



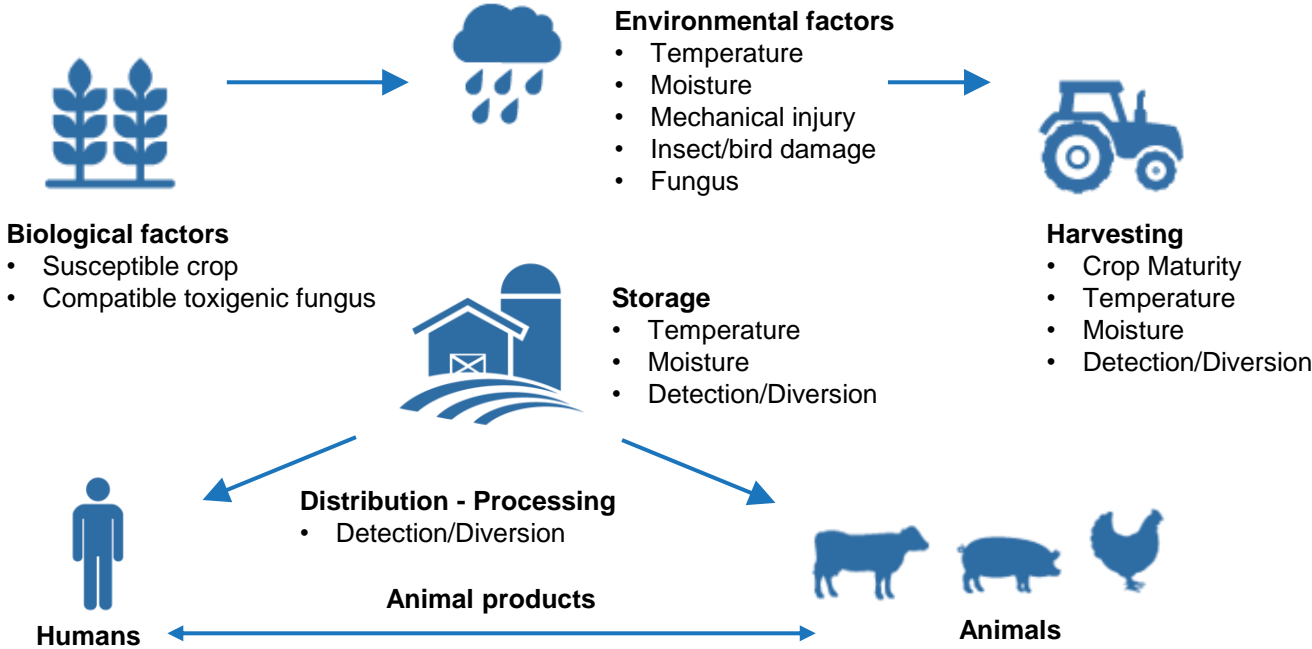
UltraSorb Overview

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Manger
Feed Additives*

volac 

Mycotoxin occurrence

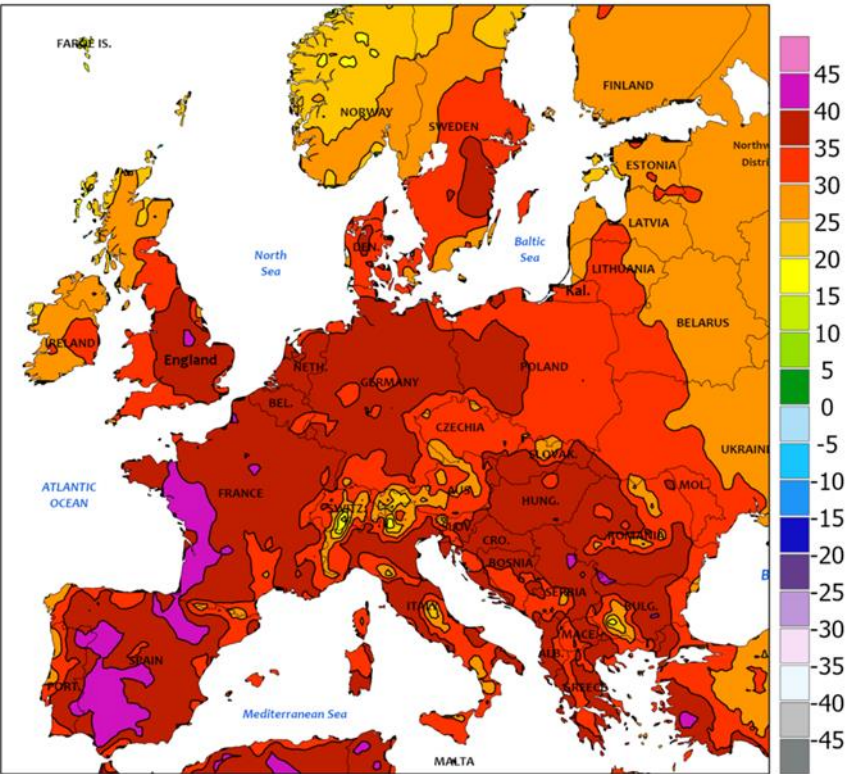
Factors affecting Mycotoxin occurrence in the food chain



