ID 1132: Cadmium and/or Ethanol Increase Oxidative Stress in Liver of the Exposed Rats

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INTRODUCTION

By using animal model (Wistar rats) we tried to investigate singular effects of alcohol (A) and cadmium (Cd) and their parallel exposure on liver red-ox status. Leading by the fact that smokers are on a greater heath risk caused by Cd, derives from cigarette smoke and that alcoholics are mainly smokers, we tried to imitate such real life circumstances, we administered Cd intraperiotenally (i.p.) (from toxicokinetics point of view it is an adequate alternative route of administration) and A was given orally to rats.

EXPERIMENTAL DESIGN

Adult male Wistar rats were randomly divided into four groups (n=6), according to the applied treatment during 21 days: control (C) group – untreated rats, A_{21} group - received daily 3 mL 20% ethanol/kg by gastric intubation, Cd_{21} group - 1 mg $CdCl_2$/kg was administered i.p. and A_{21}/Cd_{21} group – rats were exposed to both, A and Cd, in the same manner.

Measured OS parameters in liver refer to: superoxide anion radical (O_2●–), glutathione reduced (GSH) and oxidized (GSSG), malondialdehyde (MDA), activities of total superoxide dismutase (tSOD), catalase (CAT), glutathione-S-transferase (GST) and glutathione reductase (GR).

RESULTS

Group/OS parameter	MDA (nmol MDA/mg prot)	$O_2^{\bullet-}$ (nmol red NBT/min/mg prot)	SOD (U SOD/mg prot)	CAT (U CAT/mg prot)
Control	65.58±7.16	67.3±6.7	2.34±0.17	279.23±44.1
A_{21}	169.92±31.51***	178.76±30.36**	1.68±0.24**	116.13±20.03***
Cd_{21}	134.2±5.69***	139.53±21.73**	1.71±0.15**	209.77±11.12*
A_{21}/Cd_{21}	162. 83±8.66$^{***,\beta\beta\beta}$	202.29±38.03$^{**,\beta}$	1.54±0.18***	400.76±32.45$^{***,\alpha\alpha\alpha,\beta\beta\beta}$

Group/OS parameter	GR (U GR/mg prot)	GST (U GST/mg prot)	GSH (nmol GSH/mg prot)	GSSG (nmol GSSG/mg prot)
Control	0.0024±0.0001	0.0439±0.0031	32.76±3.41	1.83±0.09
A_{21}	0.0022±0.0002	0.1431±0.0188***	32.43±2.04	1.49±0.05***
Cd_{21}	0.0017±0.0002**	0.0144±0.0026***	18.27±2.01***	2.11±0.13
A_{21}/Cd_{21}	0.0028±0.0005$^{\alpha,\beta\beta}$	0.1349±0.0188$^{**,\alpha\alpha\alpha,\beta\beta\beta}$	27.39±0.35$^{***,\alpha\alpha\alpha,\beta\beta\beta}$	1.83±0.25$^{*,\alpha,\beta}$

CONCLUSION

Our results demonstrated that A and Cd developed OS in liver by different metabolic pathways (Cd depletes GSH through ligand-chelating reactions and reduces activity of antioxidant enzymes by ion-exchanged reactions with active metals in relevant enzymes; and A acts at the level of redox reactions) and do not impose additive effect when applied together.

The most significant result of this study is that A and Cd applied individually significantly interfere with glutathione cycle in liver, contrary to parallel exposure.

Conflict of interest: *The authors declare no conflict of interest.*

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