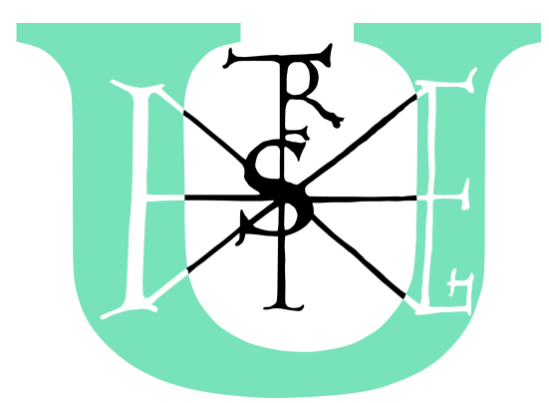


The *Fusarium* mycotoxins effect on glutathione system in broiler chicken



Szabina Kulcsár^{1,2,*}, Benjámin Kövesi¹, Miklós Mézes^{1,2}, Krisztián Balogh^{1,2}, Erika Zándoki^{1,2}

¹Szent István University, Department of Animal Nutrition, Gödöllő, Hungary

²MTA-University of Kaposvár- Szent István University, Mycotoxins in the Food Chain Research Group, Gödöllő, Hungary

*szabina.kulcsar@gmail.com

Introduction

Co-occurrence of mycotoxin contamination of feeds is a primary problem, thus the evaluation of their combined effects is essential. *Fusarium* mycotoxins, like T-2 toxin, its active metabolite HT-2 toxin, deoxynivalenol (DON) and fumonisin B1 (FB1) are commonly found in feed commodities. It was described (Mézes et al., 1998; Surai et al., 2002) that these mycotoxins in single application induce reactive oxygen substances (ROS) formation and cause oxidative stress, which is neutralized by the glutathione system within the antioxidant defence system, depending on the dose and duration of exposure.

In present study, the intracellular biochemical and gene expression changes were investigated in case of multi-mycotoxin exposure, with attention to certain elements of the glutathione redox system.

Materials and methods

In vivo study was performed in **broiler chicken** in a short-term (72 hours) feeding trial at the doses of:

1. Low (recommendation limit) : 0.25 mg T-2 toxin; 5 mg DON and 20 mg FB1/kg feed
2. High (twice of the recommendation limit) : 0.5mg T-2 toxin; 10 mg DON and 40 mg FB1/kg feed

Liver samples were taken on days 1, 2, 3 after beginning the feeding trial.



Antioxidant markers (Fig1)

The amount (reduced glutathione-**GSH**) and activity (glutathione peroxidase-**GPx**) of the glutathione redox system was measured. Changes in gene expression of **GPx4** (phospholipid hydroperoxide glutathione peroxidase), **GSS** (glutathione synthetase) and **GSR** (glutathione reductase) were also measured using qPCR.