Mycotoxin occurrence



EUROPE
Extreme Maximum Temperature (C)
July 17 - 23, 2022

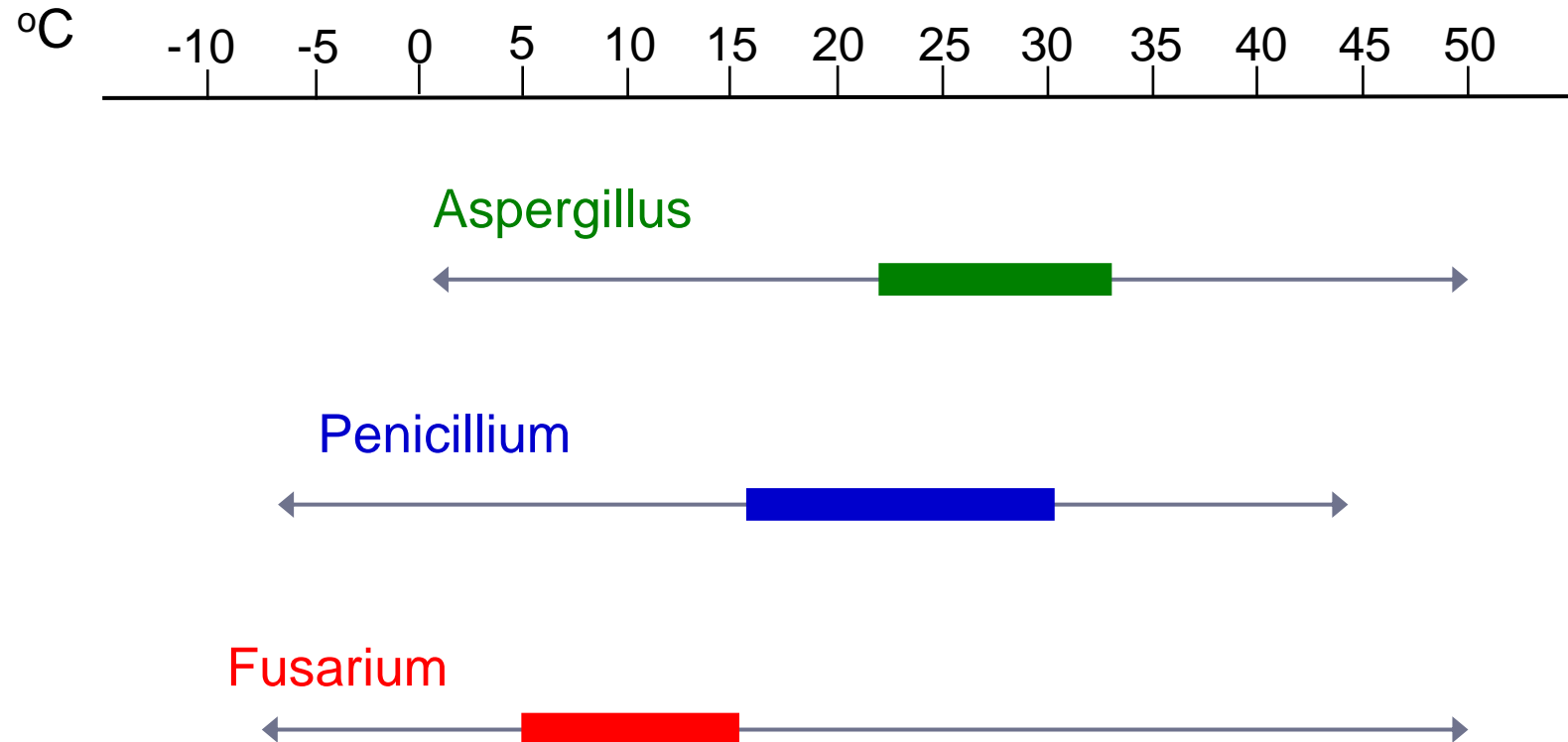


CLIMATE PREDICTION CENTER, NOAA
Computer generated contours
Based on preliminary data



Characteristics of mould growth

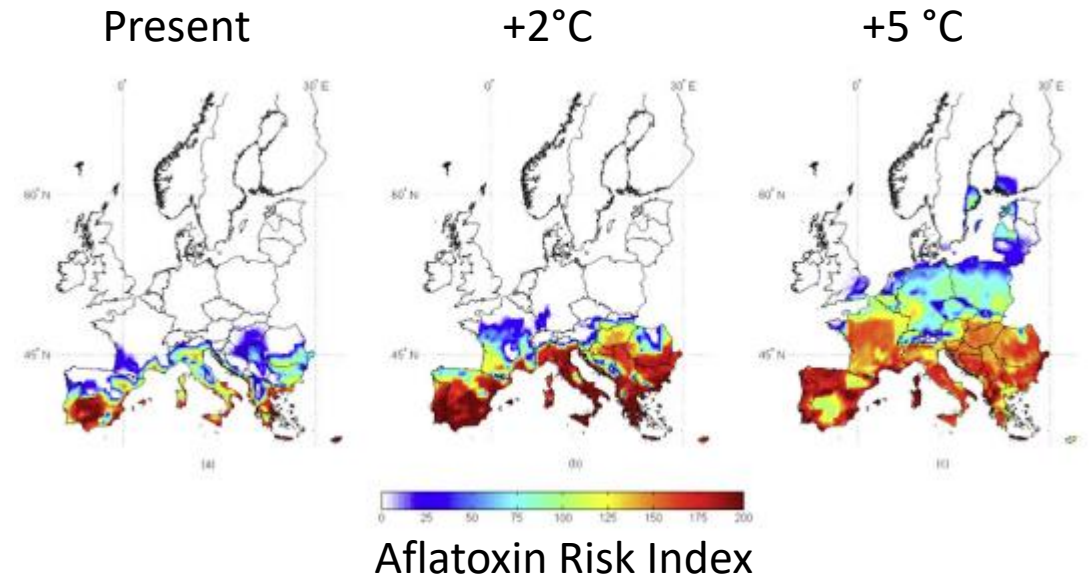
Moulds can grow over a wide range of temperatures



Europe Summary

- Still early days but a lot of factors have been present to show increased levels of mycotoxins
- DON and T2 still represent the major risk in feed ingredients particularly in Cereals and Co-Products
- Warmer temperatures have favoured a higher incidence of Aflatoxins, especially in the southern of Europe

Risk maps for aflatoxin contamination in maize at harvest in 3 different climate scenarios



Battilani *et al.*,(2016)

Mycotoxin impact on animal health

Mycotoxin	Toxic Effect	Species
AFB1	Damage to liver, immune disorders	All animal species
DON	Reduced feed efficiency Feed refusal / anorexia, Emesis, immune disorders	All animal species, pigs being the most sensitive
ZEA	Reproductive disorders immunosuppression	All animal species, pigs being the most sensitive
FB	Damage to organs (liver, lungs and heart), nerve damage, Reduced immune response	All animal species, highly toxic to horses
T-2 Toxin	Cutaneous lesions, Reproductive disorders, Immunosuppression	All animal species, highly toxic to cats

Remediation of mycotoxins in animal feed

Mycotoxin-detoxifying agents

“substances for reduction of the contamination of feed by mycotoxins: substances that can suppress or reduce the adsorption, promote the excretion of mycotoxins or modify their mode of action.”

Definition regulation (EC) N°386/2009 12/05/2009

Options

Mycotoxin modifiers / Bio-transforming agents:

- Degradation to non toxic metabolites
- Bio transforming agents include bacteria / yeasts / fungi and enzymes

Adsorbing agents (binders)

Clays - Bentonite, montmorillonite, aluminosilicate, activated charcoal

Yeast cell walls - Binding Ochratoxin & Zearalenone

What is Mycotoxin Remediation?



