



COMBINED LONG-TERM EFFECTS OF *FUSARIUM* MYCOTOXINS ON RAT BRAIN SLICES

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Background

Mycotoxins produced by worldwide spread microscopic fungi, the *Fusarium* species are common contaminants of agricultural crops. Due to their heat-stability, *Fusarium* toxins can enter food chain leading to numerous adverse effects in animals and humans.

The aim of this study is to investigate the long-term neuronal effects of the three major *Fusarium* toxins: fumonisin B1 (FB1) which is known for inhibiting sphingolipid biosynthesis, deoxynivalenol (DON), a protein synthesis inhibitor and zearalenone (ZEA), a mycoestrogen. Since natural mycotoxin co-occurrence is very frequent, we compared the effects of pairwise combinations of the above-mentioned toxins compared to their individual effects.

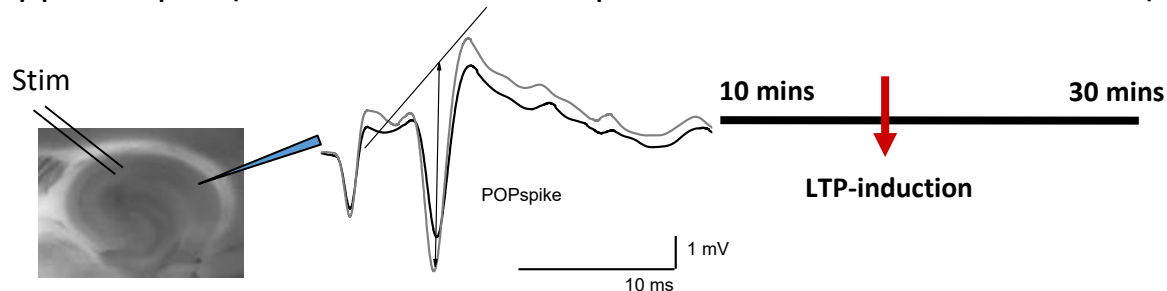
Materials & Methods



- Wistar rats of both sexes
- Treatment via gavage for 28 days
- FB1 (50 and 500 mg/bw kg) / DON (20 and 200 mg/bw kg) / ZEA (20 and 200 mg/bw kg)
- FB1-DON / FB1-ZEA / DON-ZEA in lower doses
- Electrophysiological measurements on rat brain slices

Hippocampus

Registration of toxic effects on long-term potentiation in the hippocampus (LTP, induced with a special theta-burst stimulus train)

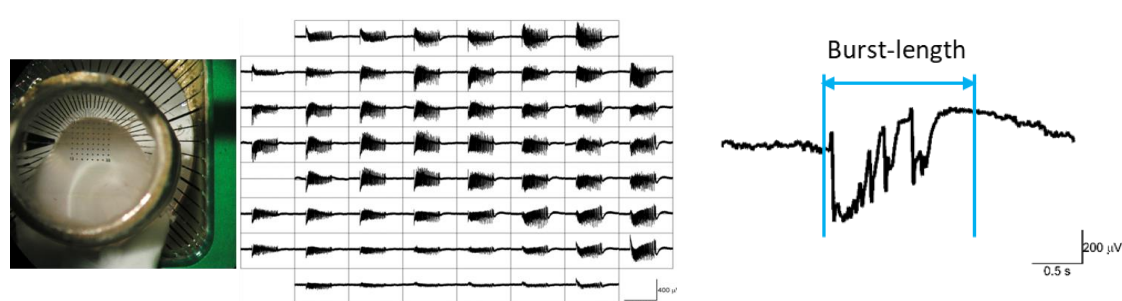


Cortex

2-channel recordings of toxic effects on epileptiform activity in the entorhinal and somatosensory cortices (induced with magnesium-free ACSF – MFR)



60-channel recordings of toxic effects on epileptiform activity in the entorhinal cortex (induced with MFR) using multielectrode array (MEA) chip.



Discussion

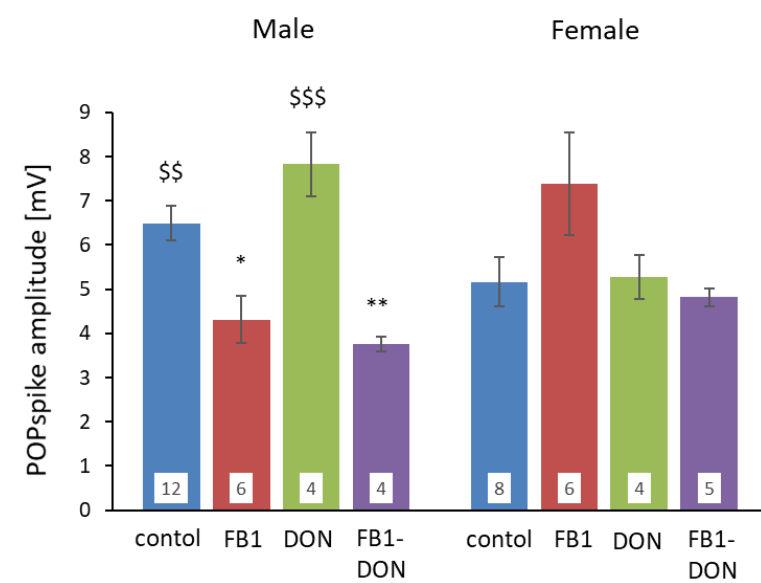
Due to the limitations representative data are shown in the poster. DON administered individually stimulated network excitability in the hippocampus while FB1 had negative effects. In contrary, treatment with the pairwise combination decreased excitability.