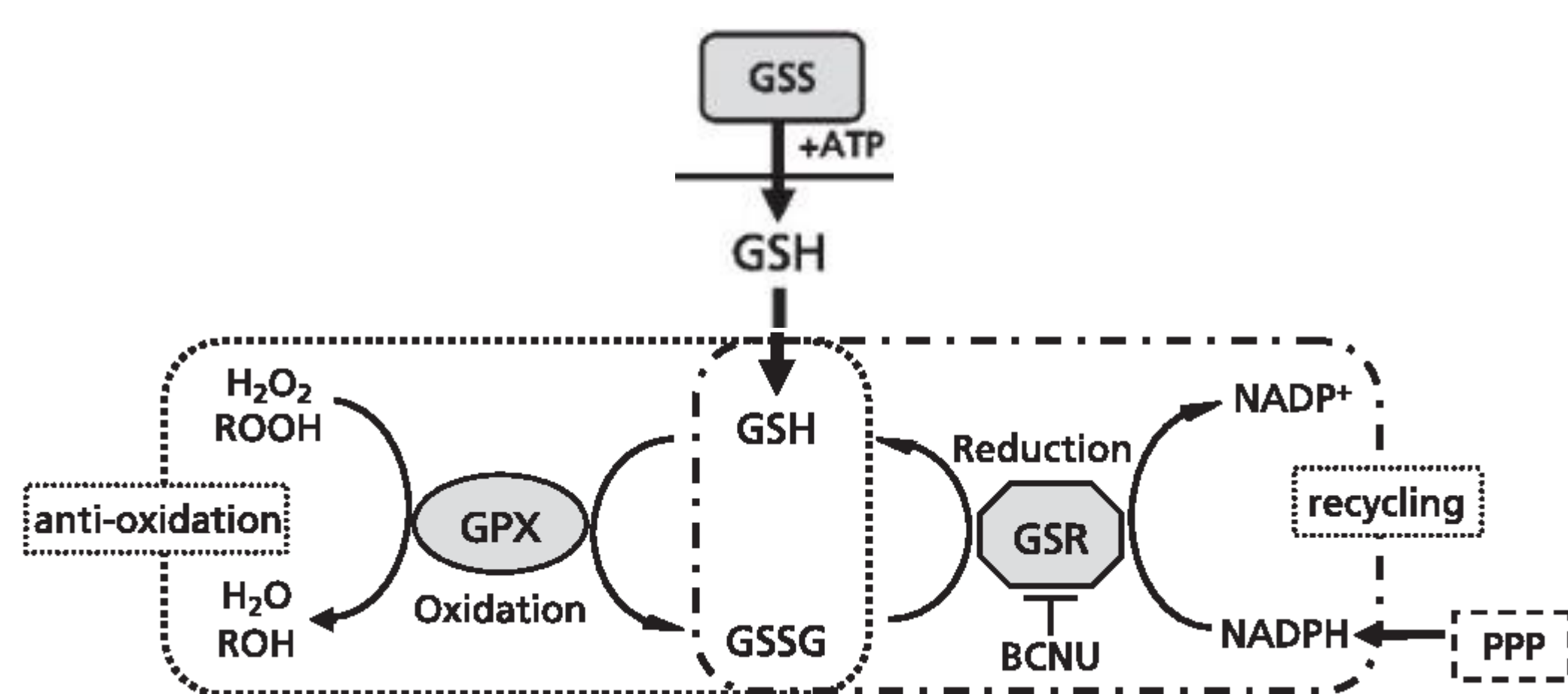
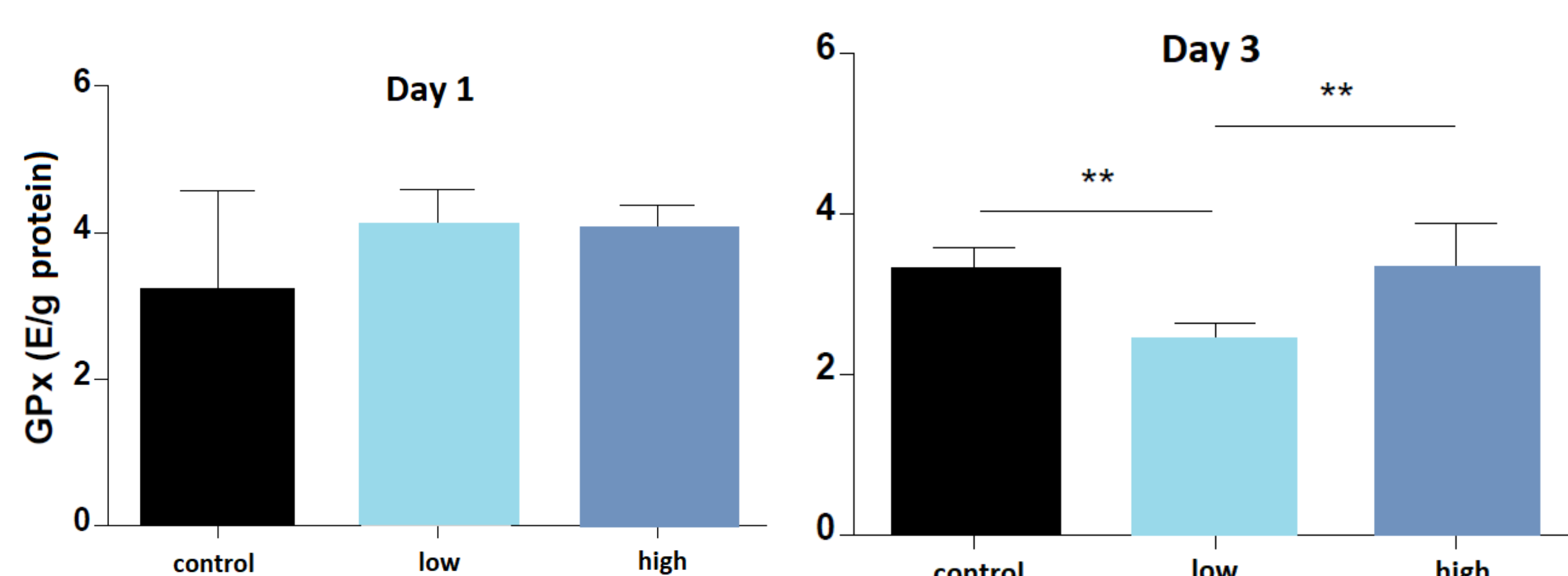


