Fact Sheet:
University of Cincinnati Research
Conducted By Dr. Eugene Saenger
(1960 - 1972)

Background:
During the 1950s and 1960s the Department of Defense (DoD) needed sought information on the biological, statistical and clinical features of radiation injury. U.S. military field commanders wanted to predict the hospitalization requirements of exposed military personnel and to estimate the decrement in work capacity after radiation exposure on a nuclear battlefield. Moreover, civil defense authorities needed a plan to combat the effects of potential nuclear explosions on the civilian population. The University of Cincinnati Medical College (UCCM) was one of several institutions charged with providing this information to the DoD.

The results of the unclassified research conducted at UCCM provided more suitable methods of diagnosis, prognosis, prophylaxis and treatment of radiation effects on a nuclear battlefield. Due to the project's unclassified status, the literature and results were available to civilian and military communities alike. DoD funds were used for laboratory studies and psychological tests of cancer patients who had received whole and partial body irradiation as part of the treatment for their disease. The DoD did not participate in patient selection, choice of treatment, nor fund any direct patient care.

Contracts:
September 1958:
Dr. Eugene Saenger, Department of Radiology, University of Cincinnati College of Medicine, as principle investigator, submitted an unsolicited research application to the Research and Development Division of the Army Surgeon General's Office.

Over the next year and a half at least five Army Medical Corps officers reviewed the proposal and recommended approval of the contract application.

October 1959:
The Defense Atomic Support Agency (DASA) began negotiating a contract with the University of Cincinnati for the study of the metabolic changes in humans following total body irradiation.

1 January 1960:
DASA and the University of Cincinnati Board of Directors executed contract DA-49-146-XZ-029. The contract allocated $25,085 for the first year and $21,000 for the two subsequent years. This contract, with supplements and modifications, funded the study through February 1964.

1 June 1964:
The second DASA/UCCM contract was executed. Contract DA-49-XZ-315 allocated $40,000 and provided funding increases in subsequent modifications. This contract carried the research until April 1969.

15 June 1969:
DASA and the University of Cincinnati entered into the third and final contract. DASA-01-69-C-0131 allocated $71,369 and increased the funding through contract modifications. This contract funded the research until March 1972.

March 1972:
The University of Cincinnati refused DoD's offer for additional contract funding. Through 1971, DoD funded $651,482.79 on research by UCCM.

Research Goals:
Dr. Saenger proposed, and was initially contracted, to research metabolic changes in humans following total body irradiation. The purpose was to determine whether the presence of amino aciduria would provide a reliable biological marker of radiation exposure (i.e., develop a simple urine test to detect how much radiation an individual had received). Over the twelve years of research, changes were made to the wording of these aims, and the techniques used to conduct the research were modified.

By 1971 the aims of project were stated differently. The use of radiation became characterized as "therapeutic" and for the palliation of certain cancers.

By the final report the aims were stated as: "The purpose of these investigations has been to improve the treatment and general clinical management and if possible the length of survival of patients with advanced cancer. Systemic effects of radiation therapy have been given particular attention in our work."

Patient Selection:
A total of 82 patients from Cincinnati General Hospital participated in this project. Patient selection criteria required that only individuals with proven metastatic or far advanced cancer be selected for the studies. In addition, subjects had to be in relatively good nutritional status and in most cases, have normal hematological values. These criteria remained relatively constant throughout the twelve years; however, the researchers eventually sought patients who had not undergone previous radiation or chemotherapy, had normal renal function and solid neoplasms that were not radiosensitive and were without lymphoma or bronchogenic carcinoma. Fifty-one (62%) of the patients treated in this study were African-American. Most of the patients treated were indigent, and some of the patients had relatively low intelligence quotients. This distribution reportedly reflected the patient population of the Cincinnati General Hospital.

Informed Consent:
The procedures for informed consent followed by Dr. Saenger reflected the evolution of informed consent characteristic of the University of Cincinnati and the nation. As the idea of informed consent developed nationally in the 1960s from informal, oral, and non-specific to formal, written, and more detailed, Dr. Saenger updated the procedures for informed consent to meet the more stringent levels required for good medical research.

