A brief history of the UT-AEC Agricultural Research Laboratory - Conclusion

(As published in The Oak Ridger's Historically Speaking column on December 8, 2009)

By the 1960's the UT-AEC Agricultural Research Laboratory employed a permanent staff upward of 160 individuals. Additionally, there were a number of visiting investigators and graduate students. Summer students from various universities who were earning their undergraduate degrees found the laboratory to be a most unusual summer job. Not only did they get to learn about farming, they were also involved in cutting edge research with plants and animals.

The internal organization of the laboratory was complicated as the director of the Tennessee Agricultural Experiment Station nearby was the project leader and reports to the USAEC for the university. The laboratory director who is in charge of the day to day operation of the laboratory reported to the project leader.

The plant and animal caretakers were assigned to the operations organization rather than to specific research areas. So, the laboratory was turning into a farm operation that also did experiments. This may well have been the reason for the laboratory's ultimate demise.

The AEC did not want to subsidize these "East Tennessee farmers." Joe Lenhard got caught up in this controversy and ultimately had to orchestrate the transfer of the program as directed by AEC headquarters. Joe was directed to seek another organization in Oak Ridge who would focus on scientific research and not farmers focusing on improving agriculture through radiation experiments.

During the height of experimentation and before falling out of favor with AEC headquarters, the UT-AEC Agricultural Research Laboratory did several major surgeries on animals and gained much valuable knowledge. Imagine the facilities required for safe and successful major surgery on full grown cattle, well, the laboratory built the needed operating facilities from scratch. The procedures became routine for the staff.

One cow had her kidney transplanted from the normal location to the neck of her twin. A kidney from the twin was transplanted from the normal location to the neck of the other cow. This may well have been the first such transplant between twin animals and was done in conjunction with the University of Wisconsin, one of the nation's most effective transplant locations today with over 6,200 kidney transplants to date.

Just think, the UT-AEC ARL may well have been the springboard that helped this tremendous transplant center learn about tissue rejection and how to prevent it. You see, these twin cows had earlier been the subject of 10 skin grafts from one twin to the other that by the time the kidney transplants were performed had remained intact for two years and were still being retained without the use of immune depressants.

There were many experiments conducted to help learn the extent of radiation damage to expect should a nuclear weapon be exploded and people be exposed to radiation and fallout. The Cold War produced great fear and such laboratory experiments were seen as the only way to prepare for the potential exposure that might occur with a nuclear strike.

Such experiments as donkeys irradiated at an early age being fed controlled rations varying only in the level of protein to check the effect of dietary variation on long term radiation responses. Ponies were trained to perform certain tasks and then exposed to radiation to determine the reduced efficiency when compared to controlled animals that were not irradiated.

Studies of the adverse effect of radiation exposure on reproduction were conducted on cows that were given substantial doses of radiation exposure and then monitored to see the ill effects on reproduction. The calves were also monitored to see if any abnormalities might be passed on to the offspring.

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Experiments determined that radiation was quite detrimental to the developing embryo. Through extensive research and repeated experiments the scientists at the laboratory could even determine which embryonic systems were most susceptible to damage during specific periods of development.

Rats were also used for experiments. A higher incidence of mammary tumors was found in rats injected with radioactive material in the form of blood plasma from lethally irradiated sheep.

Eggs were used for experiments as well. A photograph in a1966 status report on the laboratory shows the difference between a chicken hatched from an egg injected with 50 microcuries of radioactive iodine on the 14th day of incubation and a control egg. The irradiated egg produced a chicken that still looked like a baby chick at 10 weeks while the control egg produced a normal chicken looking full grown.

Not all the experiments performed on the animals used radioactive materials. Experiments on swine showed that a deficiency in zinc produced a severe skin disorder that was corrected in the same swine after nine weeks on the same ration supplemented with zinc.

By exposing selected animals to radiation and then measuring the zinc levels in the hair of the exposed skin it was determined that zinc levels increased where the body attempted to repair damage caused by radiation exposure. Maybe the same process works regardless of the cause of the damage to the body.

In the area of plants and soils, experiments determined the means by which fission products move through soils to plant roots. Other experiments on seeds determined the extent radiation exposure resulted in variations of plant size and development. Some irradiated seeds were used to compare the relative damage from fast neutrons versus gamma rays.

The Health Physic Research Reactor at the Oak Ridge National Laboratory was used in experiments with flowering plants to determine the extent of damage from various levels of radiation. The plants were spaced at intervals of predetermined distance from the source of radiation to control the amount of exposure to each plant.

Donkeys were also used for various radiation experiments. One of the donkeys from the laboratory was brought to Y-12 after the June 16, 1958 radiation accident and was exposed to radiation from a controlled radiation source that replicated the exposure received by the men working in the area. The initial estimates of radiation dose had originally been estimated to be exceedingly high. The levels were within the lethal range, so there was much concern for the lives of those individuals exposed to the accident.

However, within three days following the accident, a donkey from the UT-AEC Animal Research Laboratory was exposed to a mock-up experiment at the same location and the sodium activation in its blood used as a basis for comparison with the measurements of sodium activation in the blood of the exposed workers. From this experiment, refinements to the original estimates were made and the resulting dose estimates were made available to the doctors that were determined to be highly accurate.

This approach relieved the exposed workers and their families regarding the potential damage to expect from the accidental exposure. This is but one example of the significance of the experiments done at the laboratory.

As I close this series on the Comparative Animal Research Laboratory originally known as the UT-AEC Animal Research Laboratory, I find that what I have learned has helped me to appreciate the early experimental work done to set the base knowledge for radiation exposure damage to human tissue through the use of animals. The story of this unique laboratory is one of an unusual situation that was

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thrust upon a handful of courageous people who took the opportunities to learn as much as possible from the animals to benefit mankind.