Controlling mycotoxin risks by:

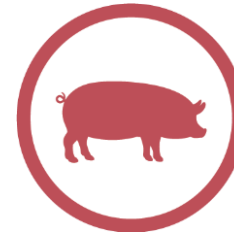
- Specially selected biologically active ingredients to bind, transform and degrade mycotoxins within the animal
- Unique species-specific formulations, targeted to the types of mycotoxin commonly seen in their feeds
- Essential oils to counteract adverse effects from toxins



UltraSorb R
MYCOTOXIN REMEDIATOR



UltraSorb P
MYCOTOXIN REMEDIATOR



UltraSorb S
MYCOTOXIN REMEDIATOR

UltraSorb is species specific

Because animal feeds contain differing amounts of forage, grains and corn, the range of mycotoxins they are exposed to are different.

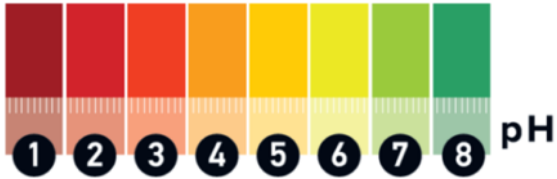
Volac tailor the formulation of each product in its range to support the industry and exposure level of mycotoxin

Different Relative Toxicity

Toxin	Poultry	Swine	Ruminant
Aflatoxins	+++	+	+
Ochratoxins	+++	+	+
Fumonisin	+	+++	+
Zearalenone	+	+++	+++
Deoxynivalenol	+	++	++
T2 Toxin	+++	++	+++

UltraSorb is Species Specific

Different Gut pH and Transit Time



Ruminant	Time, h
Esophagus/Mouth	0
Rumen	<24
Omasum	<5
Obomasum	<9

Pig	Time, h
Esophagus/Mouth	0
Stomach	0-6
Small intestine	2-6
Large intestine	20-43

Poultry	Time, h
Esophagus/Crop	50
Proventriculus/gizzard	90
Duodenum	5 -8
Jejunum	20-30
Ileum	50-70
Caecum	24-48 h
Colon/rectum	24

Mode of Action

Binds

A blend of highly adsorbent minerals to bind a wide range of mycotoxins and their derivatives to render them harmless to the animal.

Degrades

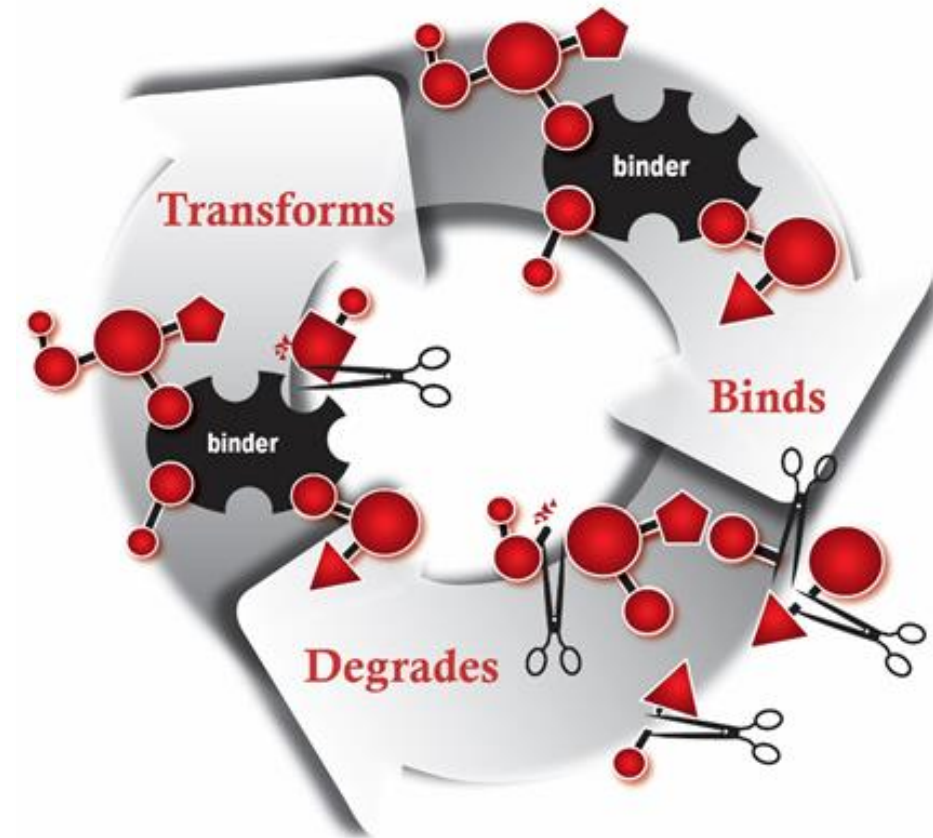
Degrades mycotoxins into smaller less toxic molecules making them easier to bind

Transforms

Biologically active YEAST DERIVATIVES transform the molecular structure of mycotoxins to improve binding efficacy

Protects

A unique blend of essential oils protects against adverse effects of toxin-forming moulds which may be present in the feed.



