

# TOP 5 Lessons learned



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## PROGRAMME AT A GLANCE

### Sunday 8 October 2023

18:30 – 20:00	Welcome reception – sponsored by R-Biopharm Chocolate Nation, the Belgian Chocolate Museum
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### Monday 9 October 2023

11:00 – 12:30	Registration and light lunch	EXHIBITION
12:30 – 13:15	<b>OPENING SESSION</b> Welcome to WMFmeetsBelgium	
13:15 – 14:15	<b>PLENARY SESSION</b> Grand challenges for a sustainable, safe, and inclusive food future	
14:15 – 16:00	<b>PLENARY SESSION</b> Interactive debate – A world tour on climate change and the battle against mycotoxins	
16:00 – 16:30	Networking break & poster viewing	
16:30 – 17:45	Speed presentations and Company pitches	
17:45 – 19:00	Wine & Cheese tasting – sponsored by dsm-firmenich and Romer Labs	

### Tuesday 10 October 2023

08:30 – 10:30	<b>SESSION 1</b> Focus on mycotoxigenic fungi, plants, and soil	<b>SESSION 2</b> Sampling and mass spectrometry- based approaches for mycotoxin analysis: an update	EXHIBITION
10:30 – 11:00	Networking break & poster viewing sponsored by Charm Sciences		
11:00 – 12:30	<b>SESSION 3</b> Mycotoxin exposure assessment and human health	<b>SESSION 4</b> Mycotoxins and their impact on animal health	
12:30 – 14:00	Lunch break & poster viewing		
12:45 – 13:45	Workshops by R-Biopharm, dsm-firmenich and GSD		
14:00 – 15:30	<b>SESSION 5</b> Managing and mitigating mycotoxin risks	<b>SESSION 6</b> Mycotoxins and animal performance	
15:30 – 16:00	Networking break & poster viewing		
16:00 – 17:00	<b>SESSION 7</b> Mycotoxin management in a sustainable future	<b>SESSION 8</b> Data-driven mycotoxin management	
17:00 – 18:00	WMF Young Scientists Forum – sponsored by Selko		
19:00 – 23:00	zoo tour & conference dinner ( <i>reservations only</i> )		

### Wednesday 11 October 2023

08:45 – 10:15	<b>SESSION 9</b> Update on global mycotoxin research and new concepts	<b>SESSION 10</b> Novel and alternative techniques in mycotoxin analysis and fungal detection	EXHIBITION
10:15 – 10:45	Networking break & poster viewing		
10:45 – 12:25	<b>PLENARY SESSION</b> Future perspectives		
12:25 – 12:35	Best Poster Award presentation – sponsored by Cargill		
12:35 – 13:00	WMFmeetsBelgium – Top Five Answers learned		
13:00	Closing of WMFmeetsBelgium		
13:30-14:30	General Assembly ISM		

- The conclusions from 13 (+3) editions of the WMF organised between 2001 and 2022 have been summarised by the general conference chair(s) as the ‘top 5 lessons learned’ on the last day of each conference
- We will continue this tradition in Antwerp!



BRILL  
WAGENINGEN  
ACADEMIC

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OPINION ARTICLE

## Lessons learned from 16 editions of the World Mycotoxin Forum 50 years after the first international conference on mycotoxins

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# WMF conferences on mycotoxins since 2001

In total, **14 WMF conferences** (3 of which as WMFmeetsIUPAC events) have been organised so far.

Conference	Year	Town	Country	Number of participants
WMF	2001	Noordwijk	Netherlands	175
WMF	2003	Noordwijk	Netherlands	186
IUPAC	2004	Washington DC	USA	300
WMF	2005	Noordwijk	Netherlands	197
WMF	2006	Cincinnati	USA	222
IUPAC	2007	Istanbul	Turkey	580
WMF	2008	Noordwijk	Netherlands	239
WMF	2010	Noordwijkerhout	Netherlands	263
WMFmeetsIUPAC	2012	Rotterdam	Netherlands	330
WMF	2014	Vienna	Austria	358
WMFmeetsIUPAC	2016	Winnipeg	Canada	373
WMF	2018	Amsterdam	Netherlands	391
WMFmeetsIUPAC	2019	Belfast	Northern Ireland/UK	399
WMF	2020	Bangkok	Thailand	259
WMF	2022	Parma	Italy	401
WMF	2023	Antwerp	Belgium	420

