

ATTACHMENT 1 – Background on the Trinity Project

Background

The Trinity nuclear test was the culmination of the Manhattan Project that began in 1942 to develop an atomic bomb. The nuclear device that became known as Trinity was designed and fabricated at the Los Alamos Laboratory in northern New Mexico and tested in south-central New Mexico at the Alamogordo Bombing and Gunnery Range on July 16, 1945. Trinity was the first test of a nuclear fission device in the history of the world and resulted in the first nuclear explosion. The device served as a prototype for the Fat Man plutonium implosion device used one month later in the bombing of Nagasaki, Japan.

Investigators in the Radiation Epidemiology Branch (REB) of the Division of Cancer Epidemiology and Genetics (DCEG) have been involved for many years in the development of methods to estimate radiation doses and cancer risks from exposure to radioactive fallout from nuclear testing in the U.S. and at sites worldwide. In particular, Drs. Andre Bouville (retired) and Steve Simon (presently head of the REB Dosimetry Unit) have conducted considerable research in this area and have experience with dose assessment at multiple nuclear test sites worldwide (Beck, Anspaugh, Bouville, & Simon, 2006; Bouville et al., 2002; Gilbert, Land, & Simon, 2002; Land, Bouville, Apostoaei, & Simon, 2010; Land et al., 2015; Land et al., 2008; Simon & Bouville, 2002; Simon, Bouville, & Beck, 2004; Simon, Bouville, & Land, 2006; Simon, Bouville, Melo, Beck, & Weinstock, 2010).

The NCI published a now well-known two-volume report on exposure of the American people to the Nevada Test Site (NTS) fallout (National Cancer Institute, 1997). That report was reviewed by the National Academy of Sciences, Institute of Medicine (Institute of Medicine, 1999) and shortly afterwards, the NCI developed the first on-line web-based calculator so that members of the public alive during the years 1951-1962 could estimate their thyroid dose and thyroid cancer risk from exposure to the NTS fallout. Information on Iodine-131 from nuclear weapons testing fallout can be found on the NCI's website (<http://www.cancer.gov/cancertopics/causes/i131>) as well as the web-based calculator (<https://nts131.nci.nih.gov/>). Both have been the subject of substantial interest over the years since their creation.

Senator Jeff Bingaman (D, NM) of the Senate Committee on Energy and Natural Resources, requested the NCI in late-2007 to estimate the health risks to the New Mexico population from the Trinity nuclear test conducted in 1945. In response to this request, Drs. Bouville and Simon prepared a preliminary assessment of radiation doses to New Mexico residents and delivered a brief report to Congress in early 2008 (National Cancer Institute, 2008a, 2008b). The NCI dose assessment for Trinity, however, was never prepared for submission for publication in peer-reviewed literature because of the tenuous nature of many assumptions made in the assessment, particularly with respect to dietary patterns in 1945. While some modeling of Native American lifestyles and radiation doses from nuclear testing has been undertaken (Frohmborg, Goble, Sanchez, & Quigley, 2000), little information is available, in particular, about dietary patterns among tribal community members or Hispanics/Latinos in the southwestern U.S. in the 1940s. In the preliminary study, crude estimates of age-specific, county average doses were derived for the populations residing in the 19 New Mexico counties that were deemed to be most affected by radioactive fallout from the Trinity test site and in certain other locations in New Mexico

(Attachment 2). The dose estimates were provided for the thyroid gland and bone marrow, which are the target tissues for two sentinel malignancies associated with fallout radiation exposure: thyroid cancer and leukemia, respectively. The estimated thyroid doses mainly accounted for the consumption of dairy products (primarily fresh milk) contaminated with Iodine-131 from the fallout (resulting in *internal dose*) and dose to the bone-marrow that arose from the decay of radioactive fallout on the ground (resulting in *external dose*). The crude assumptions that were made regarding the dietary and lifestyle habits of the populations of New Mexico were more relevant to the white population than to the Hispanic or to the Native American populations.

Since the preparation of the NCI's report to Congress, REB investigators have substantially improved their dose assessment methodology. These methods have been used for a risk projection study of persons exposed to radioactive fallout in the Marshall Islands (Kleinhans, 2010) and an epidemiologic study for persons exposed to radioactive fallout in Kazakhstan near the Semipalatinsk nuclear test site used by the Soviet Union (Drozdovitch et al., 2011; Land et al., 2008; Schwerin et al., 2010). In order to comprehensively apply these improved dose assessment methods to the Trinity test, the acquisition of appropriate lifestyle and dietary input data for the populations in New Mexico is required. In particular, information is needed about the lifestyles and diets of tribal community members and Hispanic populations for which no special assumptions were made in the preliminary 2008 assessment.