

3. Summary

Possibilities of toluendiisocyanate occupational exposure evaluation

Diisocyanates are initial raw materials for production of soft and hard polyurethanes, polyurethane foams, glues and painting material. Toluendiisocyanate (TDI) is one of the most frequently technologically used diisocyanate. TDI, as well as other diisocyanates, has irritating and allergizing effects and induces occupational diseases, particularly allergic fever and asthma bronchiale.

TDI enters body via inhalation and transdermally. The most frequent forms of work exposure are the inhalation and dermal exposures. At present, only the inhalational exposure evaluation is used for total TDI exposure, not the dermal. For the total inner dose from more exposure ways estimation, the methods of biological monitoring seem to be appropriate. In the case of TDI, the biological monitoring is based on the determination of the corresponding toluendiamines (TDA) in urine or in blood (plasma and erythrocytes). At present, there has been only limited measure of information about relationships between the environment monitoring results and the results of biological monitoring of TDI exposure, as well as about possibilities of dermal exposure to TDI.

The general aim of this dissertation thesis was to contribute to improvement of preventive measures in health protection during working with TDI and thereby to decrease the risks of the respective occupational diseases emergency, particularly the isocyanate asthma bronchiale. The aim of the theoretical part was to collect the accessible information about features, use and effects of diisocyanates, about their toxicokinetic, about occupational diseases produced by these and about the present monitoring possibilities of working exposure to these substances. The aim of the experimental part of the thesis was the accomplishment of analytical epidemiological study in the polyurethane production plant, focused on the assessment of evaluation possibilities of inhalational and dermal exposure to toluendiisocyanates (TDI).

The relationships were analyzed between the results of environment monitoring (concentrations 2,4-TDI and 2,6-TDI in the working environment) and the results of biological monitoring of the respective metabolites (TDA), in urine and plasma. The analyses confirmed the convenience of utilization of TDI in urine and in plasma for the purposes of biological monitoring of the combined (inhalational and dermal) working exposure to TDI. At the same time, the possibility of evaluation of the dermal TDI exposure intensity was estimated. The results suggested it may be possible to use the rate of 2,4-TDA and 2,6-TDA concentrations in urine and plasma of exposed workers to evaluation of dermal exposure contribution. The problem will require further research focused particularly on the monitoring number enlargement.

A file of preventive recommendations for inhalational and dermal TDI exposure monitoring was elaborated which could contribute to the improvement of health protection of industrially exposed people and to decrease the risks of emergence of respective occupational diseases.