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World Mycotoxin Survey

The Global Threat

January – September 2024



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World Mycotoxin Survey

World Overview

17 675

Samples

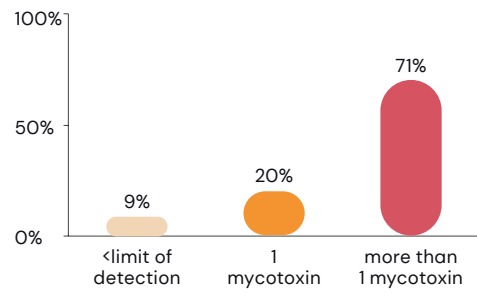
87 746

Analyses

91

Countries

Co-contamination



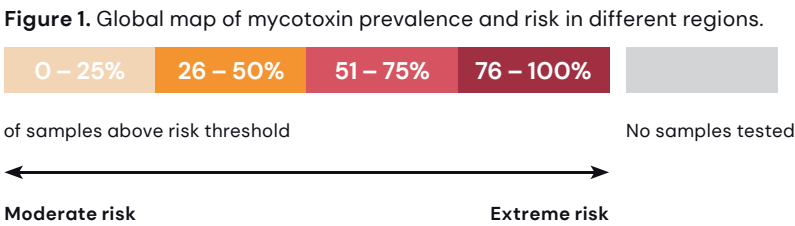
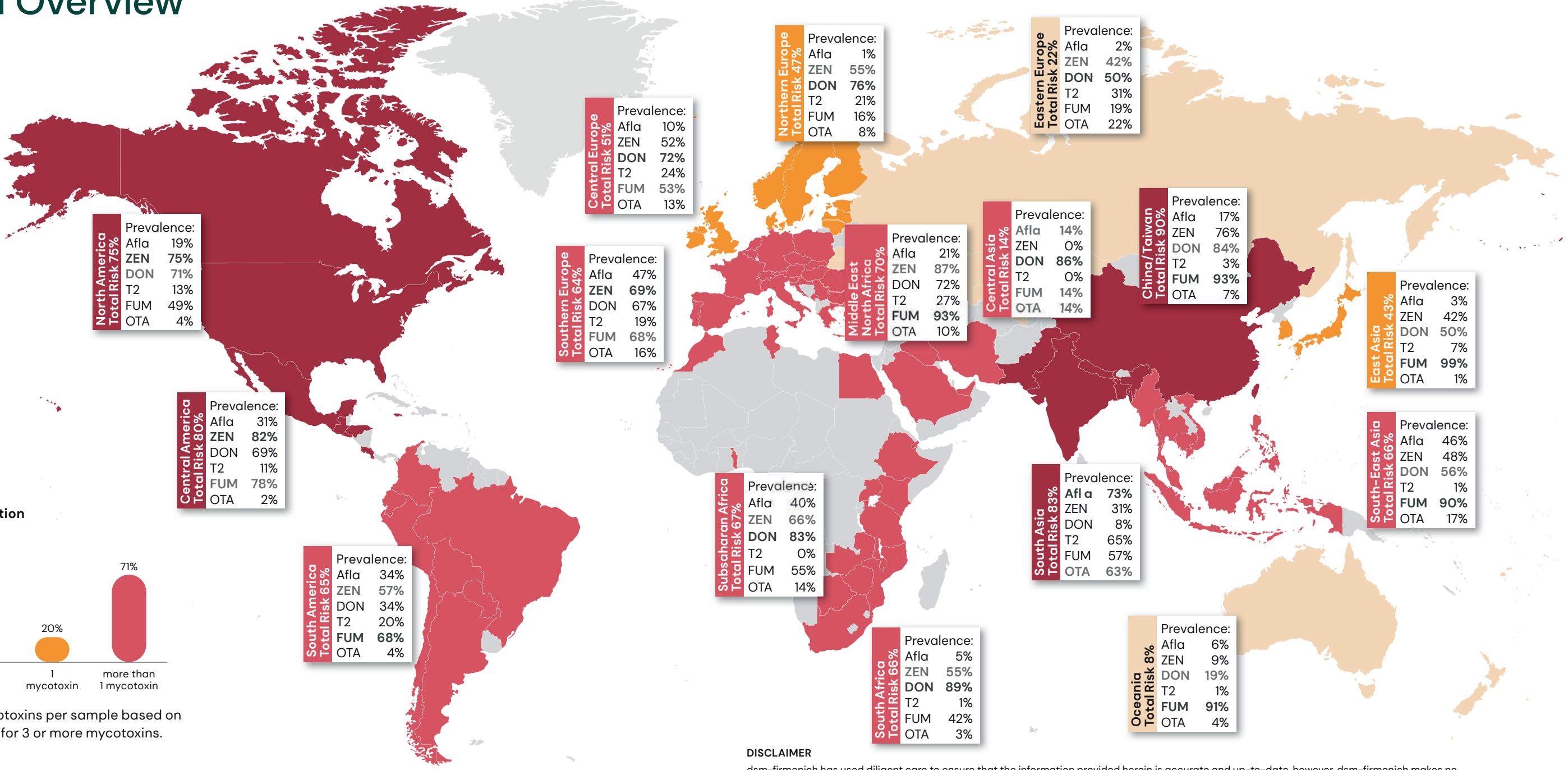
Number of mycotoxins per sample based on samples tested for 3 or more mycotoxins.

