

ATTACHMENT 11 - Summary of Findings from the Literature Review of Native American and Hispanic Diets in New Mexico in the 1940s

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Introduction

Trinity was the first test of a nuclear device to develop a deployable atomic bomb and was detonated on July 16, 1945 35 miles (56 km) southeast of Socorro, New Mexico (NM), at the new White Sands Proving Ground, which incorporated the Alamogordo Bombing and Gunnery Range. The communities living in and around the test site received no advanced notice about the test (personal communication from representatives of Las Mujeres Hablan, September 2013). Community leaders in New Mexico assert that the area surrounding the test site was populated (ibid). In 2008, experts at the National Cancer Institute (NCI) prepared a preliminary set of radiation dose estimates from exposure to radioactive fallout from the Trinity test for the population of NM as described in the 1940 census. The NCI dose estimates were primarily based on data on exposure rates that were measured immediately after the test and that are now publically available in published reports. The NCI's initial dose estimates were never published in the peer-reviewed scientific literature because of incomplete information regarding internal radiation doses from foods and some lifestyle factors. Mainly, researchers lacked information on dietary and lifestyle habits of Native Americans^[1] and Hispanic^[2] groups living in New Mexico at the time of the test. These variables are important, as contaminated food products, particularly dairy foods, may have been a source of internal radiation exposure from fallout from Trinity.

Over the past year, a literature search was conducted focusing on dietary patterns of Native American and Hispanic groups living in New Mexico in the 1940s to assess possible dietary exposure to internal radiation after the detonation of the Trinity device. The main focus was on foods consumed that would potentially contain radioactive iodine though the findings are also relevant to the other 60 radionuclides that will be estimated in the Trinity Study. The findings from this literature review were used to inform the development of a guide for key informant interviews. The guide was used as the basis to interview four Native Americans and five Hispanic elders who were alive at the time of the test. These in-depth interviews ascertained typical diets and provided data that could be compared with the information obtained in the literature review. Later, assuming that the NCI can locate additional elders in New Mexico from the Native American and Hispanic communities, the NCI plans to conduct focus group interviews for the purpose of quantifying the consumption rates of the important foods that both the literature review and key informant guides have identified. The amount of each food consumed will be used in the estimation of radiation doses to all age groups and ethnic groups in New Mexico. Based on this work, NCI investigators plan to refine their original dose estimates, using information collected on diet and lifestyle that was not available earlier and from those calculated doses, estimate the number of cancers to have been caused in New Mexico from exposure to Trinity fallout.

^[1] For the purpose of this review, we are using the term Native American to refer to the group of 12 indigenous southwest tribes for which literature were available.

^[2]^[2] The terms Hispanic, Spanish, Spanish-American, Mexican, Mexican-American, Latino and Chicano were used interchangeably throughout the literature. For the purposes of this review, we have chosen to refer to the group collectively as Hispanic.

Methods for Literature Review:

NIH Librarians assisted in the literature search after consultation with our Trinity team. After speaking to experts in the field, search terms became more focused so that specific sources of exposure could be better understood. The best results were obtained by searching full text sources, tracing cited references, and then reading and analyzing retrieved items for relevance. The literature search resulted in an in-depth review of 28 sources, which covered dietary practices for 12 different Native American tribes and pueblos, including the Navajo, Apache, Santa Ana Pueblo (traditional name: Tamaya), Zuni Pueblo (traditional name: Shewena), San Juan Pueblo, Santa Clara Pueblo (traditional name: Kha'p'oo Owinge), Taos Pueblo (traditional name: Tuah-Tah), Zia Pueblo, Jemez Pueblo (traditional name: Walatowa), Laguna Pueblo (traditional name: Ka'waika), and Cochiti Pueblo (traditional name: Kotyit), and several Hispanic communities in northern New Mexico and southern Colorado. Although the NIH librarians conducted a comprehensive search of available literature, limited dietary information was available for Native American and Hispanic groups living in New Mexico in the 1940s. While it is understood that diet among Native American and Hispanic communities would vary, the literature review could not distinguish the unique dietary habits among the different groups. The information from this review will be used to provide a foundational understanding of common regional practices and will be used to develop the talking points for the key informant guide. The interviews will augment, confirm and clarify the information obtained through the literature review.