**1.  
The WMF  
has never  
attracted  
so many  
participants!**

## 2. We need more WMF events

### (Top 5) Lessons learned from the World Mycotoxin Forum

*The 1<sup>st</sup> WMF, Noordwijk, the Netherlands, May 14-15, 2001*

1. There is a lot of attention on regulatory/enforcement issues, and
2. A substantial focus on supply chain management.
3. Major emphasis is on prevention and decontamination.
4. In the analytical arena, sampling issues, antibody-based techniques, biosensors, and near infrared spectroscopy are increasingly important.
5. The future: ... further conferences!





### 3. Fabulous local conference chairs!



Rudolf Krska @RudolfKrska · 9. Okt.

Great opening of the 14th World #Mycotoxin Forum in Antwerp, Belgium  
[@MycotoxinForum](#)



3



17



451

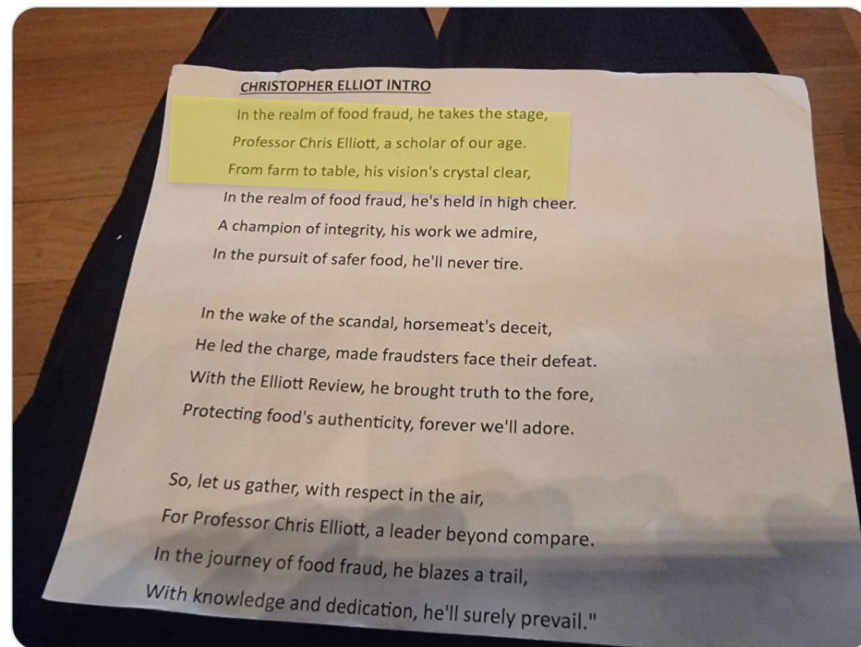


## 4. Never before have the speakers been introduced through a poem



**Prof Chris Elliott OBE** @QUBFoodProf · 9. Okt.

Overwhelmed by the introduction of my plenary lecture at @MycotoxinForum . I've never had a poem written about me before! 🥰



2



2



33



2.340



### RUDOLF KRKA INTRO

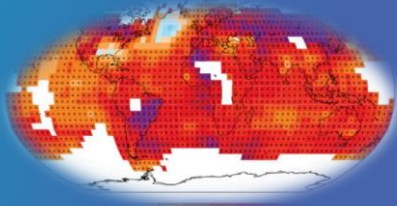
In the world of science, a luminary stands,  
Professor Rudolf Krška, with skilled and steady hands.  
A mycotoxin maestro, in research profound,  
With intellect and insight, he's renowned.

In food safety's realm, he's paved the way,  
Detecting toxins and risks, come what may.  
With methods innovative, and wisdom to share,  
His expertise ensures we all breathe easier in this air.

So, with respect and honor, we gather today,  
To welcome this scholar in a grand display.  
Ladies and gentlemen, let's give a resounding cheer,  
For Professor Rudolf Krška, we're privileged to have here.