Risk Level

The risk level expresses the percentage of samples testing positive for at least one mycotoxin above the threshold level in parts per billion (ppb).

Recommended risk threshold of major mycotoxins in ppb

Afla	ZEN	DON	T2	FUM	OTA
2	50	150	50	500	10



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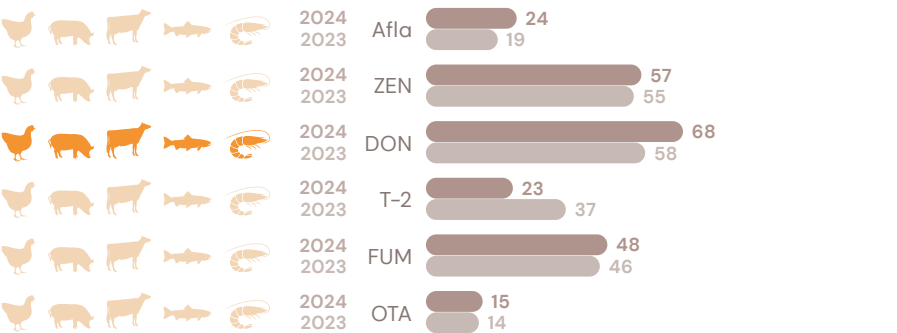
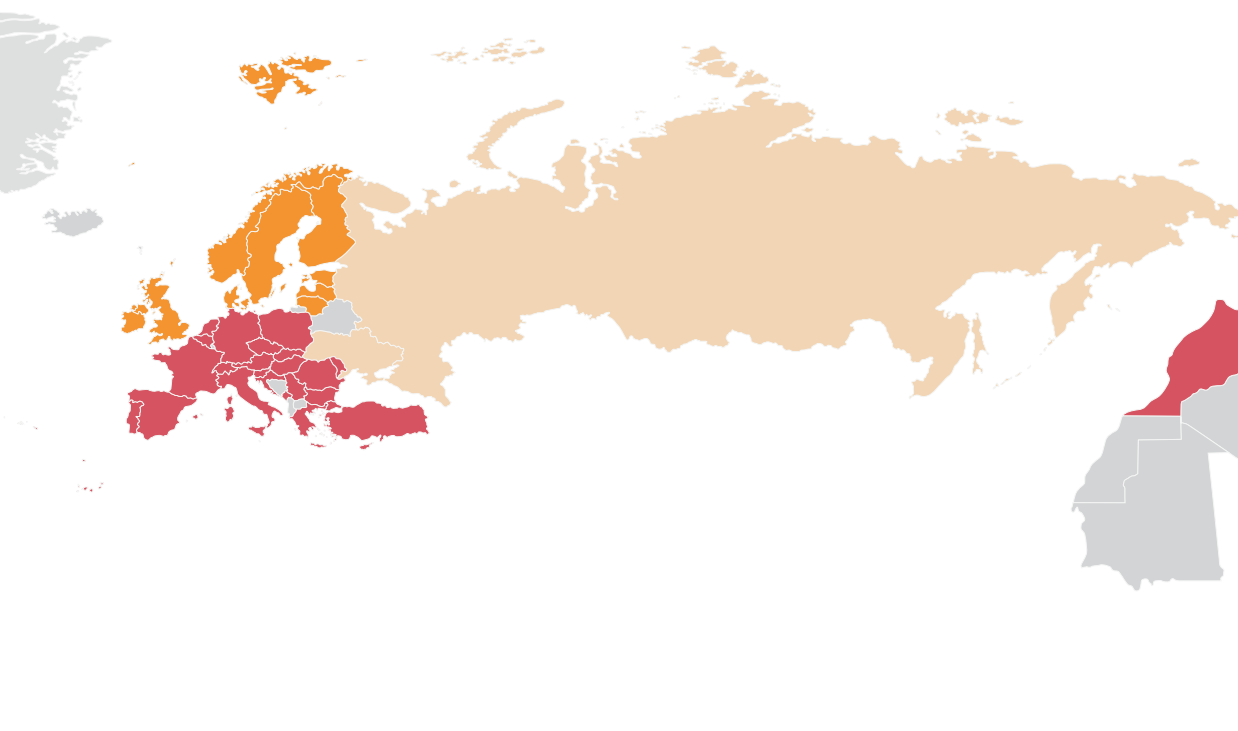
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Europe

