



# MUSHROOM VERSUS MYCOTOXINS IN FOOD AND FEED: MUSHROOM METABOLITES IN CONTROL AND DETOXIFICATION



DIPARTIMENTO  
DI BIOLOGIA AMBIENTALE

SAPIENZA  
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DEGLI STUDI DI TRIESTE



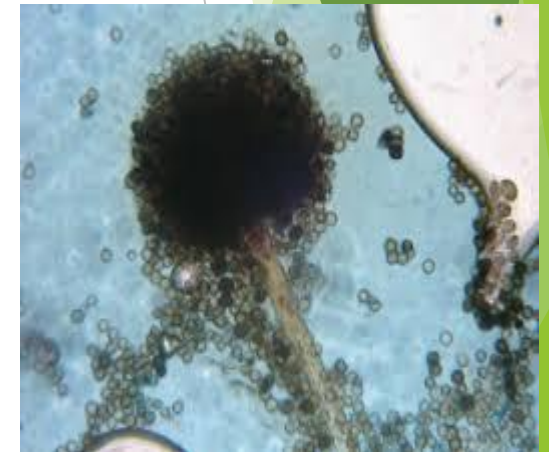
MEDICINAL  
MUSHROOMS

**Mycotoxins** – toxic secondary metabolites produced by some fungi toxic for humans and animals.

Only some fungal species produce mycotoxins, and they are referred to as toxigenic.

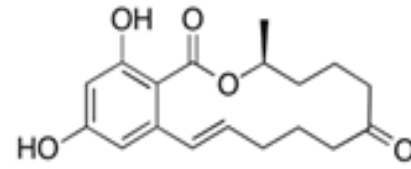


*Aspergillus flavus*

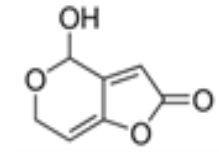


*Aspergillus carbonarius*

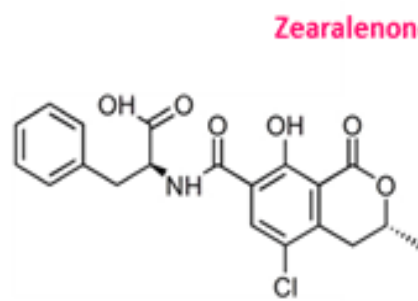
- Aflatoxin B1
- Ochratoxin A
- Patulin
- Fumonisin
- Ergot alkaloids
- Citrinin
- Zearalenone



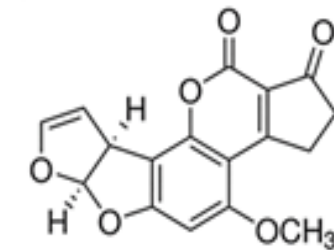
Zearalenone



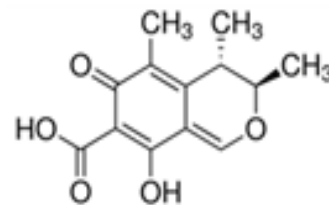
Patulin



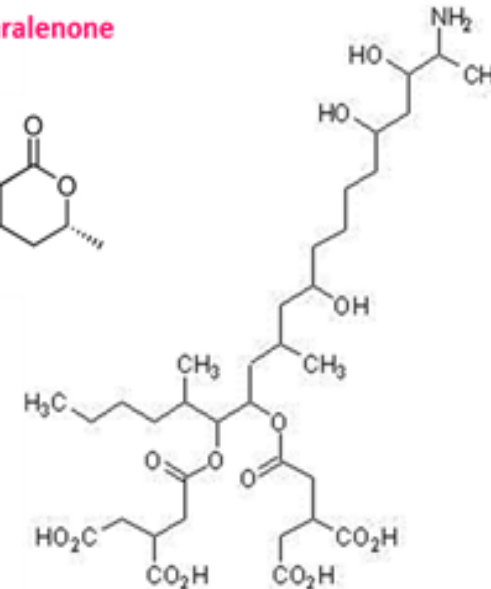
Ochratoxin A



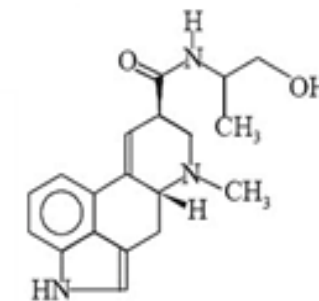
Aflatoxin B1



Citrinin



Fumonisin B1



Ergovine

EC 1881/2006

# Mycotoxins

- ▶ immunosuppressive
- ▶ genotoxic
- ▶ carcinogenic



## Mycotoxicosis in animal production

- ▶ Suppression of the immune system → major exposure to illness
- ▶ Interference with reproduction
- ▶ Impairment of growth

= Economic loss



Aflatoxin

**FOOD  
POISONING**



Feed  
Source



Human  
Consumption



Susceptible Foods



► **WHO** → it is almost impossible to produce food and feed completely free of mycotoxins

Contamination with mycotoxins is a worldwide problem



Different strategies to prevent mycotoxin contamination has been applied, but, till now, no one was resolvable.