The experiments conducted on animals at the laboratory would not likely be acceptable under today's standards. However, it was the best and most accurate way known at the time to determine how to deal with the hazards of working around and living with the radically new and powerful source of energy that was introduced to the world on July 16, 1945.

Because of the work done here in Oak Ridge at this small laboratory, much as other scientific studies and results that have continued to be produced over the years, the UT-AEC ARL/CARL has left a legacy of research results that remain some of the most important work accomplished in those early years. Anyone who worked there should feel a sense of pride in accomplishment under most unusual circumstances.

My thanks go to Joe Lenhard for his enormous help in bringing this story to light. I also appreciate the insights gained through the help of Bob Reynolds and Pete Walburg.

This burro was exposed to radiation with his head and shoulders shielded

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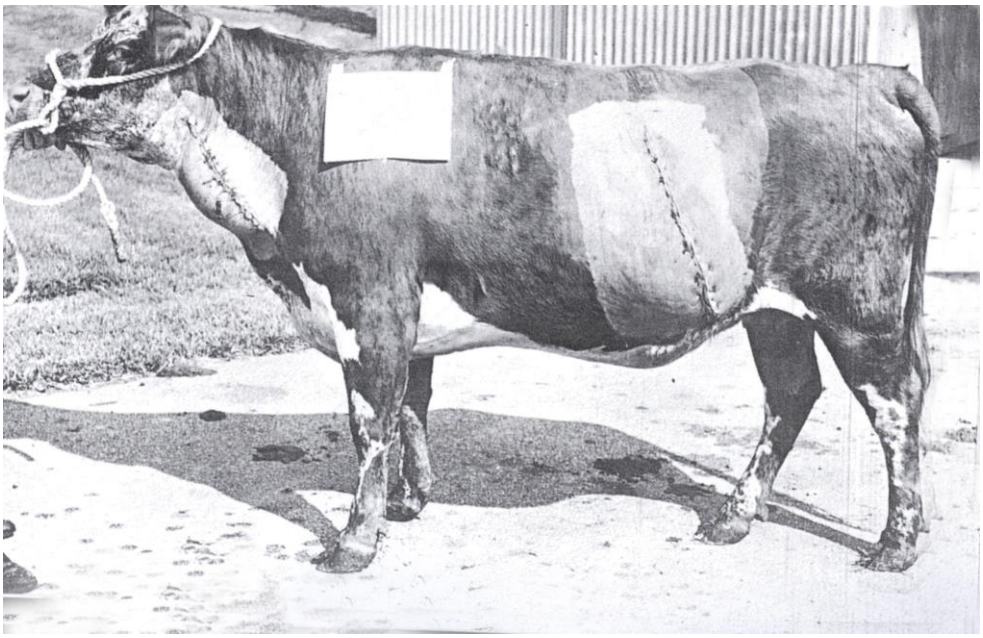
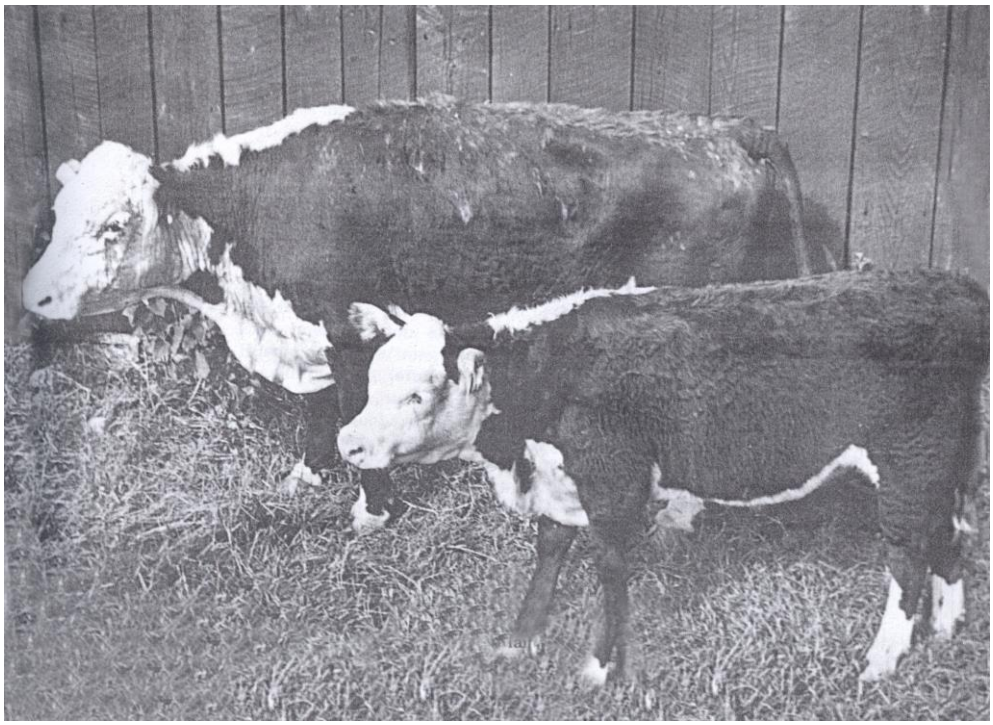


This cow, a kidney transplant experiment, had her kidney removed and relocated to her neck for easier monitoring



Alamogordo cow No. 52, the last survivor of the famous herd was photographed with her 16th consecutive calf and that photograph published in the report of 1966.