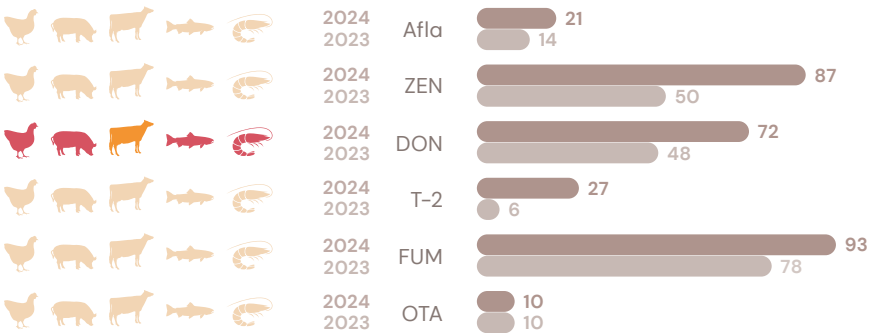
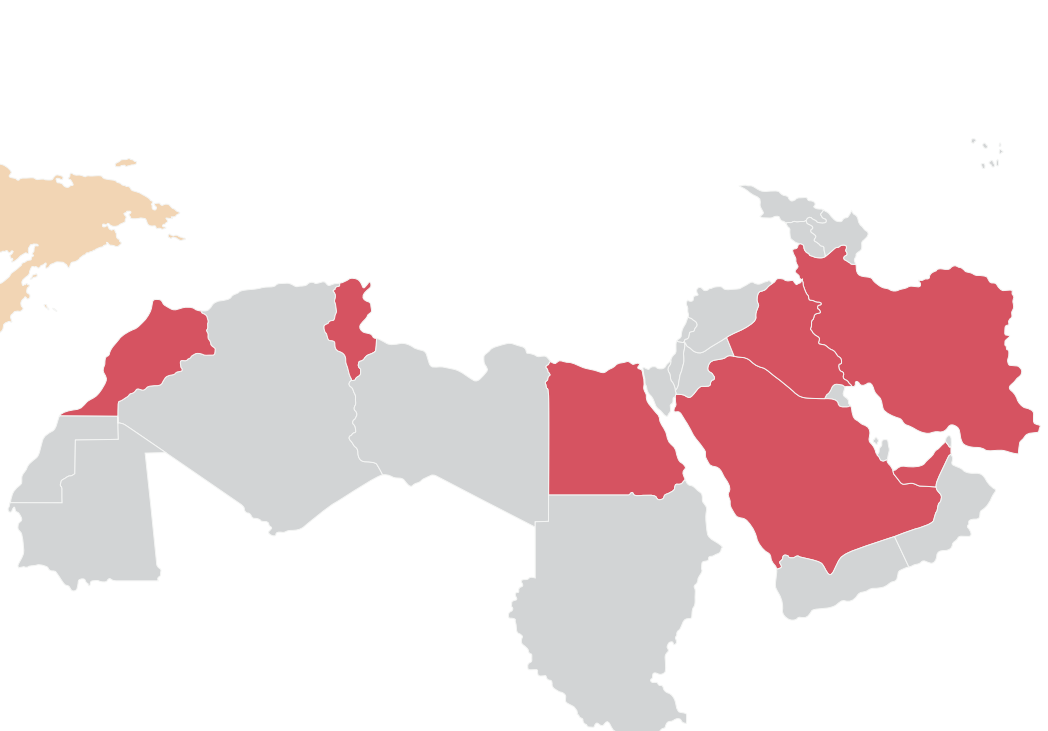


Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 7 733	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	5 543	7 308	7 409	5 272	5 082	4 922
% Contaminated samples	24%	57%	68%	23%	48%	15%
Average of positive (ppb)	8	81	519	30	288	9
Median of positive (ppb)	4	20	200	14	89	3
Maximum (ppb)	741	5000	43 891	1731	12 368	928