Fig 1.: Glutathione redox system

The enzymes, glutathione peroxidase (GPx), glutathione reductase (GR) use GSH as a substrate, and their actions result in fluctuations in the GSH:GSSG ratio. The scheme above shows the outcome of the reaction and the direction of GSH or GSSG production.

Biochemical changes

GPx



GSH

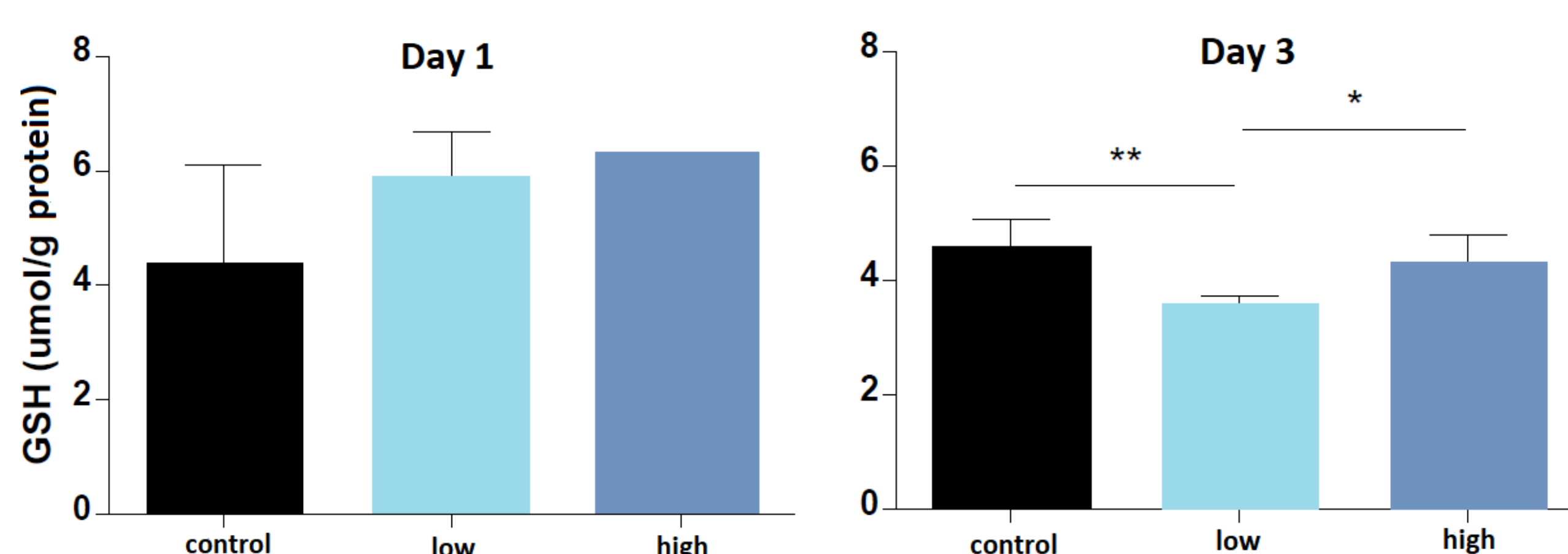


Fig 2.: Activity of GPx and amount of GSH were significantly decreased on day 3 as compared to the control in