UltraSorb Composition

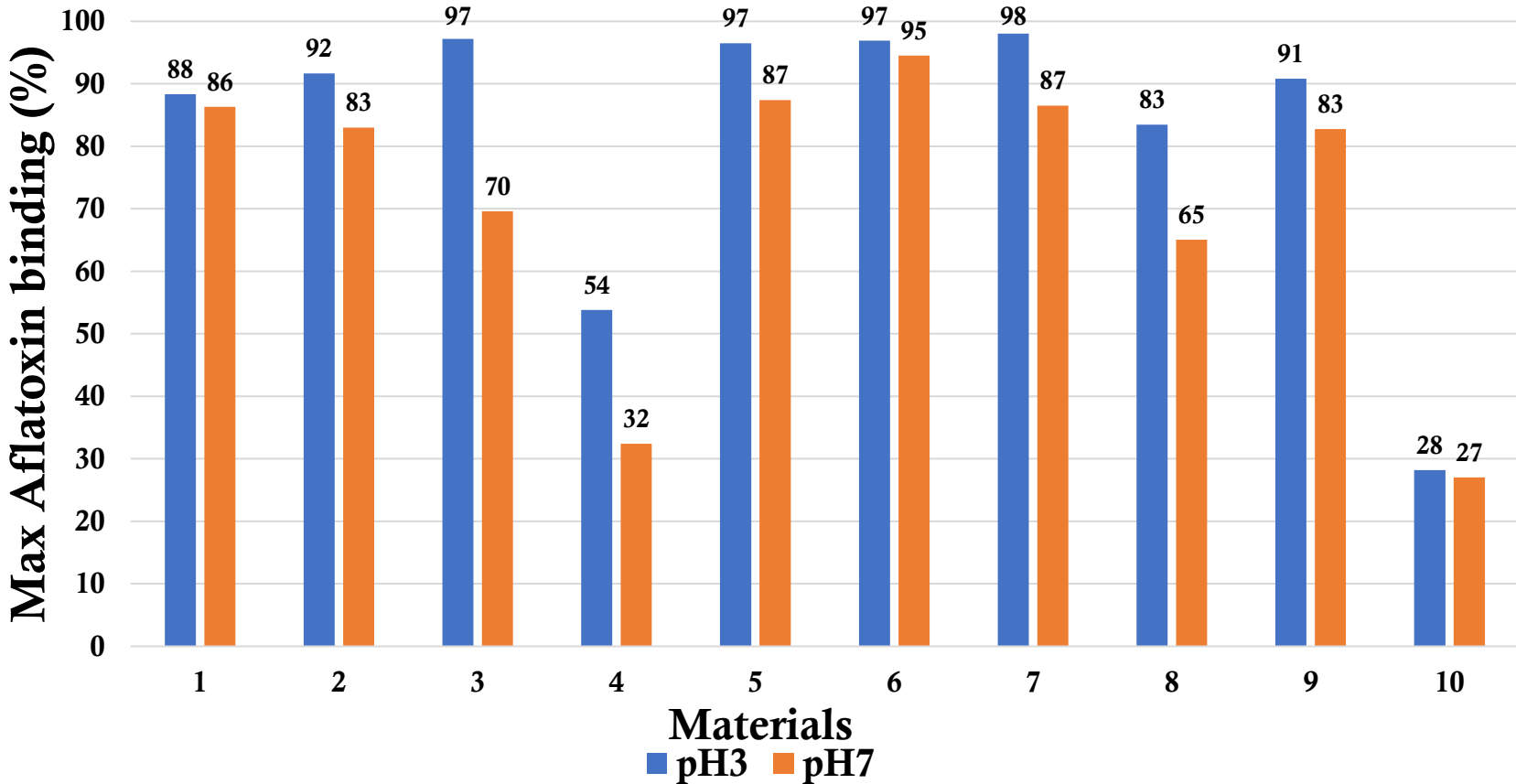
Inorganic mineral binders are selected to adsorb species specific polar mycotoxins at pH 3 and pH 7. (70%)

Organic binders selected to adsorb species specific non-polar mycotoxins. (20%)

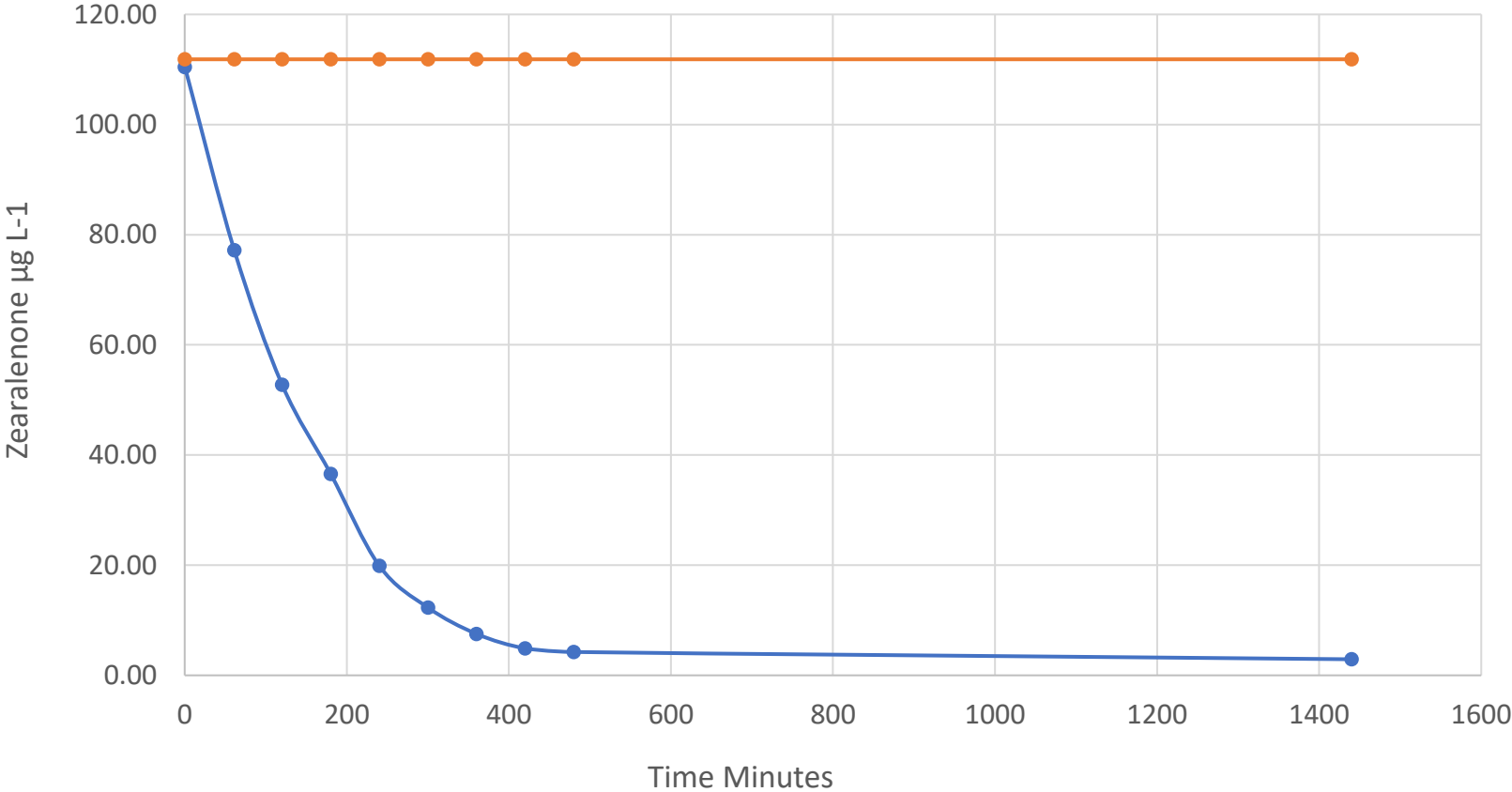


The core is based on a blend of yeast components derived from *Saccharomyces cerevisiae* to drive transformation and degradation processes. (10%)