Middle East & North Africa

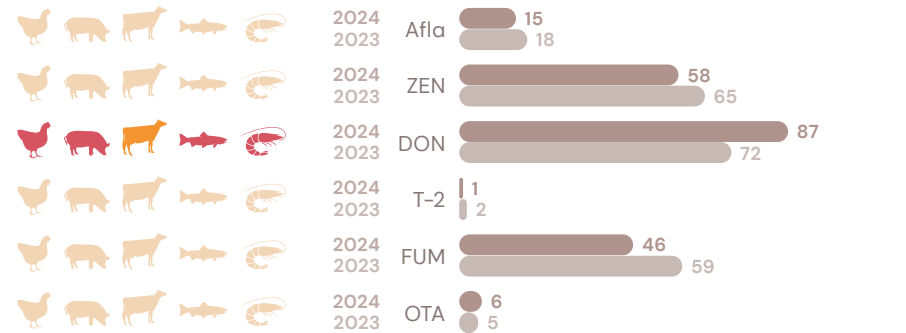


Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 149	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	149	149	149	145	149	145
% Contaminated samples	21%	87%	72%	27%	93%	10%
Average of positive (ppb)	3	40	399	15	526	3
Median of positive (ppb)	1	14	296	10	187	2
Maximum (ppb)	13	863	4 028	95	22 030	7

Sub-saharan Africa



Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

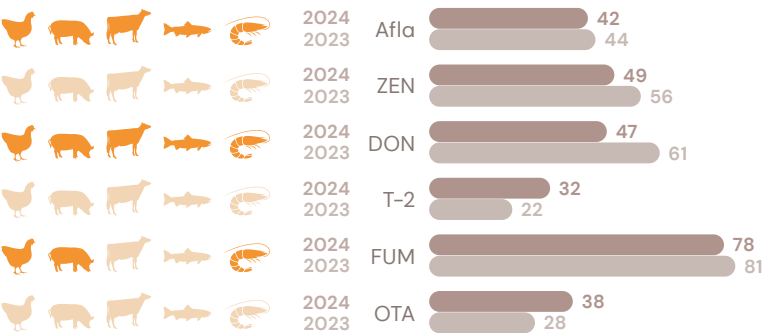
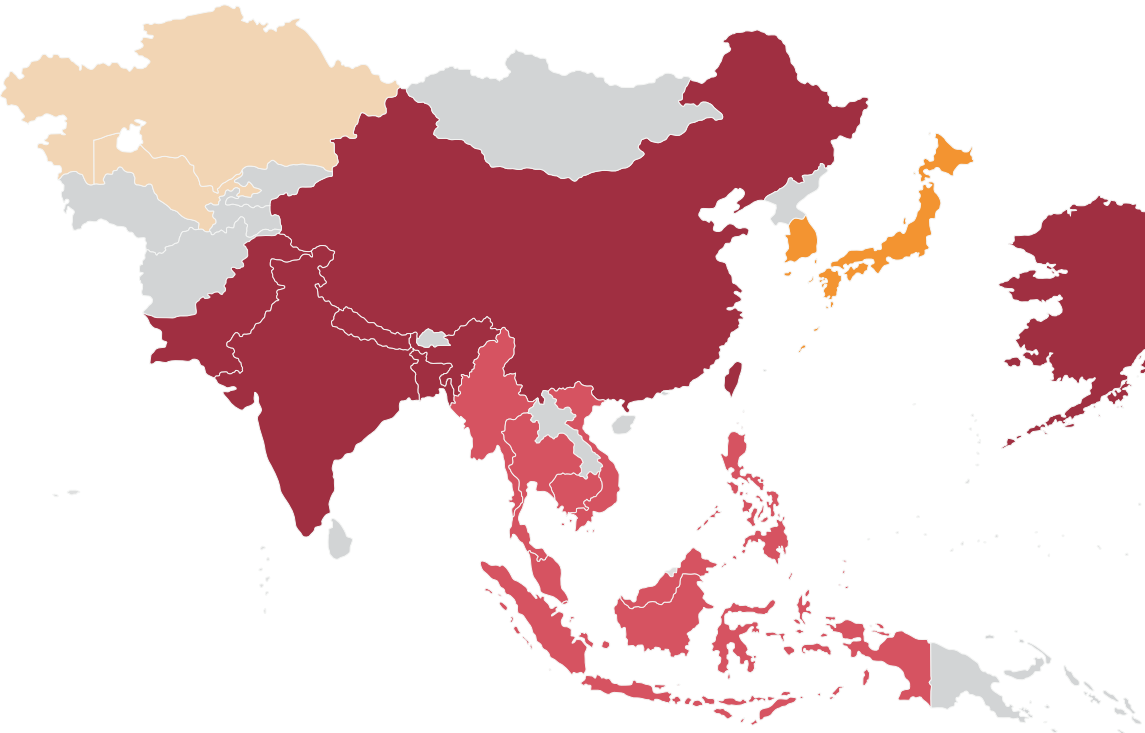
Total samples: 852	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	852	852	852	852	852	851
% Contaminated samples	15%	58%	87%	1%	46%	6%
Average of positive (ppb)	50	31	481	40	261	6
Median of positive (ppb)	6	10	234	46	84	2
Maximum (ppb)	708	1 058	18 341	89	3 252	85

