DISCUSSION ON CURRENT USES OF AMBIENT AND BIOLOGICAL MONITORING

G. LEHNERT It has generally been found that for toxicological studies it is useful to follow the system devised by Rohmert, Wenzel and Rutenfranz (1966) for studying problems of occupational physiology, whereby a distinction is made between the external load, internal load, and response. Information on the external load to which workers are exposed when handling certain substances is obtained by ambient monitoring, whereas information on the internal load and response is obtained by biological monitoring. While ambient monitoring is naturally geared to the health protection of groups of employees, biological monitoring is primarily aimed at preventive health care of the individual.

In his paper Goldstein quite rightly pointed out that haematological changes in the form either of cytopenia of some or all factors of the peripheral blood picture, or in the form of acute myeloblastic leukaemia, are the most serious hazards of chronic exposure to benzene. He also drew attention to the fact that early diagnosis of benzene-induced cytopenia is made considerably more difficult by the wide fluctuation of the normal peripheral blood picture in the same individual and between different individuals, the relatively high compensation capacity of bone marrow, and the non-specific nature of the changes. It is still not clear whether acute leukosis only follows cytopenia or whether it can also develop out of normal blood status.

It was against this background that Goldstein recommended that in cases of occupational exposure to benzene a complete blood analysis should be made initially and followed up by a series of further tests. The aim of this proposal is hardly to establish an "individual norm range", but it would help those responsible to identify trends in the results of later routine examinations and establish causal links between changes in the blood picture. In this respect the basic examina-
tion recommended by Goldstein should also be considered as a routine part of subsequent check-ups. Incidentally one might also mention that in the Federal Republic of Germany compliance with the health insurance regulations would probably demand that such a procedure be followed.

Goldstein recommends that the blood status be checked periodically in subsequent routine examinations. This advice must needs be followed, partly because there has not yet been any scientific evidence for a threshold dose for benzene and partly because there are no alternative methods of diagnosing acute leukosis.

Nevertheless we are bound to ask whether blood analyses alone are sufficient for assessing the health hazards of benzene. It should be borne in mind that any change in the blood picture represents an undesirable response by the haemopoietic system. An obvious solution would be to carry out additional routine checks of internal benzene loads to keep the latter within certain boundaries. It is now thought that this can at least help to prevent the development of cytopenia. The internal load can be determined by measuring either benzene present in the blood or phenol present in the urine; the first method is preferable, as it is more specific. The "headspace" method provides a simple and reliable means of measuring blood benzene levels by gas chromatography. Given this situation, routine checks of the benzene concentration in the blood should be instituted without delay.

At least as important as the selection of a suitable preventive care programme, if not more so, is to decide on the level of external benzene load above which regular check-ups should be instituted. This is a universal problem when dealing with hazardous substances, but it is particularly urgent in the case of benzene, as with all carcinogens, because of its leukaemia-causing potential. It is not really possible to arrive at a scientifically-based decision in the present state of knowledge regarding carcinogens, but it would be