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OPERATION IRAQI FREEDOM (OIF) MANAGEMENT OF DEPLETED URANIUM EXPOSURES

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Hello, I am Dr Craig Postlewaite, Senior Environmental Health Analyst for the Department of Defense Deployment Health Support Directorate. I am here to speak with you about the assessment and medical management of depleted uranium exposures acquired during Operation Iraqi Freedom and in support of the Post-Deployment Clinical Practice Guideline. I will cover the following topics during this presentation:

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- Background: what is DU, where do you find it, possible exposures, and potential health risks;
- OIF DU Medical Management Policy (Health Affairs Policy 03-012) and why it was issued;
- Specific policy requirements to include
  - the identification of possibly exposed personnel;
  - exposure assessments;
  - collection and processing of depleted uranium bioassays;
  - analysis of embedded fragments;
  - archiving of records,
  - case management, to include the referral of selected individuals to the VA DU Medical Follow-up Program; and
- Where to go for additional information and questions

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Depleted uranium or DU, as it commonly called, is derived from natural uranium. Natural uranium is ubiquitous in the environment. Virtually all of us have some naturally occurring uranium in our bodies due to small amounts of uranium present in much of the food and water we consume. DU is what remains of uranium ore after the more highly radioactive isotopes are removed when making uranium into nuclear weapons or nuclear fuel. DU is about 40% less radioactive than natural uranium.

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During the 1991 Gulf War, the US military used depleted uranium in combat weapons for the first time. DU is used in the manufacture of armor-piercing munitions capable of disabling enemy tanks and other weapons systems. It's high density and self-sharpening qualities make it better than other available materials for penetrating armor. The same properties make it ideal for use as armor on our Abrams tanks to provide added protection for its crews; DU armor, however, is not used on Bradley Fighting Vehicles. Most of our service members have little, if any, exposure to DU, especially to forms, which might be deposited internally in their bodies, in which case it could result in some concern. There are several battlefield scenarios, including friendly fire accidents, arising in the fog of war that may result in DU exposures to service members.

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First of all, DU that is not taken internally into the body presents virtually no health risk. For example, individuals who handle unexploded DU munitions or who work inside Abrams tanks that are equipped with DU armor are not at any significant risk from DU's low-levels of radioactivity or heavy metal toxicity. Similarly, even if DU remained in contact with skin for long periods of time, the external radiation dose

would not be great enough to produce any tissue damage other than some mild skin irritation resulting in some reddening of the skin.

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When DU projectiles penetrate armor, the projectiles self sharpen and produce small shards. The projectiles obviously can kill or wound the individuals in those vehicles, but the shards can also burst into flames resulting in small dust-like particles that can be inhaled and that can contaminate wounds. Rescue workers or others who enter contaminated vehicles could inhale or ingest these dust-like particles when transferred from hand to mouth.

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Getting back to internal deposition, there are some theoretical health risks that might be anticipated as a result of internal deposition of DU. Kidney damage resulting from DU's heavy metal toxicity is believed to be the most probable complication. The medical community, however, has yet to see any adverse health effects associated with internal exposure. Even among our 1991 Gulf War veterans who still have embedded DU fragments or who inhaled DU particulates, we still have not observed any medical problems associated with their DU exposures. Because we are not completely confident as to whether longer-term exposures might result in illness, a number of our most highly exposed veterans from the Gulf War continue to be monitored at the Veterans Affairs Medical Center in Baltimore, Maryland.

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To help identify those individuals, who may have had internal exposures to DU during Operation Iraqi Freedom, we have the benefit of a urine bioassay to verify whether internal DU exposure has occurred. This urine bioassay determines whether uranium is being excreted and the proportion, if any that is contributed by DU.

On May 30, 2003, Dr William Winkenwerder, Jr., Assistant Secretary of Defense for Health Affairs, issued Health Affairs Policy 03-012, "Policy for the Operation Iraqi Freedom Depleted Uranium (DU) Medical Management."

The policy addressed to the Services and to the Joint Staff includes detailed guidance on the use of DU urine bioassays for those who may have been internally exposed to DU in order to detect and quantify those exposures.