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Asia

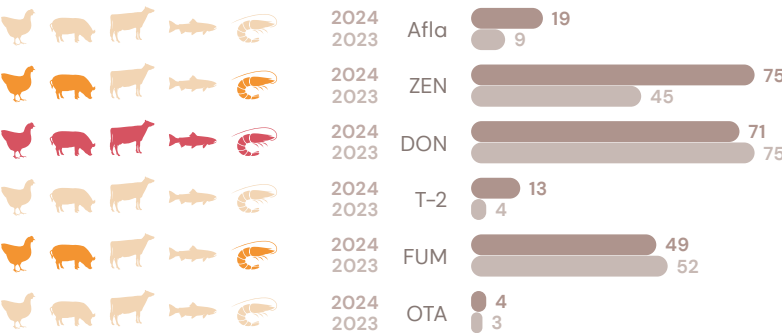


Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 3 233	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	3 013	3 110	3 218	2 527	3 000	2 271
% Contaminated samples	42%	49%	47%	32%	78%	38%
Average of positive (ppb)	34	148	1 407	28	1 667	14
Median of positive (ppb)	15	47	372	24	686	5
Maximum (ppb)	517	25 373	476 954	385	489 698	579

North America

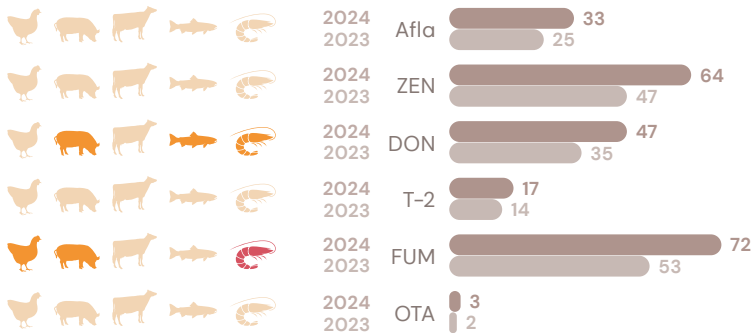


Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 1 495	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	1 458	1 468	1 424	1 424	1 423	1 421
% Contaminated samples	19%	75%	71%	13%	49%	4%
Average of positive (ppb)	56	128	1 534	33	2 997	5
Median of positive (ppb)	1	34	650	11	1 000	3
Maximum (ppb)	1 767	6 513	32 220	481	96 316	62

Latin America



Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 4 213	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	4 091	4 058	2 963	3 596	3 292	2 456
% Contaminated samples	33%	64%	47%	17%	72%	3%
Average of positive (ppb)	5	73	566	33	2 340	3
Median of positive (ppb)	2	37	316	29	1 349	2
Maximum (ppb)	306	2 599	11 190	200	244 701	15

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Spectrum 380® and Spectrum Top® 50

Only analyzing for single mycotoxins can lead to underestimation of the detrimental effects of mycotoxins on animal health and performance. Our long-term monitoring of mycotoxins in different commodities shows that co-occurrence of mycotoxins is the rule and not the exception. Here we need support of state-of-the-art analytical methods based on LC-MS/MS. These allow to detect multiple mycotoxins in one run. The high sensitivity of the method is important, as already moderate levels of mycotoxins can have a detrimental effect. This is especially true in case of co-contamination.



Spectrum 380®:

The most advanced and comprehensive mycotoxin analysis available

It detects > 800 different mycotoxins (including masked and modified forms and emerging mycotoxins), fungal metabolites as well as plant and bacterial toxins and metabolites.

This is not a routine analysis but it is done in special cases and/or also of course as part of research of future objectives.

Spectrum 380® is developed and conducted by the world's leading independent mycotoxin research lab at the Department of Agrobiotechnology (IFA-Tulln) at the University of Natural Resources and Life Sciences Vienna and offered through cooperation with Performance Solutions plus Biomin.

