War Related Illness & Injury Study Center
Office of Public Health
Department of Veterans Affairs

INFORMATION ON DEPLETED URANIUM (DU)

A Resource for Veterans, Service Members, and Their Families

What is Depleted Uranium?

Uranium is a metal that occurs naturally in the earth's crust and is found in air, water, soil, and food. We all have some microscopic amount of Uranium in our bodies. It is a weakly radioactive substance. Depleted Uranium (DU) is what is left over after Uranium is processed. DU has some of its radioactivity taken out during processing. DU is 40% *less* radioactive than natural uranium. The type of radiation given off by DU does not readily go through skin.

What are the sources of DU exposure for Service Members?

Because of its density and low cost, DU is used by the US military to make armor on tanks. DU is an excellent metal to use in armor to protect service men and women. It is also used to harden projectiles because DU munitions penetrate targets better. The first time DU was used by the US on a large scale was during the 1991 Persian Gulf War.

DU cannot cause harm as long as it stays out of the body. Just being in the area of tanks plated with or supplies made with DU will not result in exposure.

How does DU get into the body?

"Exposure" to a substance means that there must be a source and that it gets into the body. DU cannot cause harm as long as it stays out of, and doesn't interact with the body. Just being near items made of DU, including tanks shielded by or shells made with DU, will not result in exposure or pose a health risk. Even when DU munitions are fired close by, there is not a health threat as long as the metal stays out of the body.

Exposure to DU only occurs if it gets into the body via metal fragments that become embedded under the skin (shrapnel) or dust-like particles that are inhaled into the lungs or are swallowed.

Exposure to DU is the highest for service members who are near fires or explosions involving DU munitions or armor. When these fires are extremely hot, very fine DU particles can be created which can then be inhaled and taken into the body. Some of this fine DU dust may settle deep in the lungs and stay there for a long time. If shrapnel which contains DU enters the body, it could also remain in the body for an extended period of time.

What happens to the DU once it's in the body?

The very small DU particles breathed in (inhaled) may settle in the lung, while larger particles caught in the nose, throat, and upper respiratory track are then swallowed or coughed up. The DU shrapnel that enters the body through wounds or punctures may be taken out by surgery, or may need to stay in the body due to where it is found. This is a decision best made between an individual and their healthcare provider. DU that stays in the body is slowly absorbed into the blood stream, flows around the body, and is processed by the kidney. The DU then leaves the body through urine. The process of DU naturally leaving the body can occur for years. How long the DU stays in the body depends on where it is, the DU particle size, how much DU there is, and how easily it dissolves. While the DU taken into the body is moving through the body, some of the DU particles settle in other parts of the body and may remain in the bones, kidneys, and other soft tissues.

What are the possible health effects from DU exposure?

There are several theoretical concerns about whether there are any long term health effects if DU stays in the body. Some Veterans are concerned about health effects from DU's radioactivity. DU is not very radioactive. DU contains 40 percent less radioactivity than Uranium, which is already a weakly radioactive substance. The radioactivity of DU outside the body does not pose a health concern, including that of cancer. This has been studied by the World Health Organization, Department of Veterans Affairs (VA), Department of Defense (DoD), the United Kingdom Royal Society, and more recently, the Institute of Medicine (IOM) (See details in *References*, below).

Studies on uranium miners and processors (people with high exposure to uranium over a long period of time) have shown that the main health effect of high doses of uranium is on the kidneys. This is largely because uranium is a heavy metal and in this regards behaves similarly to other heavy metals. High doses of uranium cause kidney function to slowly become worse. The anticipated long term effect of high doses of DU is also on the kidneys. A person's kidney function can be tested easily by blood and urine tests.

The possibility of harmful health effects from exposure to DU is based on the amount of DU that stays in the body. The amount of DU that stays in the body is a result of the type and length of exposure. Very few service men and women are exposed to a large enough amount of DU or have enough DU left in their body to result in any health effects. All of those identified by the VA with elevated urinary DU have been victims of "friendly-fire incidents."