Prevention and control strategies → chemical compounds.



- antifungals
- antioxidants
- fungistatics

EC - since 2014. banned 50% of chemicals used in agriculture

There is a need to develop more environmentally friendly tools and methods

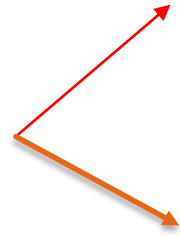
Mushroom glucans:

- non-toxic
- edible
- antioxidant activity
- enhance the immune system
- considered healing properties
- mitigate the negative effect of mycotoxins on animal health





Mushroom metabolites

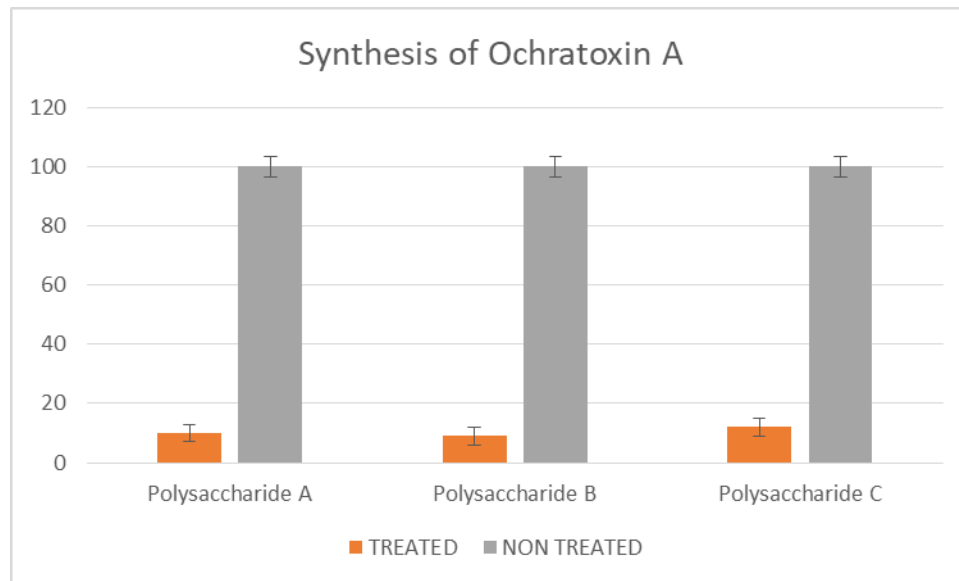


**PREVENTION**

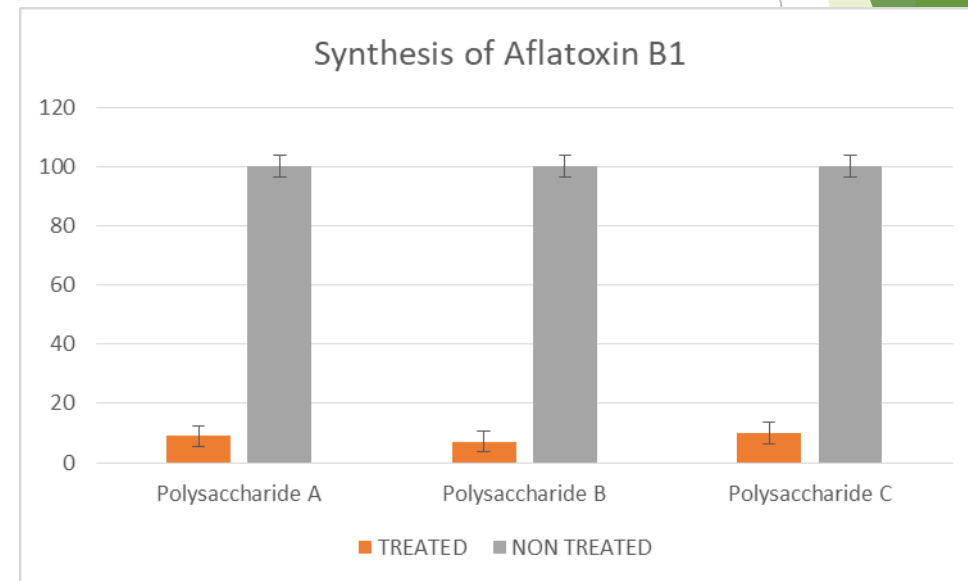
**DETOXIFICATION**

# Prevention

➔ the long lasting control of the biosynthesis of different mycotoxins at the same time.



