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Focus on IFA's work

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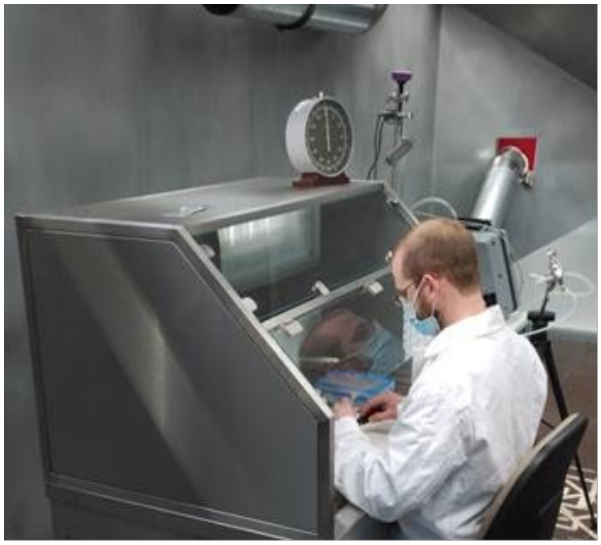
Formaldehyde exposure in pathology

Problem

A 4% formaldehyde solution is used in pathology laboratories to disinfect and preserve tissue samples. The samples are retrieved from the solution and prepared for use in histological examinations. Preparation usually begins with dissection of the tissue. Owing to the harmful effects of formaldehyde on health, this work is normally performed on dissection boards resting on a preparation table equipped with an exhaust system. The formaldehyde vapours are exhausted by a downward flow of air through the table top, which takes the form of a perforated metal plate. The advantage of downward routing of the airflow is that since formaldehyde vapours are denser than air, they tend to sink. This reduces concentration of formaldehyde in the breathing zone of the persons preparing the tissue. However, the dissection board covers part of the holes in the table top and thus impairs capture of the harmful vapours.

The metrological service of the German Social Accident Insurance Institution for the health and welfare services (BGW) has determined formaldehyde concentrations above the occupational exposure limit (OEL) of 0.37 mg/m³ in numerous workplace measurements in supposedly well-equipped pathology laboratories. This prompted the question as to what flow rate or volumetric exhaust flow is required at pathology workstations for adequate capture of formaldehyde vapours.



Downdraught table with hood

Activities

Reliable studies of this issue are virtually impossible on downdraught tables under real-case working conditions, since the results are confounded by interferences. For this reason, the IFA set up a pathology workstation and simulated activities involving formaldehyde solutions. The experimental set-up yields new information on the effectiveness of exhaust, free of confounding influences.

Preliminary tests were carried out on a typical pathology table to determine whether user-friendly instruments can be used to measure the air velocity capturing formaldehyde vapour at the table surface with sufficient accuracy as a function of the volumetric exhaust flow. The IFA used anemometers of Ahlborn and Testo for this purpose. Measurement of the flow velocity is intended to enable labour inspectors and other prevention experts to evaluate the effectiveness of downdraught tables on site, without the need for complex measurements at workplaces.

Further tests were performed to simulate a range of typical preparation activities in pathology. In these tests, dissection tasks were simulated at a range of operating parameters (such as volumetric exhaust flows), and the formaldehyde concentrations occurring at different measuring points were measured. The size of the dissection boards was also varied and the influence of a number of table attachments (table skirting, hood above the table surface) was studied.

Pieces of pig-meat, placed in a formaldehyde solution at least twelve hours previously, were used as samples for the dissection work. This yielded information on the relationship between the volumetric exhaust airflow and the local formaldehyde concentration.

Results and application

The flow velocity measurements carried out in the preliminary tests showed that at a velocity of 0.3 m/s (measured at the table surface) lead to a sufficient capture of the formaldehyde vapours. However, this requires the dissection board to be positioned on the table such that a row of holes between the pathologist and the cutting board remains unobstructed and the vapours are therefore captured on all sides of the dissection board.

Initial tests under typical field conditions with volumetric exhaust flow rates in the range between 100 m³/h and 400 m³/h yielded the following results:

- At a volumetric flow rate of 100 m³/h, formaldehyde concentrations at the level of the OEL were measured at the table. At higher volumetric exhaust flow rates – particularly at the volumetric flow rate of 400 m³/h recommended by the table manufacturer – the formaldehyde exposure levels are significantly lower.

- The use of table skirting has no significant effect on the formaldehyde concentration.

- By contrast, use of a hood significantly reduces the formaldehyde concentration at the table and thus the exposure of the employees in pathology laboratories.

Further tests are to be conducted to analyse the influence of the dissection board geometry. Suitably larger boards are normally used for larger preparation specimens. The larger board size results in more holes of the perforated plate being covered, thus affecting vapour capture.

User group

Labour inspectors of the accident insurance institutions, metrological services, OSH professionals and safety delegates

Further information

- Sicheres Arbeiten mit chemischen Stoffen in der Pathologie. Published by: Berufsgenossenschaft für Gesundheitsdienst und Wohlfahrtspflege – BGW Hamburg 2006

Technical enquiries:

IFA, Department “Hazardous substances: Handling – Protective Measures”

Literature enquiries:

IFA, Department “Interdisciplinary Services”

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Edited by: Arno Goebel
Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA)
Alte Heerstrasse 111, 53757 Sankt Augustin, Germany
Tel. +49 30 13001-0/Fax: -38001
E-mail: ifa@dguv.de, Internet: www.dguv.de/ifa