the low dose group, while the high dose group stayed higher than the control.

(*)P <0,05, (**)P <0,01, (***)P <0,001 (****)P < 0,0001

Gene expression changes

GPx4

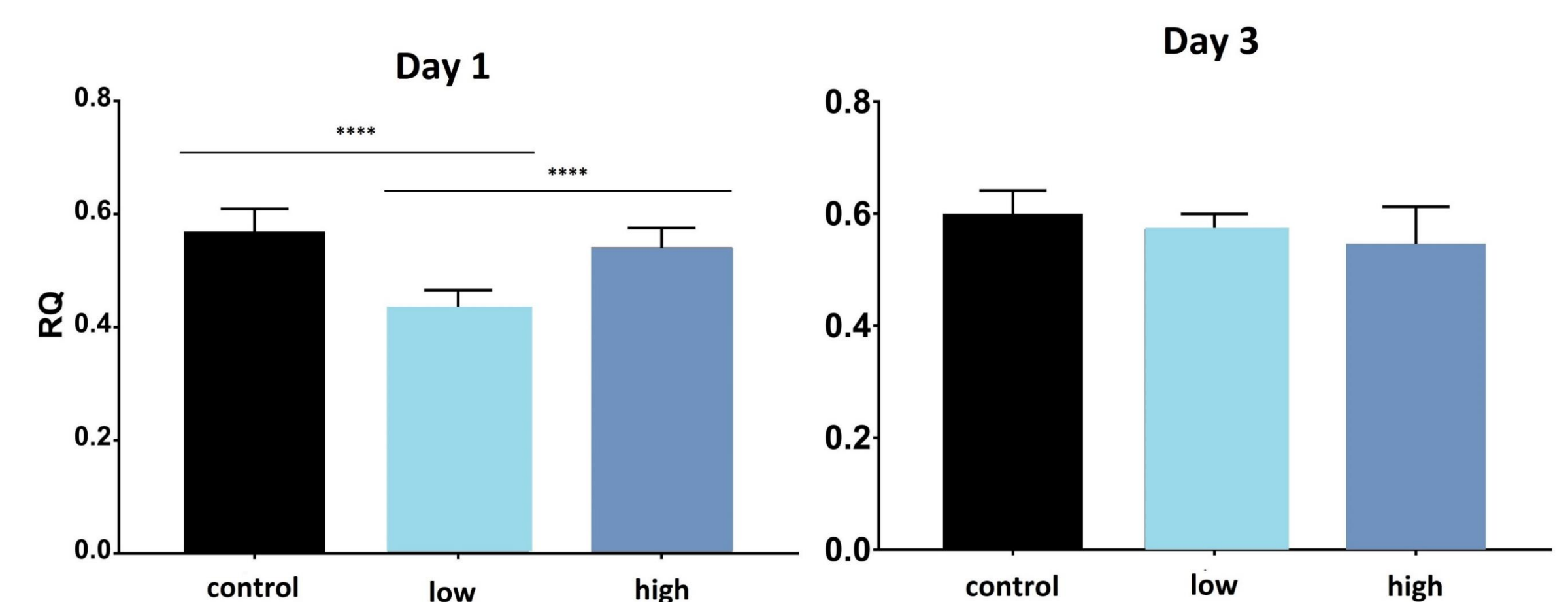


Fig 3.: Gene expression of GPx4

GPx4 is described in avian and fish species far more important in the antioxidant defence system as compared to mammals. GPx4 expression was decreased on day 1 in the low dose group, and on day 3 there was not significant changes.

