



**A Review of**  
**Gulf War and Health: Updated Literature Review of Depleted Uranium**  
**Committee on Gulf War and Health: Updated Literature Review of Depleted**  
**Uranium, The Institute of Medicine, The National Academies Press, 2008**  
**(234 pages)**

[http://www.nap.edu/catalog.php?record\\_id=12183](http://www.nap.edu/catalog.php?record_id=12183)

This book is an update of the Institute of Medicine's 2000 publication, **Gulf War and Health, Volume I: Depleted Uranium, Pyridostigmine Bromide, Sarin, and Vaccines**. The U.S. Department of Veterans Affairs asked the Institute of Medicine (IOM) if they would bring this publication up to date. It is a thorough review of the literature on uranium and depleted uranium through December 2007.

**Gulf War and Health: Updated Literature Review of Depleted Uranium's** chief function is the review of human epidemiological studies of exposure to uranium and depleted uranium. Animal and cellular studies are given a secondary role partly because these studies "typically involve administration of high doses...in this case uranium that are generally greater than those received by humans".<sup>1</sup> Although drug companies do this when testing a new drug, it is still true that extrapolating the results of such studies to humans is difficult not only because of the dosage but also because of the differences between humans and laboratory animals.

Animal studies have shown that DU can cross the blood-brain barrier. A 2005 paper by Alexandra C. Miller et al. which demonstrated that mice exposed to DU can develop leukemia under certain circumstances was one of the research papers discussed.

A chapter on Methodology discusses different kinds of biases in epidemiological studies. These include the healthy worker or healthy warrior effect where the worker or soldier is selected partly because of his or her good health, and does not represent the general population where people are not all healthy. Exposure and dose may prove difficult or impossible to measure.<sup>2</sup> There may be more toxic substances in the work area than just uranium; researchers may not record smoking history. The follow up period must be long enough for the health outcome such as cancer to manifest. These problems and others existed in the epidemiological studies reviewed by the Committee.

---

<sup>1</sup> Committee on Gulf War and Health: Updated Literature Review of Depleted Uranium, **Gulf War and Health: Updated Literature Review of Depleted Uranium**, The Institute of Medicine, Washington, D.C.: National Academies Press, 2008. (Herein referred to as **Gulf War and Health**), p. 34.

<sup>2</sup> **Ibid**, p. 74.

There are chapters on exposure assessment and the diseases that DU exposure may potentially cause. Exposure can be internal or external and there are ways of assessing either type of exposure.

The Committee reviewed 66 human epidemiological studies. Twenty-four of these studies dealt with workers in uranium-processing plants. These studies were looked upon as helping to throw light on the long-term health effects of uranium. These studies basically had the best designs and methods of all the studies and were better in linking exposure to uranium with ill health or disease.

Eleven studies were of military personnel who had been exposed to DU while on active duty. Many of these studies lacked good exposure data or a non-exposed control group and/or were of small sample size so that findings from one study to another were inconsistent. The studies of Gulf War veterans exposed to DU, done by the Baltimore Veterans Affairs Medical Center fall into this category. The participants of these studies continued to excrete DU in their urine after 14 years from first exposure to DU; the studies look in part for statistical differences between a high urinary uranium group and a low urinary uranium group on different indices such as renal function. The cut off point between the two groups is 0.10 microgram per gram creatinine.

Another 11 studies were of people living near a uranium processing facility or ingesting uranium from well water with high concentrations of uranium in southern Finland – were considered by the Committee to represent the same type of exposure to DU that Gulf War soldiers had experienced when they entered a destroyed tank looking for souvenirs or encountered DU aerosol while standing downwind from a battlefield or a fire in which DU was burning.

Nine of the 24 studies of the uranium processor workers had statistically significant differences in health outcomes. In two studies, the health outcome was lung cancer. In two other studies, the disease was lymphopietic and hematopietic cancers.<sup>3</sup> Two studies found a statistically significant difference in deaths from all cancers. Three studies found respiratory diseases to be statistically significant. Other diseases or health conditions that were statistically significant in only one study included shortness of breath, brain cancer, and circulatory disease.

Among the 11 studies of military personnel, the health outcomes that were statistically significant in two studies were Hodgkin lymphoma (Italian soldiers) and bone cancer.

In the 11 studies of residents living near uranium processing facilities or drinking water with high concentrations of uranium in Finland, the following health outcomes achieved statistical significance: renal disease, cervical cancer, and colon and rectal cancer. Finnish men also showed increased bone turnover.

Other health outcomes varied in these and the other studies reviewed. Some had significantly lower rates of mortality than non-exposed populations or groups, due in

---

<sup>3</sup> Leukemia was excluded from the lymphopietic and hematopietic cancers in one of the studies.

some cases probably to the healthy worker or healthy warrior effect. In other cases, there were non-significant differences in health outcomes between the exposed and non-exposed groups.

A problem with these studies is that the aerosol created when a DU shell impacts a tank, is that the particles created at very high temperatures, of 3,000 degrees Centigrade or higher, are extremely small and some are nano-sized. This exposure may not be similar to the exposures of many of the participants in the studies reviewed by the Committee.

The last chapter deals with the Committee's conclusions about the association of uranium or DU exposure and specific diseases or health conditions. They also give priorities for further research. Overall, the Committee came to the conclusion that "there is inadequate/insufficient evidence to determine whether an association between uranium and" the various cancers and nonmalignant diseases "exist".

The Committee felt there was a high priority for additional research for the following health outcomes: lung cancer, nonmalignant renal disease, nonmalignant respiratory disease, nonmalignant neurologic effects and reproductive and developmental effects.

As for lymphomas, the Committee stated, "The risk of lymphoma is of particular interest because uranium is known to accumulate in lymph-node tissues." They felt more research in this area "may be warranted".<sup>4</sup> The committee also determined that although research on testicular cancer was not a high priority, that further research should be done in this case because it is a disease that "is of special interest in Gulf War veterans".<sup>5</sup>

Research in the following health conditions was considered as low priority: leukemia<sup>6</sup>, bone cancer, renal cancer, stomach cancer and prostatic cancer.

There are informative tables giving particulars about the different studies at the end of the last two chapters.

Overall, this is an interesting review of the literature on epidemiological studies on uranium and/or DU exposure. The book gives the reader the most recent information about the basics about these metals, the background of toxicological studies of animal and cellular studies and a review of human epidemiological studies.

ICBUW Science Team October 2008 Contact for this paper: Gretel Munroe: zgmunroe@earthlink.net

---

<sup>4</sup> **Gulf War and Health**, p. 174.

<sup>5</sup> **Ibid**, p. 178.

<sup>6</sup> It is unfortunate that the Committee gave leukemia a low priority for further research, with the reports of increased incidence of childhood leukemia coming out of Iraq since the mid-1990's. The latency period for leukemia is as short as two years, which was not mentioned in the section on leukemia in **Gulf War and Health**. Ionizing radiation is a recognized risk factor for leukemia and DU gives off ionizing radiation. The Committee stated that leukemia, like bone cancer, is a relatively rare cancer and requires adequate sample size. The studies where leukemia was a possible health outcome in **Gulf War and Health** were inconsistent (p. 175).