## 5. This year's WMF has been dominated by climate change



Wed 11th



23°  
14°

# WEATHER

Antwerp|





# ISM DEBATE – a world tour on climate change and the battle against mycotoxins

- ~ 30% of the mycotoxin community performs R&D on climate change and its impact on mycotoxins
- Only 10% of the mycotoxin community submits mycotoxin occurrence data to EFSA.
- No harmonized data for long-term studies to relate these data with climate change
- Information on geolocation of sampling is relevant for climate change monitoring studies and prediction tools



# A lot of lessons learned.....



## DATA-DRIVEN MYCOTOXIN MANAGEMENT

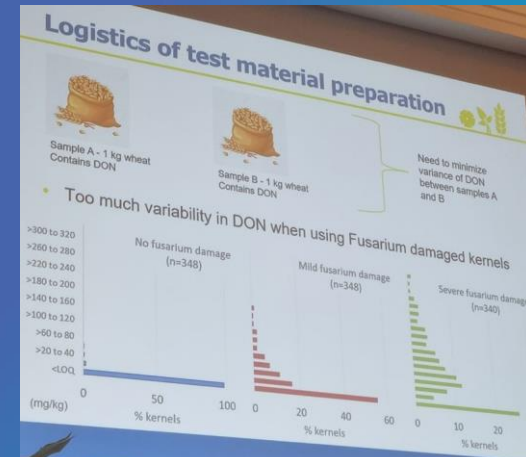
- **An acronym soup for better risk assessment of DON: HBM, NAMS, TK-TD, MCMC, HDMI, and more!**  
The authors (Dr. Chiu et al) presented risk characterization of DON by using bayesian modeling to quantify inter- and intraspecific toxicokinetic and toxicodynamic differences to replace the current tolerable daily intake standard.
- **A new *in silico* tool for the prediction of mutagenicity, genotoxicity, and carcinogenicity of over 4,000 mycotoxins**  
Dr. Palomino-Schätzlein presented a user-friendly webserver that provides predictions of genotoxicity, carcinogenicity, and mutagenicity of mycotoxins. They aim to help prioritize assessment of the emerging mycotoxin risk by using their tool.
- **Predictive models to manage mycotoxin outbreaks in the USA**  
Dr. Lina Castano-Duque presented a geospatially dynamic model to predict mycotoxin contamination of maize in the state of Illinois-USA based on gradient boosting and neural networks. Their model highlighted the correlation between pre-or post-planting weather parameters, soil properties with fumonisin contamination at harvest.
- **Resilience of the food supply chain to food safety shocks: case of mycotoxins**  
Dr. Ine van der Fels-Klerx advanced a long-range plan for resilient food supply chain that can withstand disturbances caused by mycotoxin contamination, which is expected to adapt and expand due to climate change.

# A lot of lessons learned.....

- Mycotoxins can occur in **soil** and be transported throughout the plants.
- There is a paradigm shift from the classical one pathogen = one disease to **the pathobiome model**.
- **Poly-omics approaches** are powerful tools to explore mycotoxin production of fungi.
- Mycotoxins indirectly affect the food chain by adverse **effects on salmon and poultry**.
- **A holistic approach is pursued** to reduce the presence and impact of mycotoxins by means of detoxifiers and natural antioxidants.

# A lot of lessons learned.....

- **Ergot alkaloids**: absence of sclerotia does not necessary exclude their presence and rapid test methods performances are still too far from the LC-MS outcomes.
- New scenario for the labs: more technology, more **metrological traceability**, inter-comparability of MS analytical platforms and “doped” kernels in the PT tests.
- **Human biomonitoring** is now a well-established trajectory that goes from non-targeted screening to targeted analysis to retrospective assessment.
- **Proficiency testing** does usually not assess the performance of the crucial step of sampling and sample processing which could be 600x greater than the variance due to the analytical test.





# A lot of lessons learned.....

- Mycotoxins **disrupt the ruminal microbiome** of bovines, and potentially leads to health problems, such as acidosis.
- **Poultry species differ and their susceptibility** to mycotoxins, specially AFB1. This should be taken into account when recommending maximum levels of mycotoxins to different bird species.
- Mycotoxins make animals **more susceptible to bacterial infections**.