GSS

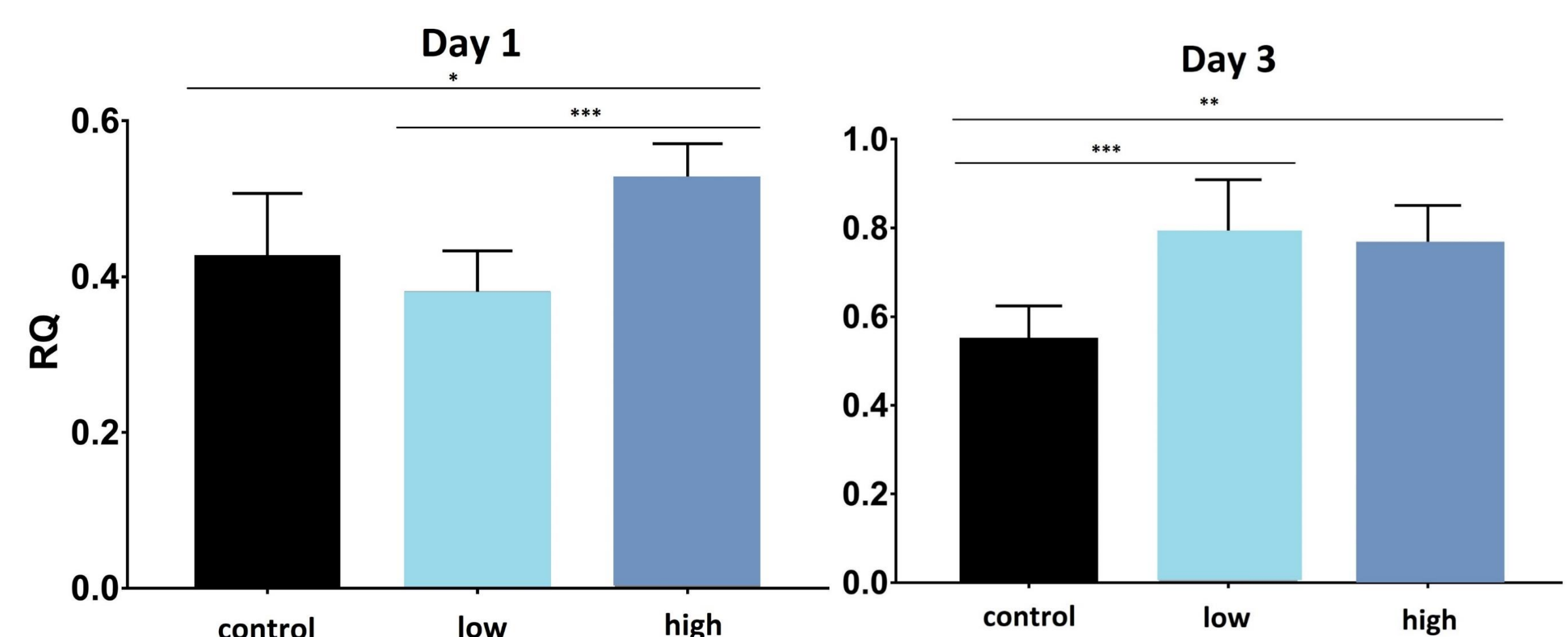


Fig 4.: Gene expression of GSS

GSS expression, which is the final enzyme in the GSH biosynthesis pathway, was significantly elevated on day 1 in the high dose group, compared to the control and in the low dose group. On day 3 the low dose group also showed elevated gene expression as compared to the control.

