment is entirely safe.

Which they can't do. Right. But that principle is entirely inverted in this scenario.

Which brings us to the underlying motive. I mean, why go through all this trouble? Why fight international law, manipulate the Geneva Conventions, silence your own medical specialists and risk the long term health of your own troops, let alone the local populations when you could just use tungsten? It's a great question. Tungsten is dense.

Tungsten pierces modern armour. Why is depleted uranium the hill the military industrial complex is willing to die on? The answer lies in a hidden economic motive. It's always money.

Always. It is a grim, highly efficient synergy between the civilian nuclear energy industry and the global arms trade. It is the ultimate, darkest form of a recycling programme.

Honestly, yeah. If we connect this to the bigger picture, we have to look back at that enrichment process we discussed at the beginning. The leftover mountains of U-238.

Exactly. Globally, there is a staggering stockpile of nuclear waste. We are talking about over 1.5 million tonnes of depleted uranium sitting around in storage facilities.

How? Generated by decades of civilian nuclear power programmes and military weapons manufacturing. And it is highly regulated. You can't just throw 1.5 million tonnes of radioactive heavy metal into a municipal landfill.

No, you definitely can't. Finding a place to store this toxic material safely for millennia is an administrative and financial nightmare. I can imagine.

It costs governments and the nuclear industry billions of dollars to maintain these facilities. Furthermore, trying to build new, long-term geological repositories faces massive public resistance. Because nobody wants that near them.

No community wants a permanent nuclear waste dump constructed near their town. So basically, it's like having a basement completely packed with toxic trash that you legally cannot afford to safely dispose of. Yep.

But instead of paying billions for a hazardous waste team to build a secure vault, you strike a deal. You hand that waste over to an arms manufacturer. They mould it into millions of bullets and tank shells, and they shoot it into someone else's country under the banner of a military victory.

It is an astonishingly effective economic strategy. Handing this waste over to the military-industrial complex provides arms manufacturers with virtually free raw materials for their munitions. It's a win-win for them.

Exactly. It takes a massive, incredibly expensive financial liability for the nuclear industry and transforms it into a cheap, readily available military asset. By firing these munitions abroad, they are literally externalising their domestic waste problem.

They are exporting their radioactive trash to foreign battlefields. Yes. It completely reframes how you look at modern warfare.

I mean, we've covered incredible grain today. We started with the sheer, terrifying physics of adiabatic shear and a metal that burns itself through steel. We looked at the biological nightmare of microscopic alpha emitters permanently lodging into lung tissue.

We saw how international law is bypassed through semantic tricks and how billions of dollars are saved by simply shooting nuclear waste out of the barrel of a tank. It serves as a

profound case study in how geopolitical and technological decisions are made, especially when short-term tactical and economic advantages are weighed against long-term, invisible environmental harms. It shows us a terrifying blueprint for how modern technology solves a problem today by quietly passing the true cost onto our grandchildren.

It really does. And we want to leave you with a final, lingering thought to mull over, something that builds on the theme of habitability from today's deep dive. If our military technologies leave biological and geological footprints that last 4.5 billion years, what happens when the literal dust from a military victory permanently prevents the surviving population from rebuilding a functional, healthy society? In an era where the weapons of today poison the soil of tomorrow, does the concept of a true post-war peace even exist anymore? Or is the war just quietly continuing in the water, the soil, and the wind? The treaties might be signed, the troops might go home, but maybe that chessboard is never really cleared.

A sobering reality to consider. Thanks for joining us on this deep dive. We'll catch you next time.

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