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OCCUPATIONAL RISKS RELATED TO CARCINOGENS  
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**Carcinogens used in hospitals: the Slovenian experience**

Healthcare and other workers employed in hospitals are known to be exposed to carcinogens, including formaldehyde and antineoplastic drugs, in their work.

Formaldehyde in the form of an aqueous solution called formalin is used in hospitals mainly for tissue fixation and disinfection, i.e. for cold sterilization of endoscopes and other medical instruments. The International Agency for Research on Cancer (IARC) has classified formaldehyde as carcinogenic to humans. Based on the results of different studies, the IARC expert working group determined that there is sufficient evidence showing that formaldehyde causes nasopharyngeal cancer and leukaemia in humans. In Slovenia, as elsewhere in the world, employees in hospitals are mainly exposed to formaldehyde in pathology laboratories, surgery rooms and endoscopy wards. Considering that formaldehyde is a carcinogen, the University Medical Centre in Ljubljana (UMC LJ) as the leading tertiary medical institution in Slovenia, pays special attention to the proper handling, use, storage and disposal of this hazardous substance. Therefore, for the needs of UMC LJ laboratories, with the exception of one, the pharmacy mostly procures 10% neutral buffered formalin to store histological samples. When purchasing, professional criteria are set which the product must meet. Formalin is purchased in different volumes, as the size of histological samples varies. Healthcare professionals, e.g. in the operating room or in the endoscopy rooms, then just open the container and add a histological sample. In this way, the exposure to formaldehyde can be significantly reduced, thus reducing the risk of nasopharyngeal cancer and leukaemia. The only exception in the UMC LJ is the laboratory where large samples are taken, processed and analysed and where the lab staff prepares formalin solutions on their own. This laboratory is undergoing renovation in order to reduce formaldehyde exposure to the lowest possible level.

In addition to formaldehyde, hospital laboratory workers in Slovenia are occasionally exposed to benzene in the processing of tissue samples. According to the IARC, benzene is also classified as carcinogenic to humans (Group 1) as it causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene and acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma.

In Slovenia, antineoplastic drugs are mainly used at the Institute of Oncology Ljubljana at UMC LJ, and also at some other hospitals. According to the IARC, some antineoplastic drugs used in Slovenian hospitals are classified as carcinogenic to humans (Group 1), e.g. etoposide, thiotepa, treosulfan, cyclophosphamide; some as probably carcinogenic to humans (Group 2A), e.g. azacitidine, cisplatin; some as possibly carcinogenic to humans (Group 2B), e.g. bleomycins, mitoxantrone and mitomycin C, while some of them are so far not classifiable as to its carcinogenicity to humans (Group 3), e.g. 5-fluorouracil, vinblastine sulphate and vincristine sulfate. Regardless of the classification, all antineoplastic agents should be handled with extreme caution. Therefore, at UMC LJ, cytostatics are prepared centrally at the Department for the Preparation of Medicinal Products from Dangerous Active Ingredients of the Pharmacy. A dust-free biological safety cabinet with a vertical laminar air flow rate of 0.4 m/s is used for aseptic preparation of cytostatic drugs at UMC LJ. The biological safety cabinet is located in a clean room intended for the manufacture of preparations under aseptic conditions and complies with International Organization for Standardisation (ISO) standards. With the correct use of a dust-free biological safety cabinet, they provide protection for workers from the effects of aerosols and vapours of hazardous substances. In addition to the use of a biological safety cabinet, the protection of the workers involved in the preparation of cytotoxic agents is also provided by using appropriate personal protective equipment.

In conclusion, the carcinogens in hospitals in Slovenia, as elsewhere in the world, are still used and will most likely be used in the future. Therefore, more effective measures are needed to reduce the exposure to these substances to the lowest possible level, which could significantly reduce the risk of developing malignancies in healthcare professionals.

**Key words:** carcinogens, hospitals, Slovenia