While studying the literature for each tribe, pueblo or Hispanic community, the focus was on six main food groups with relevance to exposure to iodine and other fallout radionuclides: large animals, small animals, plants, fruits, dairy foods, and drinking water. Some identified behaviors specific to New Mexico pueblos did not fit in these pre-determined categories so four other categories were added: Animal Diet, Medicine, Ritual Foods and Other Sources. The team reviewers listed the types of food, the preparation, the frequency of consumption and where possible, the specific amounts (e.g., grams and tablespoons). Once all sources and the list of foods were reviewed, the foods were classified by three levels of potential exposure: high, medium and low. The results of this report are based on existing literature, and that may not reflect actual dietary practices from that time, thus supporting the need for further interviews with people from the area.

Summary of Findings and Questions

Typical Diet

According to literature reviewed, it appears that the typical meals consumed by Native American and Hispanic groups in the 1940s consisted of meat (typically cooked into a stew), bread (made from wheat and/or corn), lard, beans, small amounts of vegetables, coffee and sugar. By 1940, most of these foods were apparently purchased rather than grown or foraged. Typically, three meals were eaten per day and each family ate together. The Hispanic diet appears similar to the Native American diets except that Hispanics consumed more dairy products and chile. It was anticipated that one important route of exposure to Native Americans would have been through consumption of the thyroid glands of animals and for Hispanics, through consumption of dairy products. It was not possible to verify these *a priori* hypotheses through the literature review.

The in-depth interviews and focus groups will address these and other issues raised in the literature review.

- Consumption of wild small animals, fish and poultry appears to have been “low” among the groups studied, with the possible exception of rabbits among some Native Americans, including the Taos, Santa Ana, Santa Clara, Zia, Apache and Navajo.
 - Further inquiry is needed to determine if a communal rabbit hunt (among Native American tribes and pueblos) or a matanza – roast pig feast (among Hispanics) would have taken place in mid-July in the mid-1940s.
- Sheep, goat and pig consumption were found to be “medium to high frequency”, especially among the Zia and Zuni.
- Even though the consumption of leafy greens appears to have been low on average, leafy greens can be a source of radiation exposure if their collection and consumption were high at the time of the Trinity test. The field team needs to establish in future interviews:
 - The frequency and amount of leafy greens, especially wild spinach and other wild plants, at the time of Trinity.
 - Which leafy greens were consumed by the Hispanics, where and when chile peppers were harvested and processed, as chiles were prominent in the sauces accompanying many meals.
- The leafy plants used for tea could be potential sources of radionuclide intake (as they grow, and hang to dry) so their preparation and quantity consumed should be assessed through the key informant interviews.
- Fruit consumption was classified as “low to medium frequency” among all groups.
 - The fruit hung to dry may have collected fallout
 - Seasonal fruit, such as berries, wild plum (among San Juan pueblo), and prickly pear (among the Apache), may have been consumed in high frequencies at the time of Trinity. The guide should help determine if prickly pear and other similar fruit were peeled prior to consumption.
 - The key informant guide should also seek to determine which fruits were consumed by Hispanics, and if locally grown plums were consumed during Trinity.
- The source and storage of water are important since it would have been consumed in coffee and used in cooking.
 - It is unclear if the acequias (water system) are a potential exposure pathway; the key informant interviews should seek this information.
- Large animal meat was classified as “high frequency” among Native American tribes and pueblos, and “low to medium frequency” among Hispanics.
 - Since organ meat was often consumed soon after the animal killing, meat from these animals may be a potential source of radionuclide intake. Mutton could be a source of radionuclide intake as various radionuclides can be collected in the animals’ thyroid gland, muscle, and bones. Although bone was probably not directly ingested, it was an ingredient in all of the stews. The same applies for the bones from the other large animals consumed, such as deer, bison and antelope.