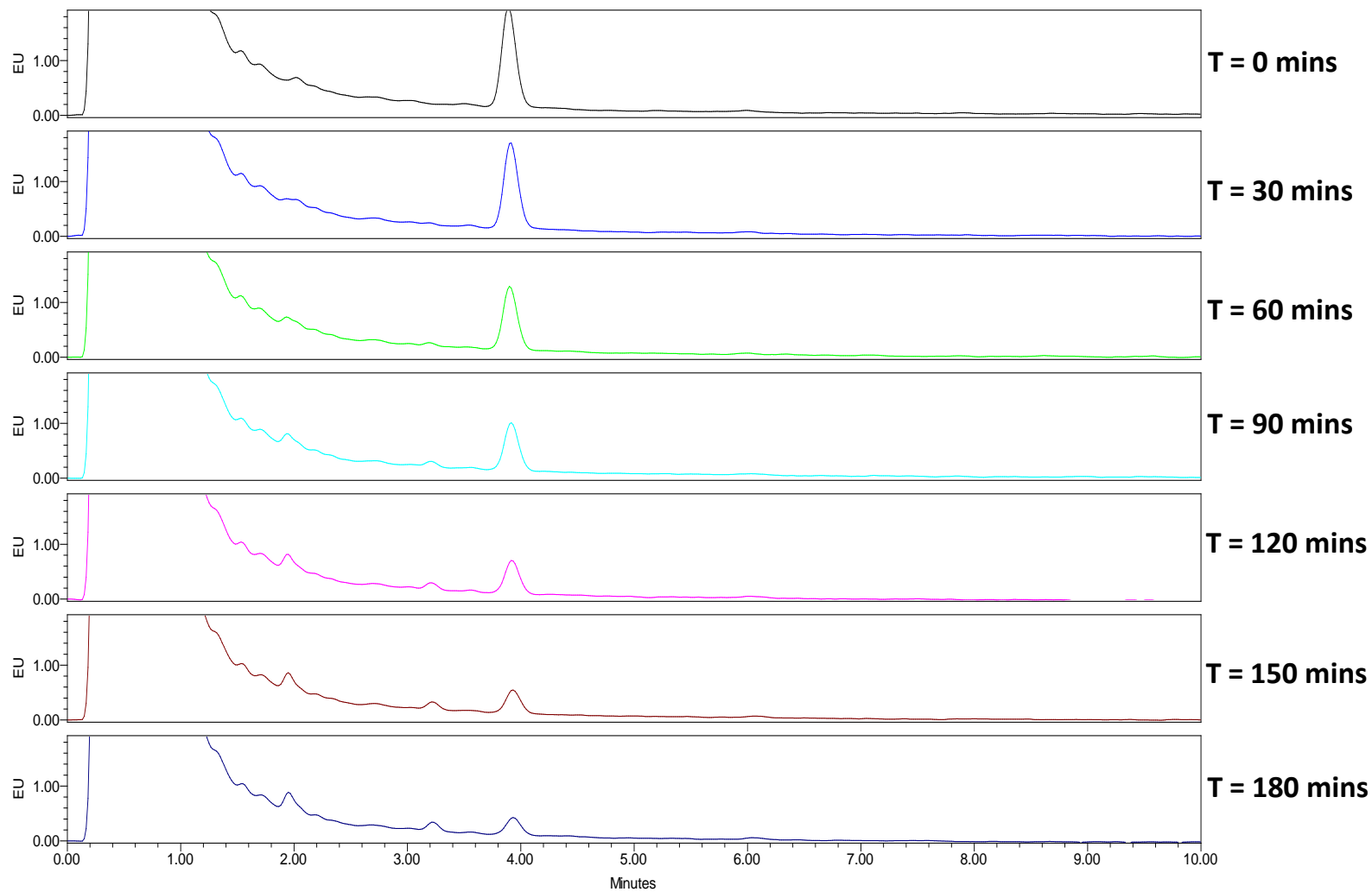
In vitro Aflatoxin binding at pH3 and pH7



Degradation of ZON



Degradation of ZON Using R404 HPLC



Why Use UltraSorb over Others?

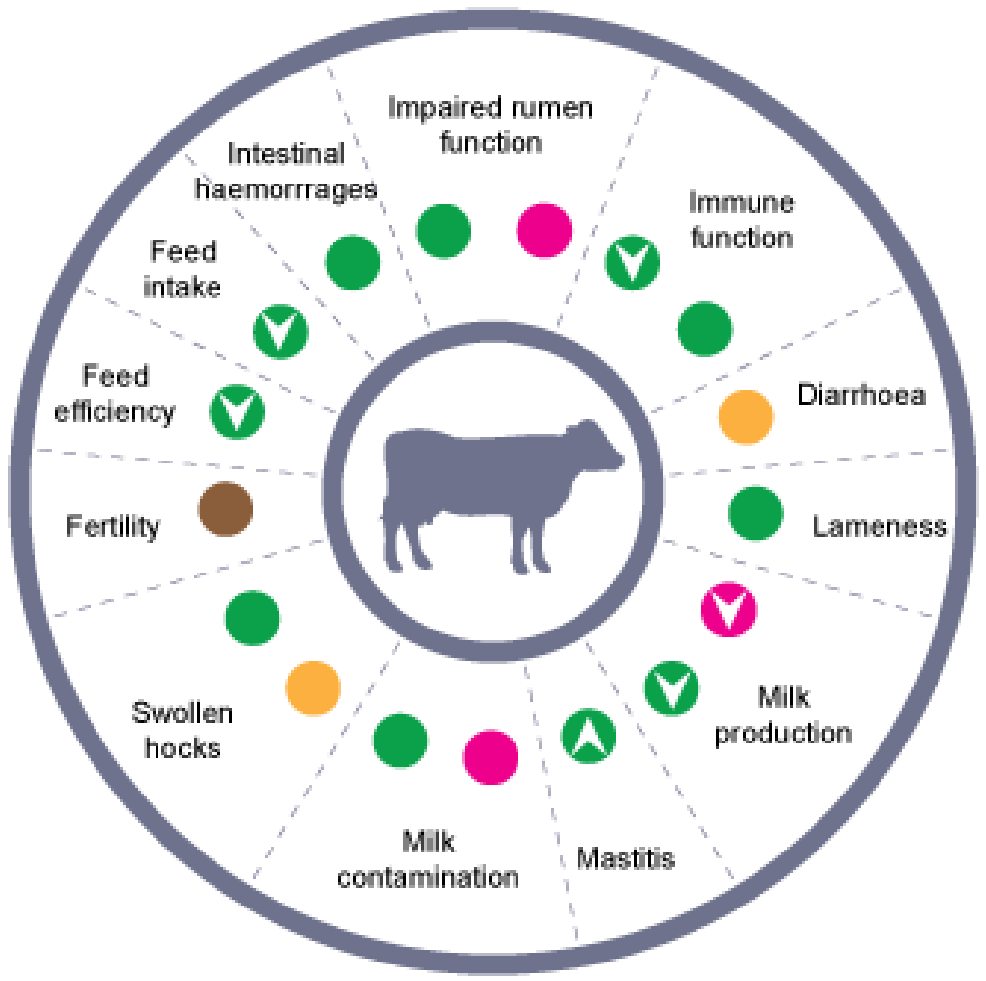


- UltraSorb uses the optimum mineral binders, proven and tested against others
- UltraSorb uses a range of yeast components
- UltraSorb has a range of products which are species specific
- Tailored to have the optimum combinations of amounts for the mycotoxins you are likely to encounter in feed
- Bespoke UltraSorb Core based on lab analysis of local clays available in the market