# A lot of lessons learned.....

- Need for balance, e.g.,
  - risks and benefits of meat alternatives
  - "greenness" of a method and its accuracy, precision, etc.
  - risk and nutrition/taste/satisfaction of food products
- New data needs: mycotoxins in "new foods", such as meat alternatives
  - harmonization of "green" principles
- Need to re-evaluate previous ideas in light of new data
  - e.g., maybe no need to discard whole loaf of bread with a moldy slice; consider efficacy of management options within risk assessment framework

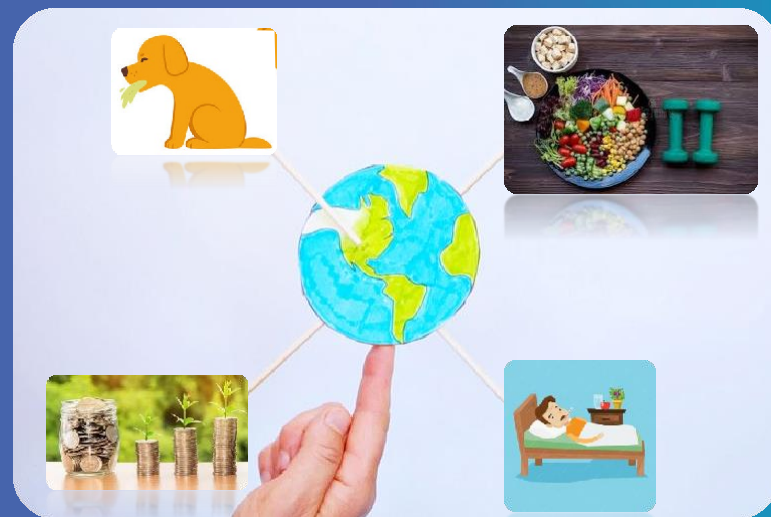


# TOP 5 Lessons learned at the 14<sup>th</sup> World Mycotoxin Forum in Antwerp

1. We need advanced **long-range plans for resilient food supply chains** that can withstand disturbances caused by mycotoxin contamination.
2. ***In silico* tool** (web server) for the prediction of mutagenicity, genotoxicity and carcinogenicity of over **4000 mycotoxins**.
3. New data needs: **mycotoxins in "new foods"**, such as meat alternatives.
4. Comparability: **Proficiency testing** does usually not assess the performance of the crucial step of sampling and sample processing.
5. **Increasingly important role of AI / machine learning**, e.g., in the prediction of mycotoxin occurrence, testing systems, and in the design of detoxifiers.

# MANAGING MYCOTOXINS IN A SUSTAINABLE FUTURE:

“It’s all about finding the  
right balance”





# Supplementary Material: Summaries of the Session Chairs

## SESSION 1: Focus on mycotoxigenic fungi, plants and soil

## Conclusions:

- Genomic analyses provide reliable information about the safety of fungal products.
- Mycotoxins can occur in soil and be transported throughout the plants.
- There is a paradigm shift from the classical one pathogen = one disease to pathobiome model.

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## Top Lesson learned:

- Poly-omics approaches are powerful tools to explore mycotoxin production of fungi.

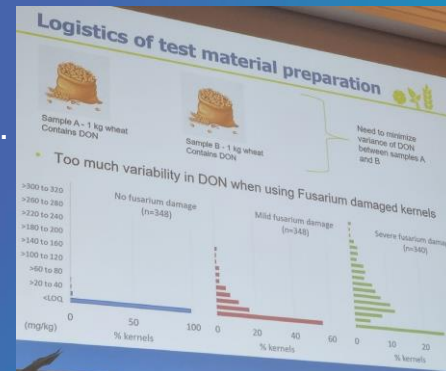
## SESSION 2: Sampling and MS-based approaches for mycotoxin analysis - an update

### Conclusions:

- Ergot alkaloids: (i) absence of sclerotia does not necessary exclude their presence; (ii) rapid test methods performances are still too far from the LC-MS outcomes; (iii) contributing factors includes changes in farming practices and weather conditions.
- New scenario for the labs: more technology, more metrological traceability, inter-comparability of MS analytical platforms and “doped” kernels in the PT tests.
- Human biomonitoring is now a well-established trajectory goes from non-targeted screening to targeted analysis to retrospective assessment.