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This policy was issued for a number of reasons:

- To document any significant internal DU exposures through the use of biomonitoring,
- To quantify radiation dosages due to internalized DU,
- To identify individuals with embedded fragments or other significant exposures for possible referral to the VA's DU Medical Follow-up program, and finally
- To ensure that DoD's commitment to address the health concerns of our redeploying service members is fully satisfied.

The policy is tied in closely with the completion of the Post-Deployment Health Assessments, DD Form 2796, and use of the DoD/VA Post-Deployment Health Clinical Practice Guideline.

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Regarding policy requirements, the policy requires the Services to identify all OIF service members who may have had possible internal exposures to DU. One important means of identification is review by healthcare providers of the DD Form 2796 Post-Deployment Health Assessment Form to identify those who have concerns about possible DU exposures. The Services also are to review operational

information to identify events involving the use of DU munitions including friendly fire accidents, fires involving DU materials, or other activities that may have led to the inhalation or possible ingestion of DU by service members. The units involved and, subsequently, the specific individuals can then be identified.

Second, healthcare providers must perform qualitative DU exposure assessments, which include a review of the operational events that may have led to possible DU exposures, with those who are referred to them.

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Third, following the exposure assessment, healthcare providers will order urine DU bioassays, which I will say more about momentarily, for certain individuals with possible internal exposures.

Fourth, those with significant levels of DU exposure as shown by their urine bioassays will be offered referral to the VA DU Medical Follow-up Program so that their DU levels and long-term health can be closely monitored for changes.

Finally, healthcare providers must effectively communicate with both the individuals being evaluated and with their families throughout this process using health risk communication methods and principles. This will ensure that the steps being taken are clear and that there are no remaining questions pertaining to the bioassay or to the interpretation of the results. It is very important that these individuals and their families be provided sufficient time to have their concerns and questions addressed fully.

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As described in Health Affairs Policy 03-012, the DU exposure assessments determine the likelihood that individuals may have been exposed internally to DU. When referred to healthcare providers for an exposure assessment, healthcare providers along with the person referred will complete the DoD DU Exposure Questionnaire and the Health Survey, which are now available as DoD Test Forms. In the near future these two test forms will be overprinted on a single Standard Form SF-600. These forms can be downloaded from the DoD Deployment Health Clinical Center (DHCC) website, http://www.PDHealth.mil. The healthcare provider along with the individuals being evaluated will review the DU Exposure Questionnaire and any other supporting information. Individuals considered to be possibly exposed will be assigned to one of the three DU exposure categories, either level I, II, or III.

All individuals categorized as level I or level II exposures will receive urine DU bioassays. Urine DU bioassays are not required for those with level III exposures.

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Level I exposures are assigned to all individuals who were believed to be struck by DU munitions or DU armor fragments. In addition, it includes those who were in, on, or near, that is less than 50 meters from an armored vehicle at the time it was struck by munitions believed to contain DU and also to first responders who entered these vehicles to render aid to the crewmen.

Level II exposures include those, other than first responders, who routinely entered vehicles possibly containing DU residues to perform maintenance and recovery operations, intelligence operations, or battle-damage assessments. This exposure level also includes individuals whose occupation required them to fight fires involving DU containing materials.

Bioassays for level I and level II exposures should occur as soon as possible and preferably within 180 days of their most recent DU exposures in order to obtain the best possible measurements. However, if more than 180 days have elapsed since exposure, bioassays must still be accomplished.

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Level III exposures are those which are incidental in nature. Incidental DU exposures would not likely result in any significant uptake of DU into the body. Examples of level III exposures include infrequently and for short periods entering or climbing on or into battle-damaged vehicles or breathing smoke from fires involving DU materials. Bioassays are not required for this level unless a healthcare provider chooses to perform one based on medical indications or upon request from individuals possibly exposed in this manner.

