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In the event of any differences in interpretation of this guide, the Finnish version shall take precedence over this translation

MEDICAL EXAMINATION OF NUCLEAR POWER PLANT PERSONNEL AND MEDICAL ACTION IN CASE OF OVEREXPOSURES AND ACCIDENTS

1 GENERAL

Health monitoring at a nuclear power plant concerns all workers engaged in radiation work. Health monitoring consists of medical examinations (first examination and subsequent periodic examinations as needed) and blood examination. The Resolution (594/68) of the Ministry of Health and Social Welfare defines dose limits and provides general regulations for health monitoring.

Individual radiation monitoring and reporting is dealt with in Guide YVL 7.10 issued by the Institute of Radiation Protection (IRP). Guidance for reporting abnormal occurrences is provided in Guide YVL 1.5.

2 SCOPE

This guide provides guidelines for implementation of the health monitoring of nuclear power plant personnel, including medical action in case of accidents and over-exposures. Rules for reporting such data are furnished as well.

3 GENERAL OBJECTIVES AND PROCEDURES

The medical examination shall protect the worker against being employed in work for which he may be unfit on medical grounds and protect the worker and his surroundings against accidents which might be caused by lack of healt. In general, the purpose of the medical examinations is the same as for medical examinations performed for reasons of general occupational health. However, special attention should be given to factors that may be significant from the standpoint of radiation hygiene.

The examination shall be performed by the physician employed at the nuclear power plant, or by a licenced medical practitioner.

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First Examination

The first medical examination shall be performed as close to the beginning of employment as possible though not later than 3 months thereafter. At the first examination, the anamnestic information, including the occupational record and previous exposure to radiation, shall be signed by the worker. Because the first examination is a full general examination performed to determine a person's fitness for a specific job, the person being examined is required, whenever possible, to inform the physician of the type work he will be engaged in at a nuclear power plant. A blood test shall always be taken as part of the first examination.

Periodic Examinations

The subsequent periodic examinations are to be performed as advised by the physician in charge of examinations, depending on the result of examination, on the type of work, and on radiation doses received. The examination shall, again, conform to a good, general examination of the worker's health. A blood examination shall be made annually regardless of medical examinations.

Blood Examination

Examination of the blood of a worker engaged in work involving exposure to radiation is insignificant to detection of minor overexposures. It must be noted, however, that an annual examinations of the blood (haemoglobin, erythrocyte haematorcit value, leucocytes, differential count, trombocytes and sedimentation rate) provides information that is important in the evaluation of the health of a person and is part of a thorough medical examination. The results of blood examinations serve as valuable reference data in the event of an accident.

Compilation of Data

The results of medical examinations shall be recorded and stored in such a manner that they are obtainable from the examining physician as needed.

In addition, the examining physician is required to submit the findings of the examination to the Institute of Radiation Protection (Medical Research Team) and both to the employee and the employer.

The results of the annual blood examinations shall be sent to the Institute of Radiation Protection

4 SKIN DISEASES AND LENS OF THE EYE

Certain skin diseases are of special importance from the radiation hygiene point of view. If a person, for example, suffers from eczema caused by protecting gloves, certain types of work that require the use of gloves, cannot naturally be performed as there is a risk of greater uptake of several radionuclides through diseases than healthy skin.

The lens of the eye is not particularly sensitive to X and gamma radiation (cataract formation). In comparison with other organs, however, the lens is considerebly more sensitive to neutron and heavy particles. Therefore it is the type of work the person is engaged in that determines whether a supplementary examination is necessary. Such examination should be made by a specialist in ophtalmology.

5 SKIN REGULATIONS APPLIED TO PREGNANT WOMEN

According to Resolution (549/68) of the Ministry of Health and Social Welfare, a woman in fertile age may be employed under conditions of work such that the dose to an embryo during the first two months of pregnancy would normally be less than 1.3 rem, and such that, when a pregnancy has been diagnosed, the dose to the foetus does not exceed 1 rem. Therefore, pregnant women cannot work under quite the same conditions as other persons.

It should be pointed out that by a simple analysis of urine a pregnancy may be diagnosed at an early stage. By examinations of this type at regular intervals it is possible to take precautions early enough to avoid the risk of radiation injury to a foetus.

The licensee is advised against using pregnant women in work involving handling a great number of open sources of radiation (A type laboratory or similiar). Such a restriction is justified because we have insufficient knowledge of the passage of radionuclides across the placenta and in the foetus.

6 MEDICAL ACTION IN CASE OF OVEREXPOSURE OR SUSPICION OF OVEREXPOSURE

The first action to be taken in accidents involving a potential overexposure is to evaluate the magnitude of the dose by means of suitable measurements. The following 'biological' observations are of importance as well:

- clinical symptoms
- changes in the blood
- number of chromosome aberrations

Among the initial clinical symptoms the most important are nausea and vomiting, caused by disturbances in the gastro-intestinal tract and pylorospasm.

Immediate first aid is not necessary in the case of radiation injuries. Conventional injuries sustained in the accident shall be treated as normally regardless of radiation injuries or radioactive contamination. Localized radiation injuries are treated according to symptoms and should be photographed for documenting purposes.

If a person has received 100 rem, he shall immediately be taken to a Central Hospital.

It is important to obtain a complete status of the blood as soon as possible after the exposure, followed by another after 24 hours. Depending on the changes in the blood, the treatment should be guided by recommendations given in Fig. 1.

The most sensitive biological indicator of the magnitude of the exposure is the number of aberrant chromosomes in the lymphocytes in the blood. However, chromosome analyses can only be made in special laboratories by special experts, normally not even in well-equipped hospitals.