FEW COMPANIES OFFER THIS UNIQUE COMBINATION



Negative effects in ruminants



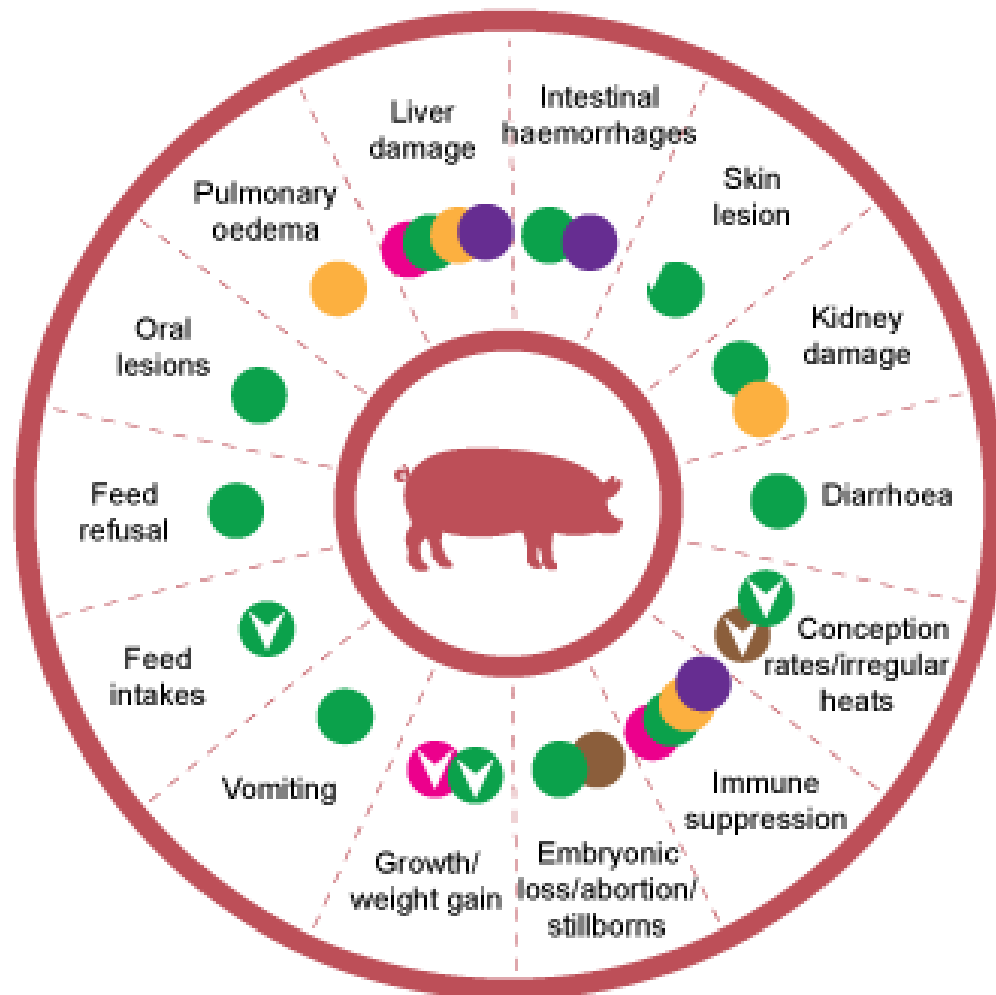
- Aflatoxin
- Fumonisin
- Trichothecenes (DON / T2)
- Zearalenone

Dose and application in ruminant species



Product	Species	Usage	Mycotoxin Risk	Cattle Dosage (inclusion) rate g/head/day	Calves, Sheep & Goats: Dosage rate g/head/day
UltraSorb R	All	Compounders & pre-mixers	Any	Low to med. risk 10g Med. to high risk 20g	Low to med. risk 3-5g Med. to high risk 6-10g
UltraSorb R Farm Pack		On farm - TMR		Low to med. risk 20g Med. to high risk 40g	Low to med. risk 6-10g Med. to high risk 12-20g
UltraSorb R Dairy	EU registered for dairy cattle	Compounders & pre-mixers		Low to med. risk 10g Med. to high risk 20g	Low to med. risk 3-5g Med. to high risk 6-10g
UltraSorb R Dairy Farm Pack		On farm - TMR		Low to med. risk 20g Med. to high risk 40g	Low to med. risk 6-10g Med. to high risk 12-20g
UltraSorb R Extra	All	Compounders and pre-mixers, also on farm - TMR at advised dose rates.	<i>Fusarium sp.</i> (Fumonisin, T2, DON, HT2, ZON). Damp & cool.	Low to med. risk 10g Med. to high risk 20g	Low to med. risk 3-5g Med. to high risk 6-10g
UltraSorb R Plus			<i>Aspergillus sp.</i> (Aflatoxins). Warm & dry climates.	Low to med. risk 25g Med. to high risk 50g	Low to med. risk 7-12g Med. to high risk 15-25g
UltraSorb R Core		Compounders & pre-mixers. Mix with a binder.	Mix 650-850kg of selected mycotoxin binder with suitable de-dusting agent. Afterwards add 150-350kg of UltraSorb R Core and mix until blend is uniform. Apply complete mixture at a dose of 10-20g/h/d in feed depending on the mycotoxin contamination level or binding capacity.		

