



# Influence of toxic metal mixture on acetylcholinesterase activity in subchronic exposure in rats

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## Introduction

- It is known that many compounds can affect the activity of AchE, from organophosphates, through drugs for Alzheimer's disease and myasthenia gravis, to metals such as **Hg, Cr, Cd, Pb, Ni** and **As**
- General population is more often exposed to a combination of different metals, than individual metals. That is why more relevant results are obtained if the effects of metal combinations, i.e. the effects of mixtures, are examined, because such results better describe the actual exposure of the general population

The aim of this study was to examine the effect of a mixture of these metals on the activity of AchE, namely the AchE present in the brain of experimental animals in a subchronic exposure experiment.

## Materials and methods

- Groups of experimental rats (Wistar rats, males, 5 per group) received a mixture of metal dissolved in water via an oral tube for 90 days. The doses to which the animals were exposed corresponded to the results of a human biomonitoring study obtained in male subjects. The control group received water.

**Table I:** Tabular representation of the composition of metal mixtures by the investigated groups. Group M1 represents the group that received doses proportional to concentrations from human monitoring representing medians, group M2 doses corresponding to concentrations from human monitoring representing 95th percentiles, and group M3 received doses proportional to concentrations from human biomonitoring corresponding to BMDL

metal	M1 (mg/kg bw)	M2 (mg/kg bw)	M3 (mg/kg bw)
Pb	0.0187	0.5317	0.0021
Cd	0.0126	0.0366	0.0023
Hg	0.4778	4.4765	0.0081
Ni	2.9907	18.8804	0.3930
Cr	0.0386	8.9682	0.6255
As	0.4979	8.9682	0.6255

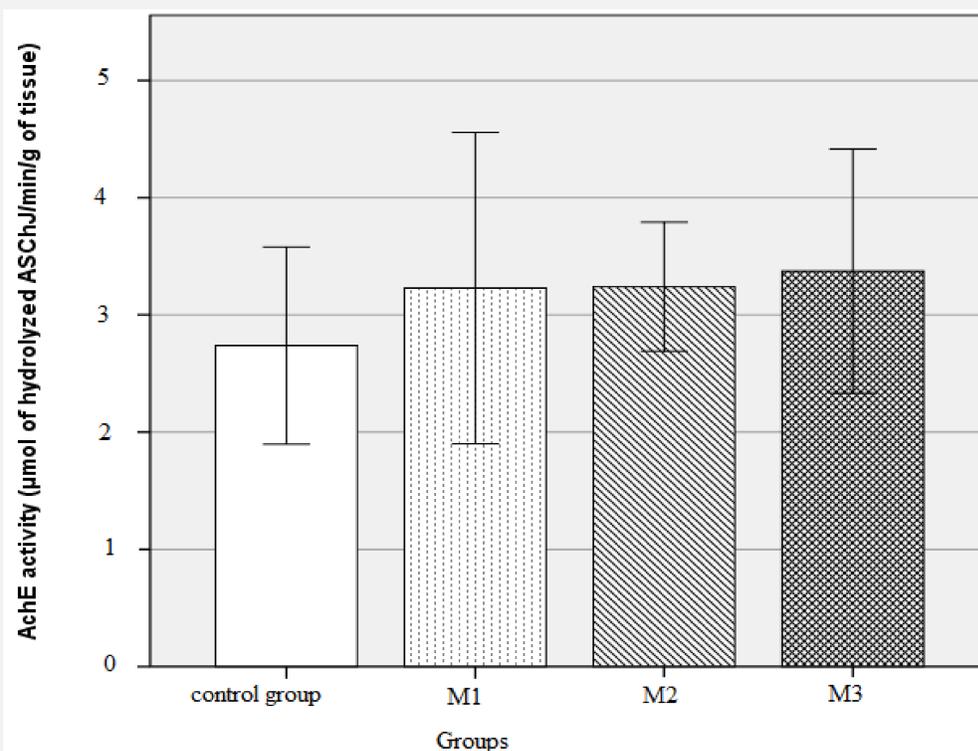
- The collected material was used to determine AchE activity by the Elman method. Acetylthiocholine iodide (ASChJ) was used as a substrate, and Elman's reagent (DTNB) was used as an indicator.

**Table II:** Instructions for spectrophotometric determination of acetylcholinesterase activity

	Blind test	Brain sample
DTNB	2500 µL	2500 µL
tissue	/	20 µL
saline	20 µL	/
The mixture is incubated for 5 minutes at 25°C		
ASChJ	20 µL	20 µL
The change in absorbance is monitored at 410 nm for 3 minutes		

## Results

- The results obtained by measuring the absorbance on the spectrophotometer were used to calculate the enzyme activity.
- Using the Kolmogorov-Smirnov test, the normal distribution of the data was determined, and then using the ANOVA test followed by the Tukey test, **no statistically significant difference was found between AchE activity measured in brain tissue of control rats and test groups.**  $F = 0.404$ ;  $p = 0.752$



## Conclusion

Low doses of six metals, which correspond to a real-life scenario of environmental exposure, do not lead to statistically significant changes in acetylcholinesterase brain activity.

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