The Institute of Radiation Protection performs chromosome analyses when it deems it necessary. A fee prescribed in law is charged for the analysis.

Reports to the Institute of Radiation Protection

When a dose limit is found to be exceeded, the IRP shall be immediately notified thereof as provided in Guide YVL 1.5.

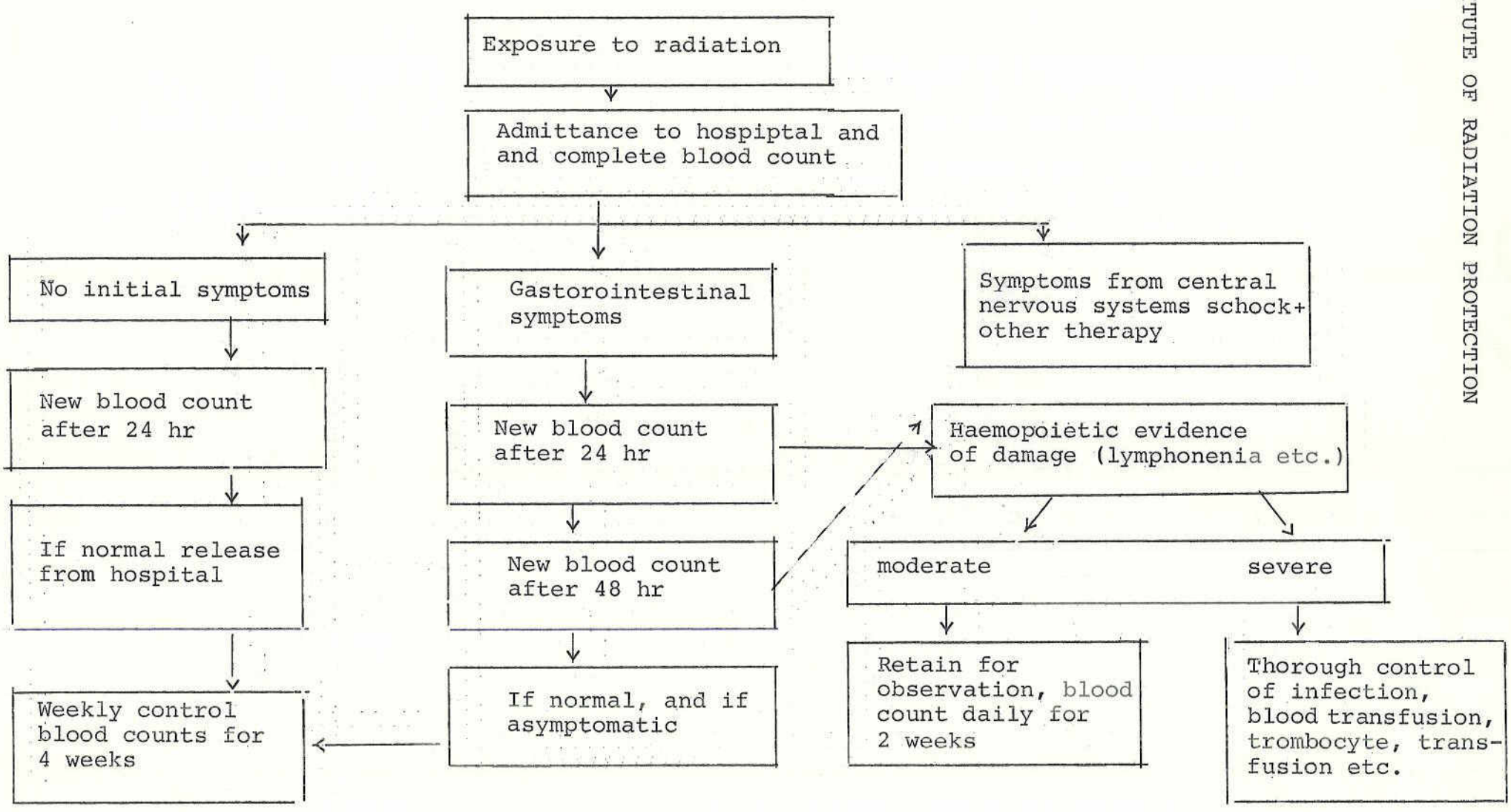
The special report to be prepared on such an incident shall describe the course of events and the results and interpretation of measurements made to determine the doses. In case the person involved is taken to a Central Hospital, the IRP shall be furnishded with complete data on examination findings and treatments.

7 CO-OPERATION BETWEEN NUCLEAR POWER PLANT AND CENTRAL HOSPITAL

During the operating license review, the license applicant shall provide plans in the form of a separate documents describing how the medical expertize and resources necessary for treatment of radiation injuries and over-exposures is assured.

The licensee shall make sure that the Central Hospital in question has the necessary special equipment and expertize and is, in the event of an accident, capable of receiving victims of a radiation accident who require hospitalization.

The Institute of Radiation Protection examines action plans for radiation accidents prior to the operation of the facility.


Exposure to radiation
Admittance to hospiptal and and complete blood count
No initial symptoms
Gastorointestinal symptoms
Symptoms from central nervous systems schock+ other therapy
New blood count after 24 hr
New blood count after 24 hr
Haemopoietic evidence of damage (lymphonenia etc.)
If normal release from hospital
New blood count after 48 hr
moderate
severe
Weekly control blood counts for 4 weeks
If normal, and if asymptomatic
Retain for observation, blood count daily for 2 weeks
Thorough control of infection, blood transfusion, trombocyte, trans-fusion etc.