Spectrum Top® 50:

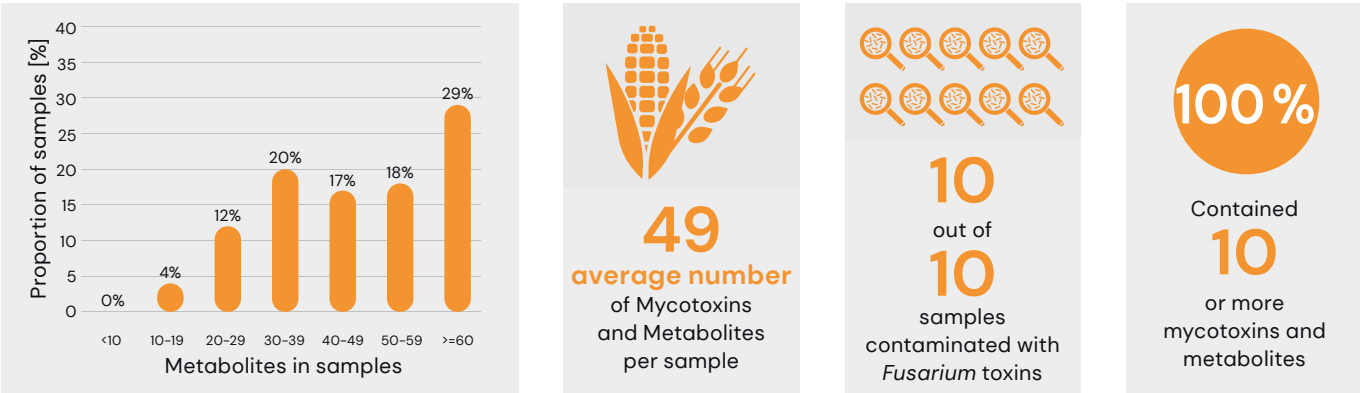
The most comprehensive mycotoxin analysis commercially available

It detects > 50 different mycotoxins (including masked and modified forms), emerging mycotoxins and fungal metabolites.

The Spectrum Top® 50 method was developed by scientists of Romer Labs, a leading global supplier of diagnostic solutions for food and feed safety.

Multiple mycotoxin occurrence

Spectrum 380® results January to September 2024: the most comprehensive mycotoxin analysis available



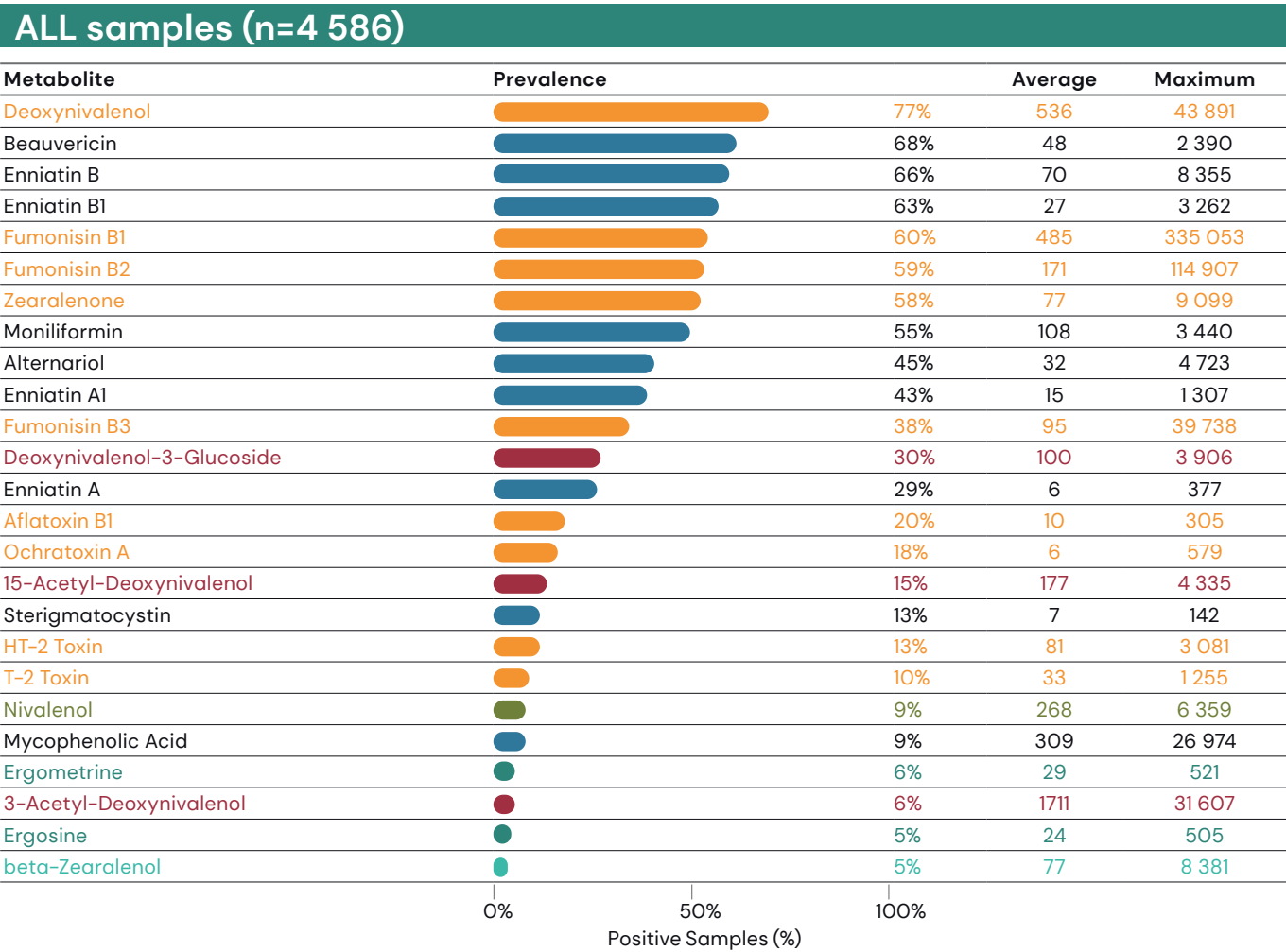
Total 829 samples from 34 countries; 663 200 points of analysis

