JUL 16 1986

MEMORANDUM FOR: Denwood F. Ross, Acting Director
Office of Nuclear Regulatory Research

THRU: Robert E. Alexander, Chief
Radiation Risk Assessment &
Management Branch, DRPES/RES

Karl R. Goller, Director
Division of Radiation Programs &
Earth Sciences, RES

FROM: Shlomo S. Yaniv
Radiation Risk Assessment &
Management Branch, DRPES/RES

SUBJECT: EARLY HEALTH EFFECTS--CHERNOBYL ACCIDENT

As you requested, I have prepared a short paper describing data on early health effects of the Chernobyl accident that would be useful to the NRC. Such data might be available in the Soviet Union.

Shlomo S. Yaniv
Radiation Risk Assessment &
Management Branch, DRPES/RES

Enclosure:
Paper on early health effects of
radiation

Distribution:
RRAMB Sbj/Rdg
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DN: Ross/DF

OFC:	RES:RRAMB	:RES:RRAMB	:RES:DRPES
NAME:	SYaniv SSY	:RAlexander	:KGoller KRG
DATE:	7/16/86	: 7/16/86	: 7/16/86

DATA ON EARLY HEALTH EFFECTS OF THE CHERNOBYL ACCIDENT THAT WOULD BE USEFUL TO THE NRC

The reactor accident at the Chernobyl Nuclear Power Station in the Soviet Union provides an opportunity to increase our knowledge regarding health effects of exposure to ionizing radiation. The accident resulted in exposure of a large number of people. The exposure was protracted (hours to days) and came from both external and internal sources. There is no previous comparable human experience, and for that reason a comprehensive study of the health effects suffered (both early and late) should be performed. However, this discussion is limited to early effects (effects other than cancer and genetic effects).*

One of the primary areas of interest to the NRC is validation and improvement of existing models used to predict the health consequences of reactor accidents. One such model has been proposed in NUREG/CR-4214 "Health Effects Model for Nuclear Power Plant Accident Consequences Analysis," July 1985. This model is based on the existing data from humans exposed to radiation and on some data from experiments with laboratory animals. A major problem is that the human data to a large extent are derived from studies of therapeutically exposed individuals and of atomic bomb survivors in Hiroshima and Nagasaki. These data are limited to external radiation only, delivered over a very short time, which is not the probable exposure pattern associated with a reactor accident.

Early health effects result from relatively large doses of radiation and manifest themselves within hours to months following radiation exposure. The effects of particular interest include, but are not limited to: death due to irradiation of blood forming organs, the lungs and gastrointestinal tract; radiation induced sickness resulting from whole body irradiation; lung function impairment; functional impairment of the thyroid gland; skin burns resulting from skin contamination by radionuclides; and transient and permanent sterility.

The time of manifestation of the effects is dose dependent; and, within certain limits, medical intervention can affect the outcome. In general, it is believed that much higher doses are required to produce the above effects if the radiation doses are delivered over days and weeks rather than minutes and hours.

The information on early health effects that resulted from the Chernobyl accident would be of great importance to the NRC in assessment of consequences of potential reactor accidents, emergency response planning and safety goal analyses.

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*Among the population exposed in the vicinity of Chernobyl, one can expect a statistically detectable increase in cancer rates. Although these cancers will not be detected by epidemiologic studies for many years, dosimetric information should be collected immediately,

Dosimetric Information

The dosimetric information needed both for fatalities and survivors includes external doses and irradiation periods, internal doses to individual organs, initial organ burdens and clearance parameters.

In principle, such information for each affected individual can be obtained from assessment of his/her exposure conditions and/or bioassay measurement results.

Radiation exposure data:

- Radiation type, dose, dose rate and exposure times.
- Air concentration, content and chemical forms of radionuclides; inhalation times. Ingestion of radionuclides.

Bioassay data:

- Whole body counting results
- Individual organ (e.g., lung, thyroid) burdens
- Excreta analysis results
- All blood cell counts over time (red, white, differential, platelets, reticulocytes, etc.)
- Chromosome aberration counts over time
- Sperm counts over time

Medical Information

All medical information should be correlated with radiation exposure data. It would be very important to obtain data that would permit determination of maximum doses (whole body and individual organs) at which no early effects are manifested.

If attempts were made to internally decontaminate some people, this information would be valuable. For fatalities, the cause of death, progression of the radiation syndrome, and the treatment administered should also be determined. For survivors, a description of injuries (bone marrow, lung, thyroid, GI tract, etc.), and detailed clinical information on injury and recovery including a description of administered treatment should be obtained.

Medical Data:

- Triage plan used.
- Symptomatology, type and appearance time.
- Physical findings: erythema, epilation.
- Treatment: reverse isolation? prophylactic antibiotics? blood transfusions?
- Bone marrow transplant criteria, methods and results.
- Decontamination methods and results.
- Contaminated wound management.
- Prodromal syndrome, especially vomiting and diarrhea.

Fetal exposure information:

It is likely that in the immediate vicinity of the Chernobyl plant (Pripyat) there were a number of *in utero* irradiations. Information on teratogenic effects is of great importance.

Fetal/Maternal Data

Frequency of neonatal and prenatal deaths.
Malformations.
Neonatal hypothyroidism (correlated to maternal dose).
Radionuclide transfer from mother to fetus (placental transfer).
Bioassay measurements on mother and neonatal infant.
Chromosomal studies on mother and neonatal infant.

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