### Top Lesson Learned:

- Variance due to sample preparation is comparable to the one of analytical test.



## SESSION 3: Exposure assessment and human health

### Conclusions:

- Intravital imaging in combination with HPLC-MS/MS is a powerful tool to analyze the distribution of mycotoxin and metabolites in tissue
- Human hair can be used for biomonitoring purposes
- More concrete HBM studies (including exposome) have to be performed enabling the development of health-based guidance values (HBGV)
- The human metabolism of (emerging) mycotoxins is often unclear and remains unresolved
- Investigations on combinatorial effects of co-occurring mycotoxins, and other compounds related to the genome and exposome, are needed



## SESSION 4: Mycotoxins and their impact in animal health

### Conclusions:

- Mycotoxins disrupt the ruminal microbiome of bovines, and potentially leads to health problems, such as acidosis.
- Poultry species differ and their susceptibility to mycotoxins, specially AFB1. This should be taken into account when recommending maximum levels of mycotoxins to different bird species.
- Mycotoxins make animals more susceptible to bacterial infections.

### Top Lesson Learned:

- Mycotoxins are detrimental to animal health not only by their direct toxicity, but also by unbalancing host protection systems.



## SESSION 5: Managing and mitigating mycotoxin risks

### Conclusions:

- Artificial intelligence could become a good tool to improve current mitigating activities.
- Using the correct agricultural practices and cropping systems may have a huge potential to reduce mycotoxin contamination in the field.
- The use of natural compounds and innovative mitigation technologies could provide a good alternative to current non-environmentally friendly practices.

### Top Lesson Learned:

- Although there has been advances in this area during the last years there is still lots of work to be done to transfer science from the laboratory to real world production facilities.

## SESSION 6: Mycotoxins and animal performance

### Conclusions:

- Mycotoxins indirectly affect the food chain by adverse effects on salmon and poultry.
- A holistic approach is pursued to reduce the presence and impact of mycotoxins by means of detoxifiers and natural antioxidants.
- Machine-learning modelling is in the lift!

### Top Lesson Learned:

- ML models to design detoxifiers should also take into account micronutrient levels & naturally contaminated feed should be taken into account when executing mycotoxin-animal trials.



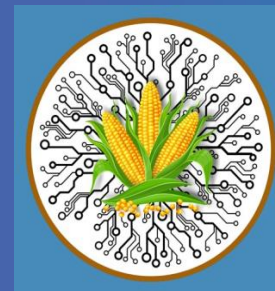
## SESSION 7: Managing mycotoxins in a sustainable future

### Top Lesson Learned:

- “It’s all about finding the right balance”



## SESSION 8: Data-driven mycotoxin management



### Conclusions:

- An acronym soup for better risk assessment of DON: HBM, NAMS, TK-TD, MCMC, HDMI, and more! The authors (Dr. Chiu et al) presented risk characterization of DON by using bayesian modeling to quantify inter- and intraspecific toxicokinetic and toxicodynamic differences to replace the current tolerable daily intake standard.
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## SESSION 9: Update on global mycotoxin research and new concepts

### Conclusions:

- Peanut production increased 17-fold since 2000 in Ethiopia as the crop is far less water consuming. Aflatoxin contamination is extremely high with little awareness and training of farm workers. **Radio was identified as the most important training tool** in Ethiopia. No country on its own can solve the mycotoxin issue.
- **Collaboration** of countries, policy makers, food industry, consumers and food safety experts is **the only way forward to mitigate the mycotoxin issue globally**.
- WHO is determining the **global health health burden caused by** food-borne illnesses, including **aflatoxins**. By **updating the study** every decade real impact of food-borne illnesses and mitigation strategies can be quantified now.



## SESSION 10: Novel and alternative techniques in mycotoxin analysis and fungal detection

### Conclusions:

- Regardless of the technology used, portability is needed for on-site-testing.
- One size does not fit all for mycotoxin testing. 'Fit for purpose' testing is critical.
- More work is needed in this area to ensure the continued development of faster, cheaper, better testing.

### Top Lesson Learned:

- Rapid and reliable mycotoxin testing is ever evolving.