Mycotoxins & metabolites

Metabolite	Prevalence	Average	Maximum
Tryptophol	91%	435	78 200
Aurofusarin	82%	390	17 329
Moniliformin	77%	75	1 233
Absciscic acid	76%	254	7 685
Enniatin B	75%	85	2 871
Infectopyron	73%	9 913	631 680
Equisetin	73%	83	10 603
Culmorin	72%	111	2 581
Beauvericin	68%	17	568
Enniatin B1	68%	44	1 283
Asperglaucide	68%	155	25 781
Asperphenamate	66%	174	12 557
Brevianamid F	66%	64	1 663
Siccanol	66%	271	8 688
Flavoglucin	65%	427	95 136
Bikaverin	63%	27	605
Fellutanine A	62%	53	1 288
Emodin	61%	43	2 197
Daidzin	59%	30 079	237 100
Daidzein	59%	3 824	26 110
Genistein	58%	3 017	22 649
Deoxynivalenol	58%	506	8 335
Genistin	57%	44 715	317 400
Tenuazonic acid	57%	327	9 188
Neoechinulin A	56%	259	79 008
Altersetin	56%	54	5 052
15-Hydroxyculmorin	56%	491	14 770

Positive Samples [%] for metabolites present in >55% of samples (orange bars indicate regulated or guideline mycotoxins; red bar indicates a masked mycotoxin). Cut off for all metabolites 1 ppb (except for aflatoxins 0.5 ppb). Average of positives and Maximum are presented in ppb.

Overview of the most frequently found mycotoxins, their masked and modified forms as well as emerging mycotoxins in all samples and finished feed



Top25 metabolites are presented according to their prevalence (orange bars indicate regulated or guideline mycotoxins; red bar indicates a masked mycotoxin). Cut off for all metabolites 1 ppb (except for aflatoxins 0.5 ppb). Average of positive samples and maximum levels found are reported in ppb.

Ergot alkaloids

Regulated or guideline mycotoxins

Masked and modified mycotoxins

3-Acetyldeoxynivalenol and 15-Acetyldeoxynivalenol are metabolites of the mycotoxin Deoxynivalenol. They can be converted to Deoxynivalenol in the intestinal tract.

DON-3-glucoside: plant metabolite of DON (masked DON); less toxic than DON, but it converted back to DON in the gastrointestinal tract of mammals.

Beta-zearalenol: Metabolite of ZEN

Aflatoxin B2 and G1: Aflatoxins, less toxic than Aflatoxin B1, not regulated

Nivalenol: Type B trichothecene, more cytotoxic than DON in intestinal cells of pigs and ruminants (in vitro)