Production of Ochratoxin A from *Aspergillus carbonarius* fungus treated and untreated with polysaccharides A, B and C, after 21 days of incubation



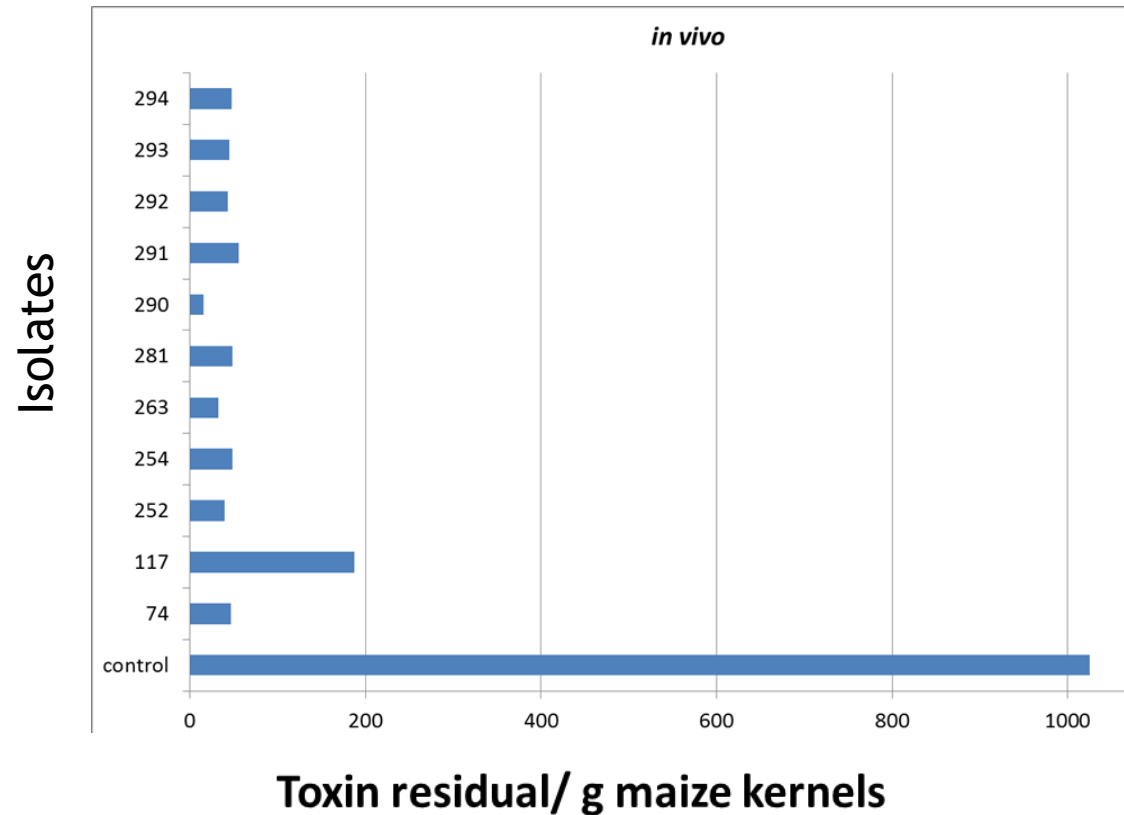
Production of Aflatoxin A1 from *Aspergillus flavus* fungus treated and untreated with polysaccharides A, B, and C after 21 days of incubation

# Detoxification

➔ AFB1 degrading potential of *T. versicolor* laccases on contaminated maize seeds



*A. flavus* inoculation on maize seeds (1 kg)  
Abot 1 ppm of AFB1 is produced after 10 days of incubation



Most cultural filtrates (xyloidine stimulated) degrade more than **90%** of AFB1 on maize seeds after 72 h of incubation

# Conclusion

Edible non-toxic mushrooms metabolites present potentially powerful tools for controlling mycotoxin contamination and detoxification of food and feed

The commercial application is under the study

Thank you for your attention!