ZEA increased the length of seizure-like events in the cortex in a different extent according to the sex of the animals. However pairwise combinations of ZEA with the other toxins had no effect on the measured parameter. Further investigations with MEA revealed that DON-ZEA treatment has an excitatory fashion in males like ZEA itself but it seems to inhibit burst-length in females.

To evaluate these effects more precisely we need to elevate our sample size. In conclusion, all the three examined *Fusarium* toxins acted on neural networks in a different fashion depending on the type of toxin, sex of the animals and the studied brain area. Administration of the toxins in combinations, however, often resulted in the inhibition of the investigated electrophysiological features.

Results

Hippocampus



In the hippocampus FB1 had inhibitory effect on network excitability in case of males and excitatory in females. DON however stimulated network activity in males while there were no effects on females.

In combination they had no effect in females and were clearly inhibitory in males.

It seems like FB1 inhibited the excitatory effect of DON suggesting interactions between the two toxins.

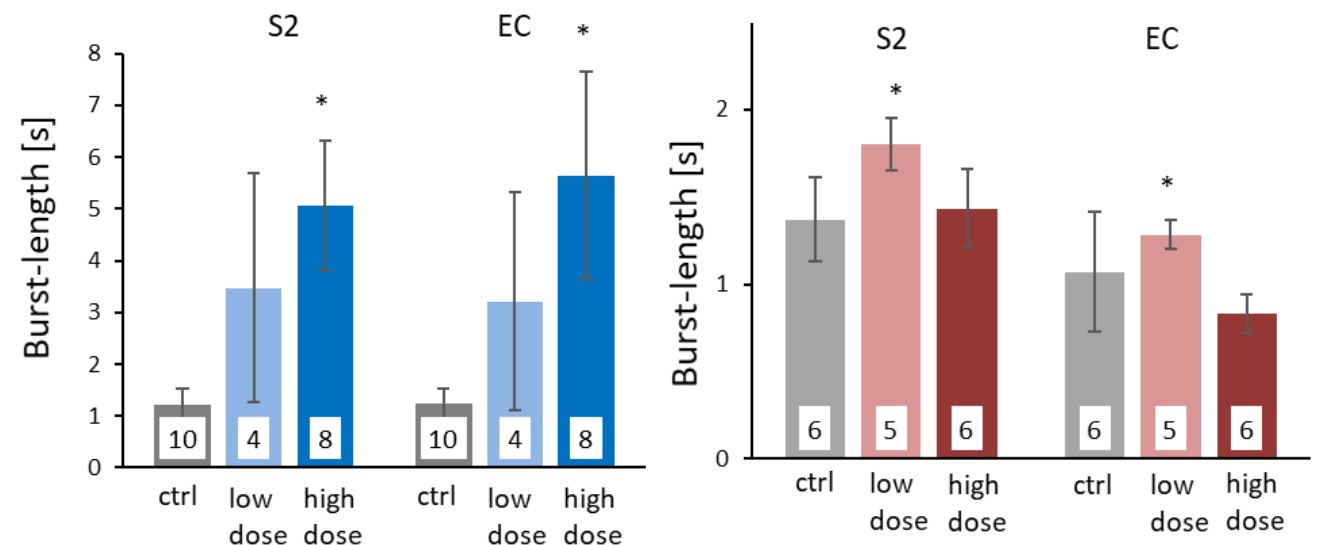
In contrast with the above-mentioned marked effects on network excitability, treatment with FB1, DON or FB1-DON had no effect on synaptic plasticity characterized by the effectivity of LTP.

* means significant difference compared to control.

\$ means significant difference compared to combined treatment.

Cortex

2-channel

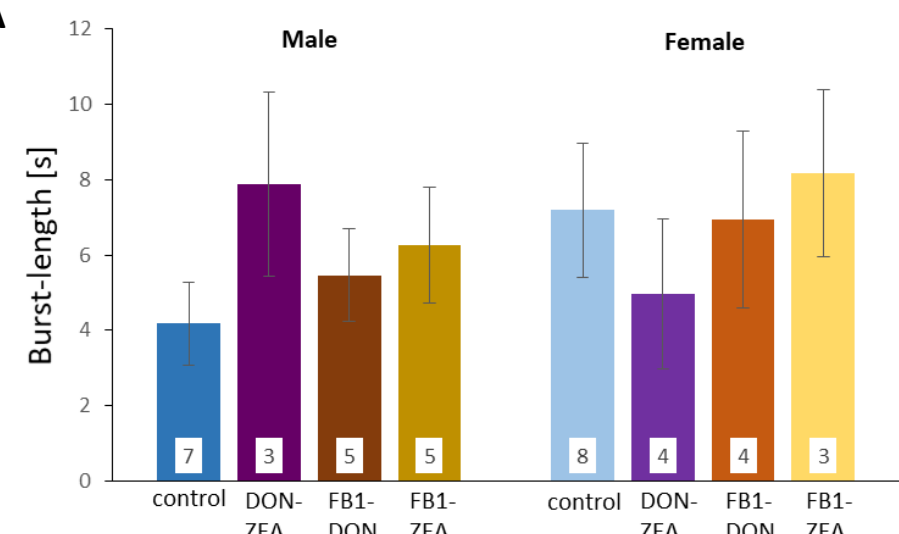


In the cortex ZEA increased burst-length in both male and female animals. Female ones were susceptible for the lower dose while burst-length of male rats was increased by the higher dose.

In contrast, treatments with pairwise combinations of ZEA with the other toxins had no effect in the two measured cortices.

* means significant difference compared to control.

MEA



In the entorhinal cortex the pairwise-combinations had no effect on the length of seizure-like events. However trends can be observed which shows that DON-ZEA treatment may increase burst-length in case of males but in females it acted in an inhibitory fashion.

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