4 586

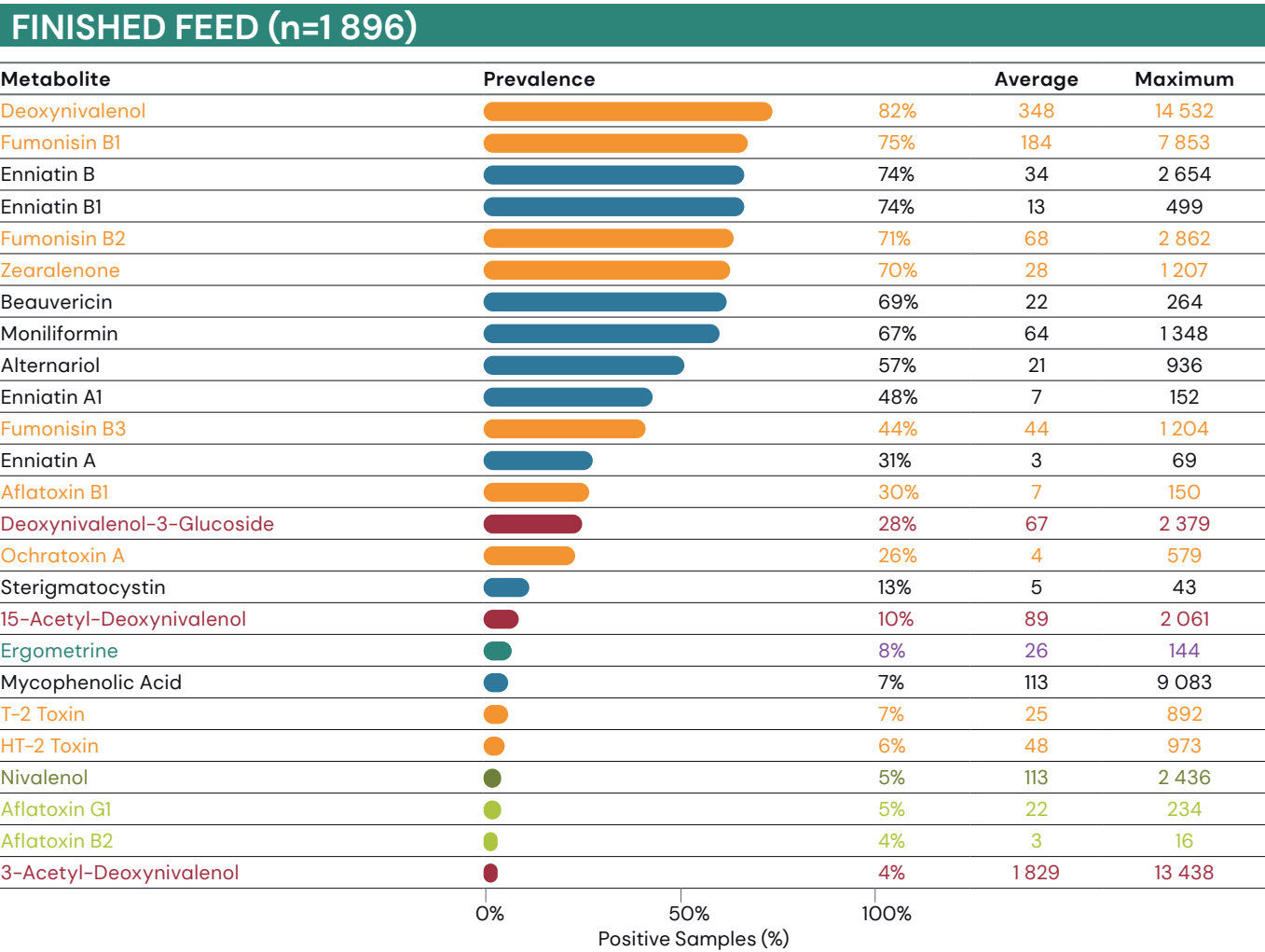
243 058

77

Samples

Analysis points

Countries



Top25 metabolites are presented according to their prevalence (orange bars indicate regulated or guideline mycotoxins; red bar indicates a masked mycotoxin). Cut off for all metabolites 1 ppb (except for aflatoxins 0.5 ppb). Average of positive samples and maximum levels found are reported in ppb.

Emerging mycotoxins: frequently found on agricultural commodities, not regulated; toxicity is under investigation, but toxic effects suggested in some scientific literature; EFSA started to publish reports to do a risk assessment for these toxins.

Moniliformin: broiler very susceptible, genotoxic, immunosuppressive; causes heart damage, muscular weakness, respiratory distress

Mycophenolic acid: Mycophenolic Acid shows a low acute toxicity in animals but may cause immunosuppression.

Alternariol: no acute toxicity, cytotoxic and mutagenic in vitro, effects on reproductive & immune system in vitro.

Beauvericin and Enniatins: effects on immune system: accumulation in fat-rich tissue.

Sterigmatocystin: precursor of aflatoxins; causes similar effects as aflatoxin B1 in animals, but lower acute toxicity; negative effects incl. bloody diarrhea, less milk production, less feed intake, hepatotoxicity, nephrotoxicity

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