Dose:
Radiation was delivered by a Cobalt 60 Teletherapy Unit and doses ranged from as low as 16 rads in the first year of research to as high as 300 rads in the later years. Delivery of the higher radiation doses caused subjects to experience hematological difficulties. Infusion of bone marrow earlier in the post-irradiation period was hoped to prevent the hematological depression associated with higher doses of radiation. Researchers in this project proposed establishing facilities for the withdrawal, storage, and reinfusion of bone marrow in May of 1963. By April of 1966, a filtration system for the reinfusion of human bone marrow was completed, and by April of 1969 success in analogous marrow infusion had been attained.

Psychological Studies:
Psychological studies of the patients in Dr. Saenger's project began in 1965. The broad objective was to determine the effect of radiation exposure on emotional and intellectual functioning. The testing protocol was designed to take into account the many complex variables which may influence the measurement of cognitive and emotional functioning after radiation treatment. Tests utilized include: Reitan Trials Test, Cattell's 16 Personality Factor Test, Wechsler Depression Rating Scale, Wechsler Adult Intelligence Scale, and the five minute verbal content test of Gottschalk and Gleser. The researchers found that there was evidence of a rise in cognitive malfunctioning immediately after radiation. This effect was transient and decreased markedly within three days. Those with higher levels of basic intelligence responded with less dysfunction than those with basic intellectual deficits.

Research Results:
Whole and partial body radiation therapy showed beneficial effects in controlling certain advanced cancers. The palliative effects compared favorably with results using anti-cancer drugs or chemotherapy. The use of autologous marrow reinfusion immediately after radiation therapy minimized the characteristic marrow depression associated with higher doses of radiation. The degree of illness following infusion was greatly lessened and hospitalization greatly shortened. However, an equal degree of success was not achieved in the search for the biological marker for radiation exposure. By 1963, the researchers concluded that the elevation of amino acids in urine was non-specific and not solely characteristic of irradiation. The researchers then began to investigate breakdown products of deoxyribonucleic acid (DNA). One such product that showed elevated levels after irradiation was deoxycytidine. However, the presence of elevated levels of deoxycytidine in urine could have been caused by radiation or from other sources such as burns. At the time the research was discontinued in 1972, the researchers were attempting to develop a means to differentiate between deoxycytidine created by irradiation and deoxycytidine created by other sources.

Review Processes:

Throughout the UCCM project the research was reviewed by the University of Cincinnati and DoD contract officers. In addition to these reviews, the UCCM project came under intense scrutiny from the following organizations.

GAO: October 1971 - The Government Accounting Office (GAO) began an investigation of the UCCM project at the request of Senator Edward Kennedy. The August 1972 summary of the GAO investigation report in the *Congressional Record* reviewed DoD policy on human experimentation policies and procedures and stated that the UCCM contract did not cover the cost of radiation treatment and patient care. Additionally, DoD funds only paid for supplementary laboratory analyses of patients who had received whole-body irradiation in order for the DoD to gain information for national defense.

ACR: November 1971 - Senator Mike Gravel requested the American College of Radiology (ACR) to evaluate the UCCM project. In January 1972 the ACR responded to Senator Gravel's request. The ACR report concluded that the UCCM project was validly conceived, stated, executed, controlled and followed up.

UCCM Ad Hoc Committee: November 1971 - Dean Clifford Grulee of UCCM appointed an Ad Hoc Committee to review the project. The report indicated that there was no evidence that DASA funding was made contingent on work, ideas or suggestions proposed by DASA and that all information reported to DASA was kept unclassified and publicly available. According to the report, the work was carried out by the university researchers with complete scientific freedom.

UCCM Junior Faculty Report: January 1972 - Three members of the UCCM Junior Faculty Association released "A Report to the Campus Community." In the report, they addressed three questions: was cancer study the main object of the experiments, what were the real risks to the patient, and did the patients give their informed consent to being used as experimental subjects? With respect to these three questions the report was highly critical of the research and urged the cancellation of the project.

House of Representatives Subcommittee Hearing: April 1994 - Representative John Bryant of the House Judiciary Committee chaired a congressional hearing on the Saenger Research for the Subcommittee on Administrative Law and Government Relations. Representatives from DoD, UCCM, the medical and academic communities and surviving family members of patients in the study provided testimony to the Subcommittee.

Senate Committee Hearing: January 1994 - Senator John Glenn of the Senate Committee on Governmental Affairs chaired a hearing on the federal government's role in human radiation and other scientific experiments. Representatives from medical and academic communities, the Department of Energy, the Department of Veterans Affairs, the Department of Defense, the Department of Health and Human Services, and a participant from an experiment involving radiation provided testimony to the Committee.