Urine Testing for Depleted Uranium

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Introduction:
Some Soldiers returning from Southwest Asia have expressed concern that they have been exposed to high levels of depleted uranium (DU). DU and its potential health effects have been studied extensively since the Gulf War by many organizations, to include the National Research Council Institute of Medicine, the World Health Organization (WHO), the International Atomic Energy Agency, as well as the Department of Defense. This fact sheet briefly outlines some basic information about DU, and specifically about the medical test most often used to determine if a person has been exposed to DU.

What is Uranium?
Uranium is a weakly radioactive element that occurs naturally in the environment. Each of us ingests and inhales natural uranium every day from the natural uranium in our air, water, and soil. The amount varies depending upon the natural levels found in the area where you live, and the levels found in the areas where the food you eat and the water you drink are produced. Consequently, each of us has some level of uranium in our body, which is eliminated in the urine. The Centers for Disease Control and Prevention (CDC) has measured uranium levels in a sample of the United States population, so we know a range of amounts one would expect to see from normal daily activity. In areas where the natural uranium level in the soil or water is high, people will have higher levels. However, with respect to the radioactive properties of uranium, normal or background levels are not associated with any adverse health effects.

In addition to being a weakly radioactive element, uranium is a heavy metal. Like other heavy metals such as lead or cadmium, breathing air or eating food with high levels of uranium can have an adverse health effect particularly on the kidneys. These high levels of uranium, their chemical form, and how they reach the kidneys determine if there will be any adverse health effects on the kidney.

Enriched uranium (processed uranium that is more radioactive than natural uranium) is used in nuclear power reactors and very highly enriched uranium is used in some nuclear weapons. DU is a byproduct of that enrichment process, containing lower levels of radioactivity than natural uranium.

What is Depleted Uranium?
Depleted uranium (DU) is the uranium left over from the process of enriching uranium for nuclear power or weapons. In its natural form, uranium is only slightly radioactive. DU is 40% less radioactive than natural uranium (that is why it is called depleted), but the chemical or metal properties are the same as other forms of uranium. The United States Armed Forces uses DU because of its density and metallic properties. DU was first used by the U.S. military in the 1991 Gulf War, where it clearly demonstrated how well it protected our Soldiers' lives. Abrams Heavy Tanks reinforced with DU armor are better able to withstand antitank weapons, and therefore better protect Soldiers in combat. Antitank munitions made with DU are more effective at penetrating enemy armored vehicles than munitions made of other materials, such as tungsten, which can "mushroom" and become blunt on impact.

When is urine tested for DU?
As part of the post deployment evaluation, you are asked questions regarding your potential exposure to DU. If you were in or less than 50 meters from a vehicle struck by a DU round, fought fires involving DU munitions, or routinely entered DU-damaged vehicles as part of your job, we recommend that a screening evaluation be done for DU. This is because in those situations it is possible that you may have inhaled DU, or been wounded and retained a DU fragment as shrapnel (metal pieces). Soldiers from the first Gulf War who are known or thought to have been exposed to DU have been medically monitored by the Veterans Administration (VA) for more than a decade. To date, most of the Soldiers in this program who have DU in their urine were exposed through shrapnel wounds, as opposed to breathing in DU dusts. A few have no history of wounds, but were in or around DU-damaged vehicles. However, the amount of DU in their urine is very, very small. If you are not in the above categories and continue to be concerned, you can ask for the test to be conducted.

How does the test work?
You will be instructed to collect all of your urine for 24 hours. It is necessary to collect 24 hours worth of urine, because the amount of uranium that leaves in your urine varies during the day. After collecting a day's worth of urine, we can get an idea of how much uranium leaves the body over time. Some of the urine is then used to measure the total uranium level. This level measures any and all forms of uranium in the body (to include DU, if present.) This level is compared to the amount of uranium we would expect to see in people based just on diet and the general environment around them without any unusual or additional DU exposure. This is our screening process. If your urine contains more uranium than what is considered typical, it will be tested further to see if it is DU.

What does the screening level of uranium mean?
Based on the population sampling discussed in the first question, scientists know the average amount of uranium Americans have in their urine from eating and drinking. This range represents what is called "background" levels of uranium, and is considered normal. It is not associated with any known health effects. We also know that the kidney is the organ most sensitive to very high amounts of uranium, and we know the amount of uranium in urine that can damage the kidneys. Based on experience from the first Gulf War, the amount of DU in the urine of any deployed Soldier will most likely be many thousands of times less than the amount that would have any measurable effect on the kidney or its functioning. Soldiers from the first Gulf War with embedded DU shrapnel continue to be followed and do not show any measurable decline in kidney or reproductive functions. However, we have chosen to use the "normal background" level of uranium as our screening level since it is not associated with any known health effects.

What does it mean if my urine results show uranium at higher than background levels?
If your urine uranium is higher than the "normal background," further testing of your urine will be done to see how much of it is naturally occurring uranium and how much is DU. Even though these are very low amounts of uranium, DU does not occur naturally and lab tests can confirm whether the uranium is natural or man-made. If DU is found in your urine, you should not have any health effects based on what we know from those with embedded DU, and the extremely low levels we are measuring. However, as a precaution, you will be referred to the medical monitoring program (see final question).

Should I be concerned if you find depleted uranium?
Most likely not, but it depends on the amount. To date, the amount of uranium, depleted or not, measured in those individuals with embedded DU fragments is many, many times lower than a level which could harm your kidneys, a very sensitive organ. These individuals have been followed for more than a decade and have not shown any adverse health effects related to DU exposure. Therefore, we are confident that anyone whose urine shows minimal DU will not develop any related kidney problems. The potential risk of cancer from radiation is also extremely small, since DU is less radioactive than natural uranium.

What will happen next?
Your urine analysis result will be compared to "normal background" levels to see if it is significant in any way. A radiation dose due to the measured DU is also estimated. So far, we have not seen any levels that have any radiation health risk of concern at all.

Why do you refer to the VA Depleted Uranium Follow-up Program?
Since we were originally unsure about the health effects from an embedded DU fragment that was not removed, the Baltimore VA has and will continue to follow these soldiers from the first Gulf War very carefully. Some fragments could not be removed due to location or the damage that the surgery to remove them might cause. Although we have seen no health effects of concern, these soldiers with retained DU fragments continue to be followed very closely as a precaution. We do refer to the VA individuals who are identified as being exposed to DU and require additional medical assessment.

Where can I get more information about DU?

ATSDR Uranium Toxicological Profile and Public Health Statement http://www.atsdr.cdc.gov/toxprofiles/tp150.html

DU Library: Depleted Uranium Information Page
Deployment Health Support Directorate
http://www.deploymentlink.osd.mil/du_library/index.shtml

Deployment Health Clinical Center (DHCC)
Phone: 866-559-1627
http://www.pdhealth.mil/

US Army Center for Health Promotion and Preventive Medicine
http://chppm-www.apgea.army.mil
Phone: 800-222-9698

Department of Veterans Affairs
http://www.va.gov/gulfwar