GSR

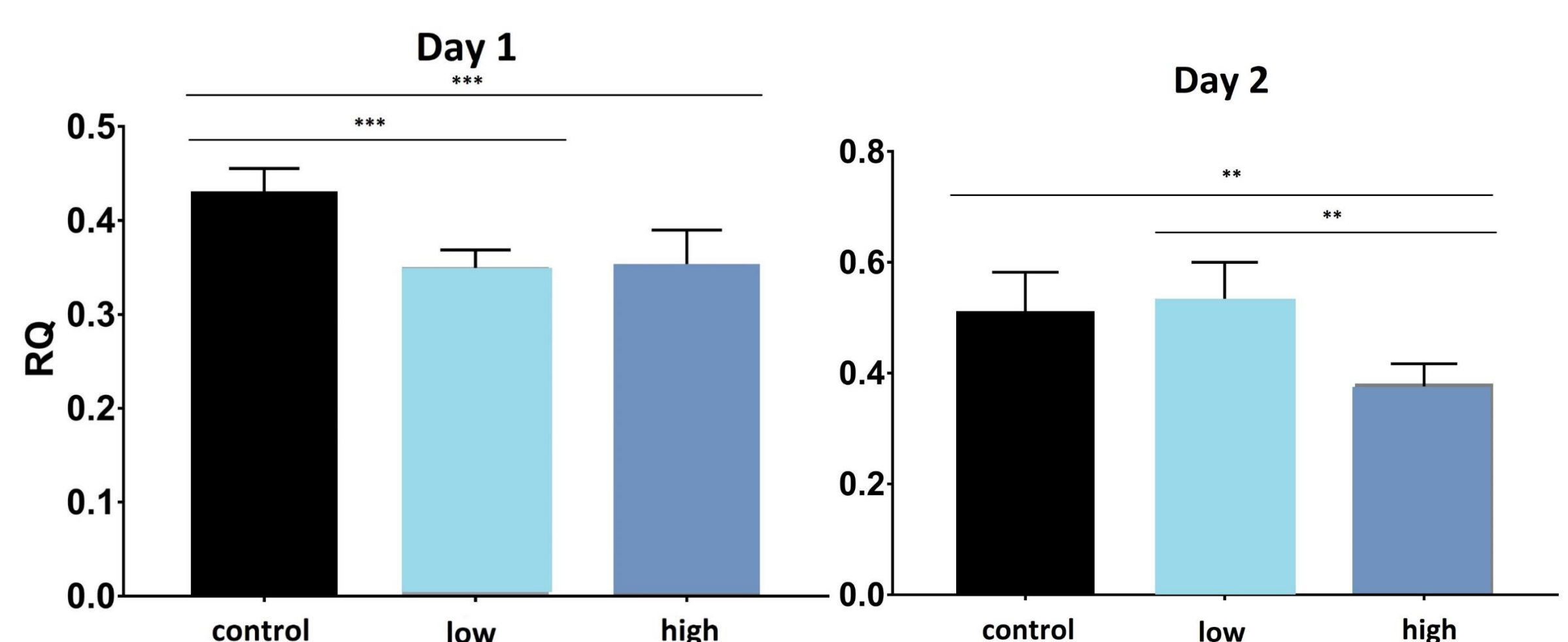


Fig 5.: Gene expression of GSR

GSR expression was significantly lower on day 1 in all treatment groups as compared to the control, and showed elevation in the low dose group on day 2.

Summary

- The results revealed that multi-mycotoxin exposure caused significant differences in the amount and activity of the glutathione redox system as a function of the exposure time.
- Relative expression of glutathione system encoding genes changed significantly on the day 1 in dose dependent manner. GSS expression elevated in both treatment groups on day 3, and on the day 2 GSR expression also elevated in the low dose group as compared to the high dose group. This can be the result of activation of the antioxidant defense system in the mycotoxin treated groups.
- According to the results can be concluded that the 3-day *Fusarium* multi-mycotoxin exposure probably emerged ROS formation, which resulted in the presented responses in the activation of the antioxidant system by its individual effects.

References

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The research was supported by the NVKP_16-1-2016-0016 and EFOP-3.6.3-VEKOP-16-2017-00008 co-financed by the European Union and the European Social Fund projects.