Negative effects in swine



- Aflatoxin
- Trichothecenes (DON / T2)
- Fumonisin
- Zearalenone
- Ochratoxin A

Dose and application in swine



Product	Usage	Mycotoxin	Sows: dry & gestating (kg/tonne)	Boars: Developing & mature(kg/tonne)	Piglets: Pre-starter, starter (kg/tonne)	Growers & finishers (kg/tonne)
UltraSorb S	Compounders and pre-mixers, or on farm at appropriate dose rates.	All	Low to med. risk 1kg Med. to high risk 2kg	Low to med. risk 0.5kg Med. to high risk 1kg	Low to med. risk 1kg Med. to high risk 2kg	Low to med. risk 0.5kg Med. to high risk 1kg
UltraSorb S Extra		Increased risk of Fusarium sp. (Fumonisin, T2, DON, HT2, ZON). Cool & damp.	Low to med. risk 1kg Med. to high risk 2kg	Low to med. risk 0.5kg Med. to high risk 1kg	Low to med. risk 1kg Med. to high risk 2kg	Low to med. risk 0.5kg Med. to high risk 1kg
UltraSorb S Plus		Increased risk of Aspergillus sp. (Aflatoxins). Warm & dry climates.	Low to med. risk 2.5kg Med. to high risk 5kg	Low to med. risk 1.25kg Med. to high risk 2.5kg	Low to med. risk 2.5kg Med. to high risk 5kg	Low to med. risk 1.25kg Med. to high risk 2.5kg
UltraSorb S Core	Compounders and pre-mixers. To be mixed with a binder.	All	Mix 650-850kg of selected mycotoxin binder with suitable de-dusting agent. Then add 150-350kg of UltraSorb S Core and mix until blend is uniform. For best mixing properties avoid the use of vegetable oils as a de-dusting agent. Apply complete mixture at a dose of 0.5 – 2kg/t feed depending on the mycotoxin contamination level or binding capacity.			

Negative effects in poultry



- Aflatoxin
- Trichothecenes (DON / T2)
- Fumonisin
- Zearalenone
- Ochratoxin A

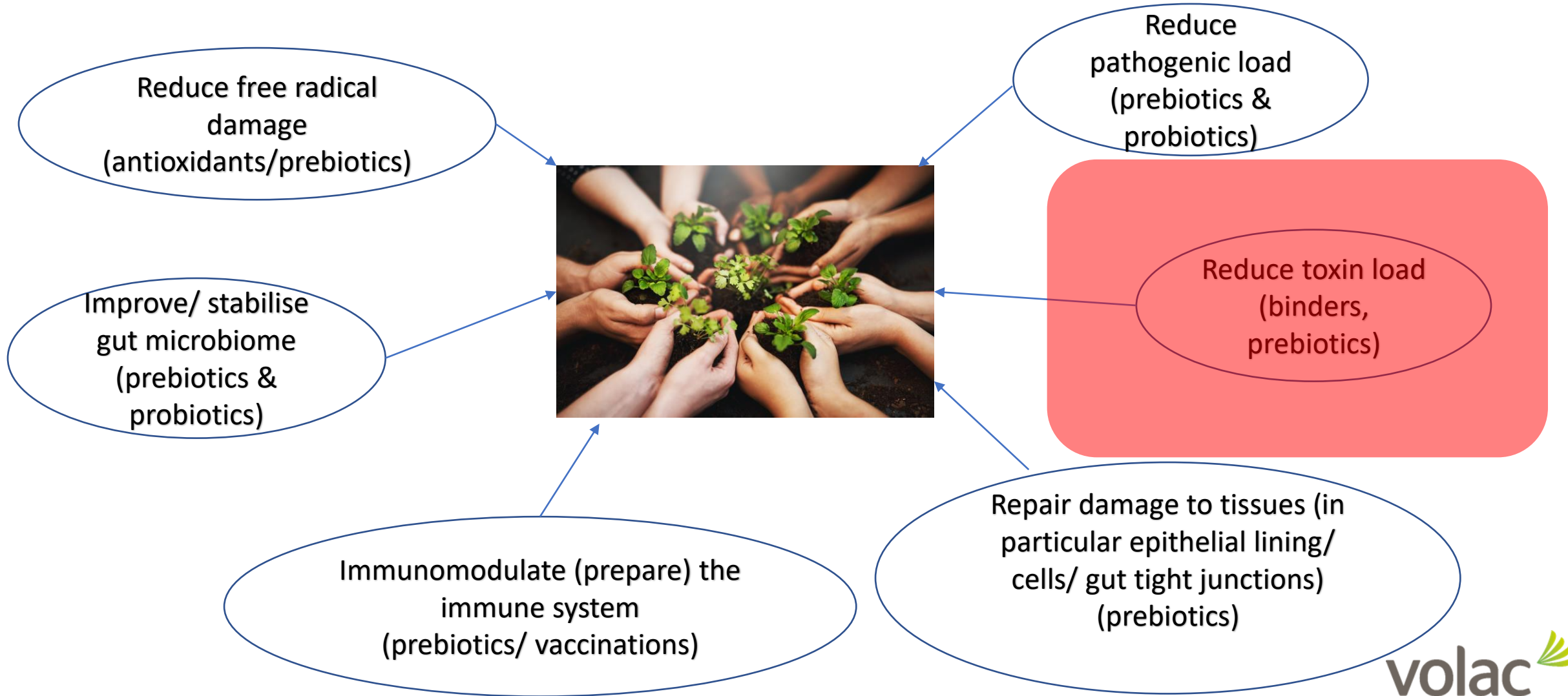
Dose and application in avian species



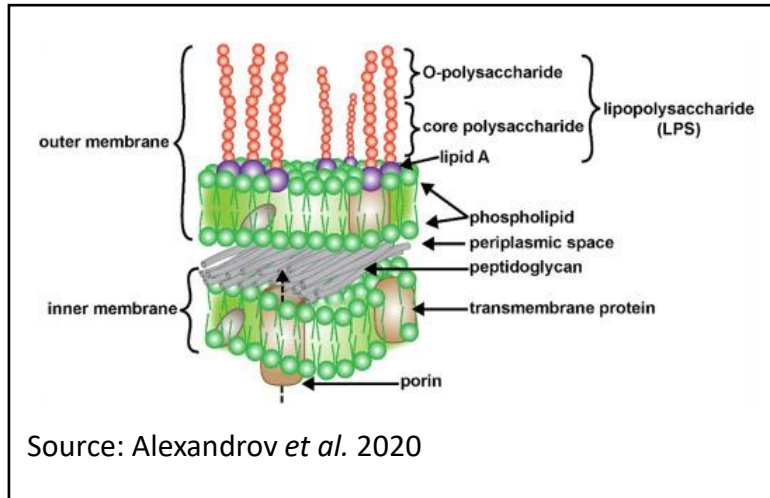
Product	Usage	Mycotoxin	Broiler chickens (kg/t complete feed)			Breeders & layers (kg/t complete feed)			Ducks, turkeys, geese (kg/t complete feed)				
				Low to med. risk	Med. to high risk		Low to med. risk	Med. to high risk		Low to med. risk	Med. to high risk		
UltraSorb P	Compounders, premixers and on farm	All	Starter	1	2	Pullet	1	2	All	1	2		
			Grower	1	2	Pre-layer	1	2					
			Finisher	0.5	1	Layer Breeder	0.5	1					
UltraSorb P Extra		Compounders, premixers and on farm	High risk of Fusarium species (Fumonisin, T2, DON, HT2, ZON)	Starter	1	2	Pullet	1	2	All	1	2	
				Grower	1	2	Pre-layer	1	2				
				Finisher	0.5	1	Layer Breeder	0.5	1				
UltraSorb P Plus			Compounders, premixers and on farm	High risk of Aspergillus species (Aflatoxins)	Starter	2.5	5	Pullet	2.5	5	All	2.5	5
					Grower	2.5	5	Pre-layer	2.5	5			
					Finisher	1.25	2.5	Layer Breeder	1.5	2.5			
UltraSorb P Core	Mix with binder			Mix 650 - 850kg selected mycotoxin binder with suitable de-dusting agent. Afterwards add 150 - 350kg UltraSorb P Core and mix until the blend is uniform. For the best mixing properties avoid the use of vegetable oil as a de-dusting agent. Apply complete mixture at an inclusion rate of 0.5 - 2 kg/t of feed depending on mycotoxin contamination level.									

