

Energy production failure in human drug addiction

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INTRODUCTION

Drug addiction is a chronic brain disease characterized by a set of cognitive, behavioural and physiological symptoms. Different types of drugs of abuse exert their initial reinforcing effects by activating reward circuits in the brain and have been associated with disruption of bioenergetics. This study aims to evaluate the effect of prolonged drug abuse in a population of addicted individuals, through the analysis of the mitochondrial respiratory chain (MRC) activity in peripheral blood lymphocytes and the ATP levels in plasma, searching for the alterations in bioenergetics' functioning.

METHODS AND SUBJECTS

30 patients seeking detoxification:

2 women and 28 men
39±8 years old (19-52)

Control group:

59 individuals (51 women and 8 men)
32±9 years old (21-47)

Lymphocytes

Determination of the catalytic activity of the MRC enzymatic complexes (complexes I-V) by double wavelength spectrophotometry (Grazina, 2012).

Plasma

Plasma ATP measurement by luminometry (Gorman *et al.*, 2003).

Statistics:

Mann-Whitney test was applied, using Software GraphPad Prism[®] 5. A p-value < 0.05 was considered as statistically significant.

- ❖ Approval of Ethics' Committee (ID # CE-4/2012)
- ❖ Informed consent was obtained from all participants

RESULTS AND DISCUSSION

❖ Evaluation of MRC enzymes activities

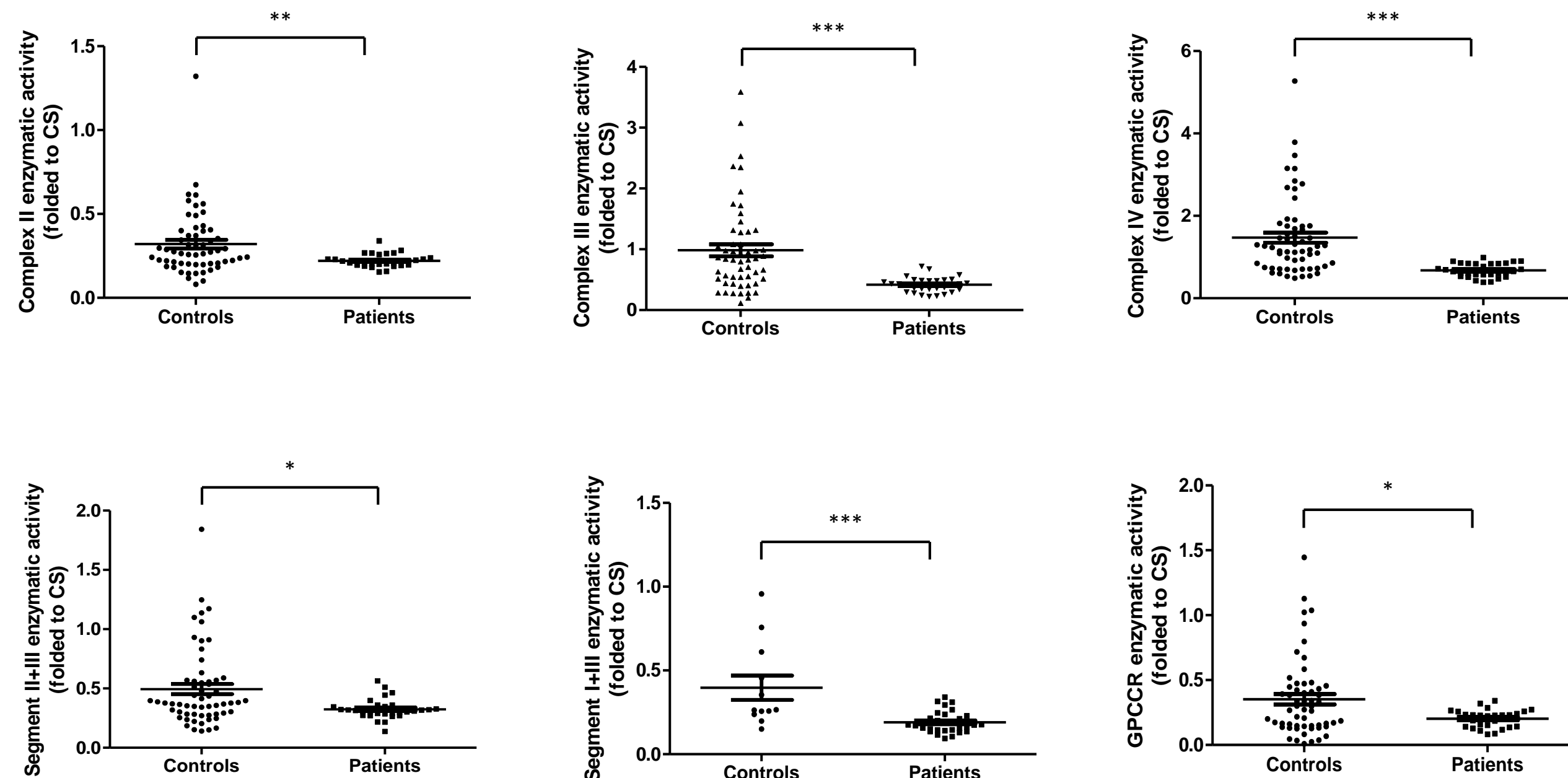


Figure 1: Mitochondrial enzymatic activity in control group and patients for complexes II, III and IV, segments II+III, I+III and GPCCR (Glycerol-3-phosphate dehydrogenase plus complex III).

❖ Determination of ATP plasma content

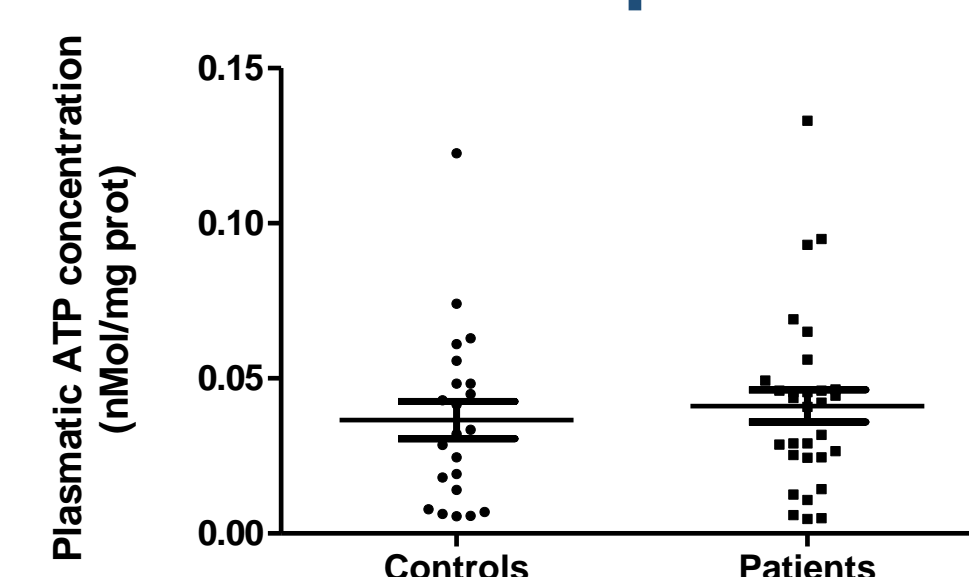


Figure 2: Plasmatic ATP concentration in controls and patients.

Complexes III and IV and segment I+III were the most affected, with lower enzymatic activities comparing with control group, followed by complex II, segment II+III and GPCCR.

No alterations have been identified in plasma ATP content.

CONCLUSIONS

This study allowed the analysis of some effects of drugs of abuse in mitochondrial functioning, through biochemical alterations concerning MRC dysfunction reflecting the peripheral cytotoxicity induced by substance abuse and addiction. The present work is a relevant contribution for a better understanding of the bioenergetics' compromise in drug addiction, particularly in research with human samples.

References:

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Competing interests:

The authors declare no conflict of interest.

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