A 2008 study by the IOM included a review of over 1,000 recent research studies which examined exposure to DU and health effects (i.e. different types of cancer like renal cancer and non-malignant diseases such as neurological problems). The IOM report concluded that a large or frequent health effect is unlikely from exposure to DU. The report also emphasized that there is not enough research to state for sure that a particular health outcome can never occur.

The VA and the DoD established the Depleted Uranium Follow-Up Program at the Baltimore VA Medical Center to screen and monitor Veterans for health problems associated with exposure to DU. Since 1993, ongoing studies of Gulf War Veterans and Operation Iraq Freedom (OIF) Veterans who have elevated urinary Uranium and Veterans who had no exposure to DU have been underway. All of the Veterans with elevated urinary Uranium either have DU shrapnel or were victims of "friendly-fire incidents"; these are the high exposure group. After 18 years of follow up, the high exposure group has not had any health problems that can be linked to the DU, including cancer, birth defects and kidney problems, even though their measures of uranium on a urine test are elevated, as expected. Further, there were no clinically significant differences between those with high and low DU levels. All of the Veterans and service members identified with elevated DU have been victims of "friendly-fire incidents."

When should an individual be tested?

Current research shows that most service men and women who were exposed to DU are not likely to have harmful health effects. However, Veterans often wonder if they were exposed and how much exposure they may have had. In general, most services members have not had an exposure that would make DU testing clinically recommended.

It is still important to talk about any concerns you might have about exposure to DU with your primary care provider. He or she can discuss the type and length of your exposure to DU and the chance that you might still carry DU in your body. You can work as a team to see what steps to take next.

The easiest tests for health effects of DU exposure are simple blood and urine tests to evaluate your kidney function. Your provider may also refer you to see an Environmental Health Clinician to talk further about your deployment exposures and health concerns, or refer you to the War Related Illness and Injury Study Center (WRIISC) for an exposure consult. If after these discussions you are still concerned about your exposure to DU, you may request a test for DU, that is available from the VA at no charge to you.

What is the 'test' for DU and what does it show?

The test for DU is a 24-hour urine sample that will look at the total uranium that leaves the body in the urine. If the level is high, more tests on the same urine sample will look at how much of the total uranium is DU. The urine collection is sent to the Baltimore VA Medical Center, where the tests are actually performed. Results will show the level of DU in the urine compared to the normal range of DU excretion in the general public. It is important to know that the test does not look at kidney function. If the result is high you will need to talk to your doctor about whether or not follow up is needed.

If you are a Veteran with exposure concerns, contact the WRIISC nearest you to set up an in-person or phone evaluation by a physician who specializes in environmental health:

East Orange, NJ at 1-800-248-8005 Palo Alto, CA at 1-888-482-4376 Washington, DC at 1-800-722-8340

References:

- **War Related Illness and Injury Study Center**
  http://www.WarRelatedIllness.va.gov
- **Department of Defense's Depleted Uranium (DU) Library**
  http://fhp.osd.mil/du/
- **Deployment Health and Family Readiness Library**
  http://deploymenthealthlibrary.fhp.osd.mil/Product/RetrieveFile?prodId=18
- **Institute of Medicine**
  - **http://www.nap.edu/catalog.php?record_id=12183#toc**
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- McDiarmid MA, Engelhardt SM, Oliver M. "Urinary uranium concentrations in an enlarged Gulf War Veteran cohort." Health Phys 80; 270-273: 2001.
- McDiarmid MA, Squibb K, Engelhardt, et al. "Surveillance of depleted uranium exposed Gulf War Veterans: Health effects observed in an enlarged 'friendly fire' cohort." JOEM 2001;43(12):991-1000.
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This document was developed by the War Related Illness & Injury Study Center (WRIISC)
Office of Public Health (OPH)
Department of Veterans Affairs (VA)
Last Updated: December 2012.