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As I stated, all individuals with level I or level II DU exposures will undergo a bioassay. The Health Affairs Operation Iraqi Freedom DU Medical Management Policy outlines the procedures to follow for the collection and processing of urine samples for the analysis of DU. Additional information is available on the DHCC website. The specific requirements and timelines are as follows:

The purpose of the initial 24-hour urine specimen is to obtain data to estimate the total amount of soluble uranium internalized as well as the fraction, if any, contributed by DU. This initial urine collection must begin not earlier than 24 hours after exposure and, if possible, not later than 180 days after exposure. A complete 24-hour sample requires the collection of all urine excreted during that period. Urine collection should begin after the first morning void on the first day of collection and end after the first morning void the following day.

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For individuals still in theater and where the 24-hour collection may not be feasible, collect and process a 120-milliliter first void, spot urine sample; depending on the result, the laboratory may request that a 24-hour sample be taken at a later time. Should individuals present after 180 days post-exposure, proceed with the collection and analysis of this initial 24-hour urine sample, though it may be more difficult to accurately calculate an individuals total uranium exposure.

If collection of the initial 24-hour sample began between 24 and 48 hours after exposure and was completed as a full 24-hour collection, another 24-hour urine sample should be collected 7-10 days after exposure. A 7-10 day urine specimen is useful for monitoring the rate of uranium excretion and provides additional data to estimate the amount of insoluble uranium internalized. If collection of an initial sample began more than 48 hours following exposure, then skip the 7-10 day sample, unless it is needed for clinical management.

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Process urine specimens for total uranium analysis and also for DU isotopic analysis through laboratories with established analytical capabilities and quality assurance/quality control procedures that are approved by the Service Surgeons General. The laboratory should be contacted for shipping instructions. Each laboratory request for uranium analysis will include name, SSN, age, sex, height, and weight of the individual; dates of exposure; the date and the start and stop times of urine collection. The sample must be identified as an initial 24-hour, initial spot, 7-10 day sample, or a repeat sample.

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The request should specify that a urine total uranium and uranium isotopic analysis be run and that the results be normalized to urine creatinine result with results expresses as nanograms of uranium/gm of urine creatinine.

The request that results must be normalized to the volume of urine with results expressed as nanograms of uranium per liter of urine is also needed. A urine creatinine test must be requested on an aliquot of

urine taken from the entire sample. It is permissible for the collecting lab to do the urine creatinine test if they have the capability. If this is the case, those results must be forwarded along with the urine specimen. Isotopic analysis is the specific test used to identify the fraction of the urine uranium contributed by DU. Copies of the exposure assessment and health survey forms must accompany the urine samples.

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Send any embedded fragments removed from those injured by fragments to an appropriate laboratory for analysis of the metal composition and ensure the results are entered into the individual medical records. Analysis helps verify exposure to DU as well as to identify the composition of any other fragments that may pose a potential health risk. Providers should discourage the keeping of fragments or other souvenirs containing DU by the service members.

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Individual medical records should contain exposure assessment questionnaires, lab results, referral consults, and narrative summaries from follow-up care with copies of such documentation forwarded to the DoD Deployment Health Clinical Center for archiving. The Deployment Health Clinical Center is the central DoD archiving location for both active duty and reserve component for all patient information related to DU exposure, testing, and follow-up. DHCC will ensure these personnel receive any medical follow-up indicated. Service Labs and the Baltimore VA Medical Center will forward all DU-related medical documentation to DHCC for archiving following completion of DU-related health procedures.

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The Baltimore VA Medical Center has had an on-going long-term monitoring program for level I or level II exposed service members since 1993. DoD has arranged for the VA to offer enrollment of additional DoD service members with significant levels of DU exposure into their DU follow-up program. Those with level I exposures with retained DU fragments or other level I or level II exposures whose urine DU bioassays show significant exposures are to be offered referrals to the program.

The primary care manager or healthcare provider who receives the results indicating that DU is present in the urine and/or embedded DU fragments are present in the exposed individual must contact the Deployment Health Clinical Center to discuss the results and possible referral to the Baltimore VA Medical Center.

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If you have questions or need additional facts on the health-related aspects of DU or with the Operation Iraqi Freedom DU Medical Management Program, the Deployment Health Clinical Center's "PDHealth" website should be consulted. In addition, Service subject matter experts are available for consultation as well as experts at the Deployment Health Clinical Center. You can contact them by email, regular mail, or telephone using the contact information on this final slide.

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