- Further inquiry is needed to determine if sheep would have been slaughtered and consumed in mid-July when the Santa Ana Feast Day and other mid-summer Feast Days are reported to have taken place.
 - Another potential source of radionuclide intake could come from meat hung up to air dry and contaminated by fallout, further inquiry would also be needed.
- Among the various Native American tribes and pueblos milk consumption is classified as “low to medium frequency,” and is age dependent.
 - Native American adults were probably exposed to a low degree from this source since there is little documentation that of Native American tribes or pueblos consumed large volumes of milk. In one description of Zuni living, the milk added to the frequent coffees was canned, condensed milk and purchased from the trading post.
 - Children under 2 years of age may have been exposed to radionuclides through breast feeding and consumption of animal milk, which may include cow, goat, and sheep.
 - Consumption of milk from various sources, age dependency and prevalence of lactose intolerance need to be confirmed by interviews.
- Some Hispanic communities consumed milk and dairy products; however milk consumption and age dependency among specific Hispanic groups need to be confirmed by interviews because there are conflicting accounts in the literature.
- For many of the Native American tribes and pueblos, plant and crop consumption is classified as “low frequency” with the exception of wheat and corn, which was consumed with “high frequency” among the Navajo, Santa Ana, Zuni, San Juan, Santa Clara, Zia, Jemez, Pecos, and Apache.
 - Assess how much of the wheat consumed was grown and processed locally to determine if this would be a potential source of exposure.
- For the Hispanic groups, plant and crop consumption was classified as “medium to high frequency” depending on the plant or crop. In addition, the non-vegetable plant consumption (e.g., teas) was classified as “low.”
- Medicinal teas were consumed but the amount of plants used in teas deems consumption as "low frequency" among Native Americans and Hispanics. Key informants could be asked if there were specific home remedies or medicinal teas consumed during the summer months.
- Key informants should be asked about the growing and gathering of tobacco, and the digging and uses of clay.
 - The consumption of clay is important but most likely a low source of exposure. The key informant interview should gather information on clay consumption as there may be consumption by particular groups and the extent of usage in cooking is unclear.
 - Smoking and cooking of plants (tobacco, green husks of corn) was classified as a potentially “low” exposure.

Cultural Factors:

- Various festivals, such as The Feast Day of Santa Ana celebrated on July 26th, may have activities of importance for radiation exposure. The descriptions suggest that preparations for the festivals began several weeks before the day, possibly including the time of the Trinity detonation.
 - The festivals were important to each Pueblo as well as the surrounding Pueblos who traveled to join in the festivities.
 - Asking participants to remember such festival times, may help them recall the specific time of year
 - Other Feast Days celebrated with festivals took place between late June and early July. St. Bonaventure or San Buenaventura Day, like other Feasts Days, featured special consumption patterns such as eating small mammals.
 - There are specific accounts of Native American men going to mountainous areas to gather spruce and other wild plants for the festivities. It is important to obtain details of these Feast Days, particularly including the food preparation directly before and after the activities. We recognize that discussion of information related to ceremonial activities is private and sharing of this information is at the discretion of the participants.
 - The key informant guide should also ask whether the Hispanics also participated in the same or similar summer festivals or Feast Days.
- Between the 1920s and 1960s, the US Forest Service introduced grazing regulations
 - Reductions in livestock numbers may have impacted consumption of medium and large animals in the 1940s.
 - The grazing patterns of animals should be established by key informants and focus groups to determine whether animals grazed in areas of the fall out.
 - It would be helpful to discuss with key informants the butchering and sharing of animal meat from communal herds during this time
- Trading Posts
 - In reading an ethnographic account of a Zuni mother preparing the family meal, many of the ingredients were purchased from nearby trading posts.
 - The source of foods sold in trading post needs to be established to determine if the food was locally sourced or sourced from an area within the fallout.
 - It is unclear if Hispanics were also associated with either selling or buying food from the trading posts.
- Food preparation
 - The preparation of meat dishes among Native American often involved many parts of the animal being cooked into a stew. More details about how meat was butchered and prepared will be queried through key informants and focus groups.
 - Ovens were located outdoors and also sealed and cleaned with natural substances such as clay and spruce. Food and water storage areas were also outdoors and so the locale of these storage areas should be determined.

Conclusion

The review of literature resulted in a long list of foods likely to have been consumed in the 1940s. Ethnographic details helped contextualize the food preparation and consumption patterns. The foods were rated into what appeared to be high, medium and low categories of consumption, and importance in the overall diet, but the reviewed literature could not adequately assess the amounts of each food consumed. The focus was on general dietary patterns but also noted discrepancies in trends that may be particularly relevant to certain Native American and Hispanic groups during the time of year that Trinity took place. It was not possible to ascertain specific information about many aspects of food consumption based on the literature review. For example, it was not clear if particular organs (i.e., thyroid gland) were given to certain family members or if the organ meat was handled differently than other parts of the animals. In addition, information was available on only some of the Native American populations and further detail is needed about unique and common aspects of population groups.

Questions raised from the literature review have been added to the Key Informant Guide. The next steps are to compare the findings from this literature review with academic experts and responses from four Native American and five Hispanic key informants. Later, focus groups can verify these dietary practices and quantify the consumption of the important foods that both the literature review and key informant guides have identified. These data will be used to estimate radiation doses to selected organs for typical persons alive at the time of the test in all ethnic groups in New Mexico and subsequently used to estimate the number of cancers that might have been caused by exposure to radioactive fallout from the Trinity test.

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