

Acetylcholinesterase inhibitors – Addendum: withdrawal of BAT value and continuation as BLW

Assessment Values in Biological Material – Translation of the German version from 2024

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Keywords

biological guidance value; BLW;
biological tolerance value; BAT
value; acetylcholinesterase;
acetylcholinesterase inhibitors

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Abstract

The German Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (MAK Commission) re-evaluated the biological tolerance value (BAT value) of acetylcholinesterase inhibitors, defined as a reduction in activity of no less than 70% of the reference value in erythrocytes. The BAT value is defined as a concentration at which the health of an employee generally is not adversely affected. However, it is not always clear whether the inhibition of acetylcholinesterase is the most sensitive toxicological endpoint of a substance or this has usually not been explicitly tested. The BAT value for the activity of acetylcholinesterase in erythrocytes is therefore suspended and continued as a biological guidance value (BLW). For substances for which it has been conclusively demonstrated that acetylcholinesterase inhibition in erythrocytes is the most sensitive endpoint, 70% of the reference value continues to be the BAT value.

Citation Note:

Weistenhöfer W, Drexler H, Hartwig A, MAK Commission. Acetylcholinesterase inhibitors – Addendum: withdrawal of BAT value and continuation as BLW. Assessment Values in Biological Material – Translation of the German version from 2024. MAK Collect Occup Health Saf. 2024 Sep;9(3):Doc069. https://doi.org/10.34865/bb0astrinhe9_3ad

Manuscript completed:
13 Mar 2023

Publication date:
30 Sep 2024

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BLW (2023)**Reduction of acetylcholinesterase activity to 70% of the reference value**

BLW derived as ceiling value because of acute toxic effects

Sampling time: end of shift; for long-term exposures, after several previous shifts (after three consecutive working days); determination of individual pre-exposure values as reference values after an exposure-free period of at least one week

The inhibition of acetylcholinesterase in erythrocytes has proven to be a suitable indicator for the toxicity of organic phosphoric acid esters, organic sulfuric acid esters, sulfonic acid esters, and carbamates. In 1986, a BAT value for a reduction in erythrocyte acetylcholinesterase activity to no less than 70% of the reference value was derived as the maximum value due to acute toxic effects (translated in Lewalter 1995).

It is often unclear whether acetylcholinesterase inhibition is the most sensitive endpoint. As compliance with the BAT value is defined as a concentration at which the health of an employee generally is not adversely affected even when the person is repeatedly exposed during long periods,

the BAT value for acetylcholinesterase inhibitors is hereby withdrawn,

but is continued as a biological guidance value,

BLW, with a reduction of acetylcholinesterase activity to 70% of the reference value.

The value is established as ceiling value due to acute toxic effects. For substances for which it has been proven that acetylcholinesterase inhibition is the most sensitive endpoint, a reduction of acetylcholinesterase activity to 70% of the reference value continues to be the BAT value.

The individual reference value for acetylcholinesterase activity is to be determined at least once per year after an exposure-free period of at least one week.

For the reliable detection of representative acetylcholinesterase activity levels, it is recommended to take blood samples for the determination of acetylcholinesterase activity at the end of a shift after several previous shifts (after three consecutive working days) under contaminant-free conditions. For the evaluation of any collected data, it is important to note that women may exhibit lower acetylcholinesterase activity levels than men and that certain pharmaceuticals may alter acetylcholinesterase activity (see also Lewalter 1995).

Notes

Competing interests

The established rules and measures of the Commission to avoid conflicts of interest (www.dfg.de/mak/conflicts_interest) ensure that the content and conclusions of the publication are strictly science-based.

References

Lewalter J (1995) Acetylcholinesterase inhibitors. BAT Value Documentation, 1986. In: Lehnert G, Greim H, editors. Biological Exposure Values for Occupational Toxicants and Carcinogens. Volume 2. Weinheim: VCH. p. 15–24. Also available from <https://doi.org/10.1002/3527600418.bb0astrinhe0002>