Next Generation R&D: Endotoxin Challenge

Improving host immunity

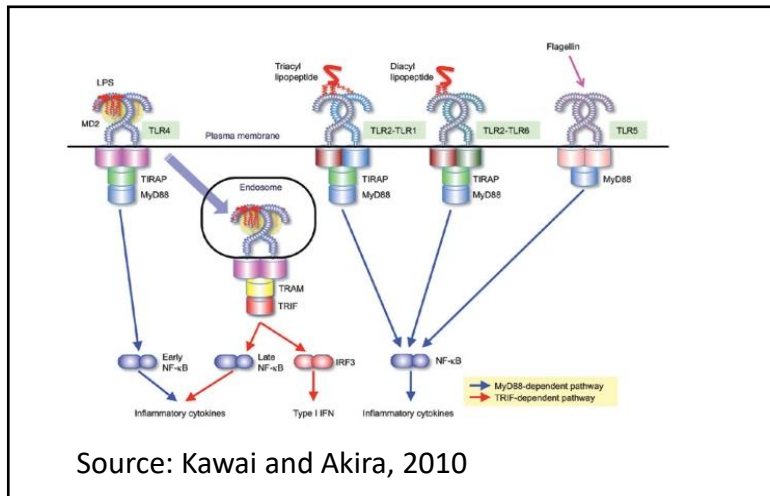


Endotoxins – what are they and how do they stimulate inflammation?



What are Endotoxins?

- Vital component of the outer cell wall of bacteria – cell structure, adhesion and protection
- Found on GNB (lipopolysaccharide, LPS) and GPB (lipoteichoic acid, LTA)
- Pathogen associated molecular pattern (PAMPs)



How do they stimulate inflammation?

- Detected by cell membrane bound receptors (Toll-like receptors TLRs)
- Cause a signalling cascade and production of proinflammatory cytokines

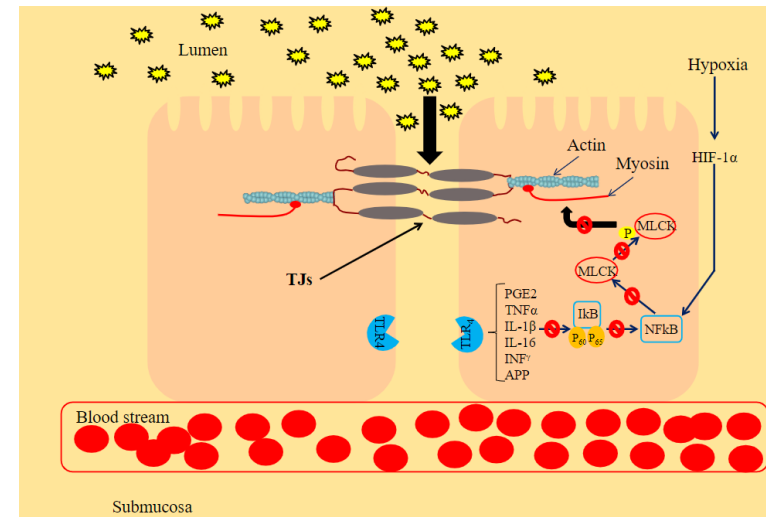
Endotoxin Related Challenges in Animal Production

- **The Obvious:**

- Mastitis
- Metritis

- **The Less Obvious:**

- Acidosis
- Transition period
- Heat stress
- Receiving phase
- Immunocompromised animals
- Environment



70% of the immune system is located in the gut

Example Pathogenesis: Acidosis

- Over 20 billion bacteria in 1 teaspoon of rumen fluid
- Many of which are gram negative and have LPS
- During acidosis, lysis of GNB is the biggest contributor to free LPS in rumen fluid
- Acidotic diet also increases GNB growth, contributing further to free LPS
- Increased gut permeability – tight gut junctions
- TLR4 signalling pathway leading to proinflammatory response
- Endotoxocis

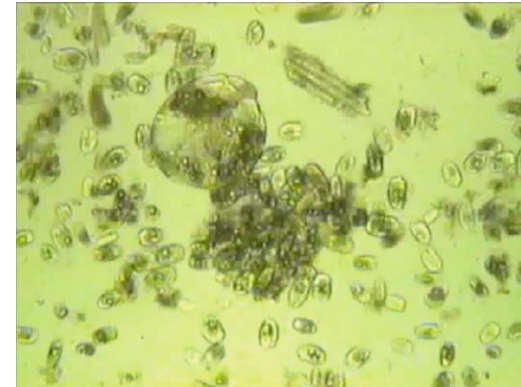


Table 6. The mRNA expression of tight junction proteins of the colonic epithelium of control (CON) dairy goats and dairy goats with SARA (n = 6 goats/group)

Item	Treatment		SEM	P-value
	CON	SARA		
<i>CLDN1</i>	0.98	1.65	0.128	0.030
<i>CLDN4</i>	1.01	1.21	0.073	0.826
<i>CLDN7</i>	1.03	0.88	0.046	0.583
<i>OCN</i>	0.93	1.54	0.055	0.016
<i>ZO1</i>	0.91	0.83	0.047	0.590

Additive challenge of mycotoxins and endotoxins?

- T-2 and LPS simultaneous exposure lead to:
 - Increased mortality
 - Hypothermia
 - TNF α production
 - Thymic atrophy

- Indirect signalling through TLR4 pathway – proinflammatory cytokine production



UltraSorb Next Generation

- **LPS binding**
 - Reducing endotoxin load at times of stress
- **Gut integrity**
 - Supporting gut function
- **Liver function**
 - Supporting other biological functions



Questions?

