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World Mycotoxin Survey

The Global Threat
January – December 2024

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World Overview

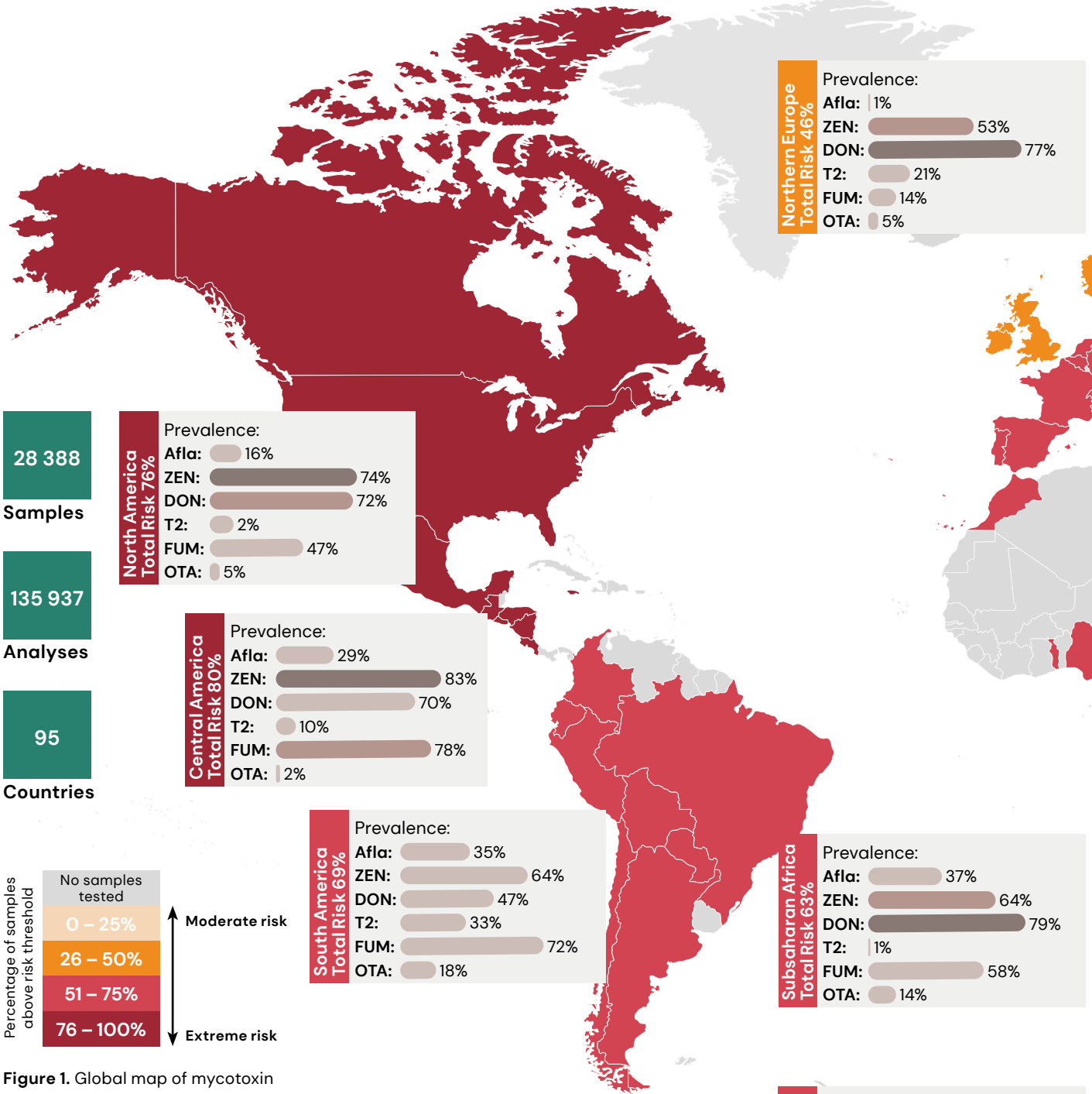


Figure 1. Global map of mycotoxin prevalence and risk in different regions.

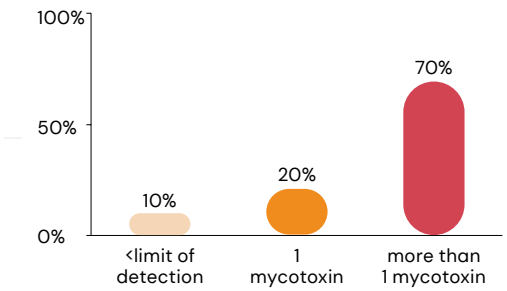
Risk Level

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

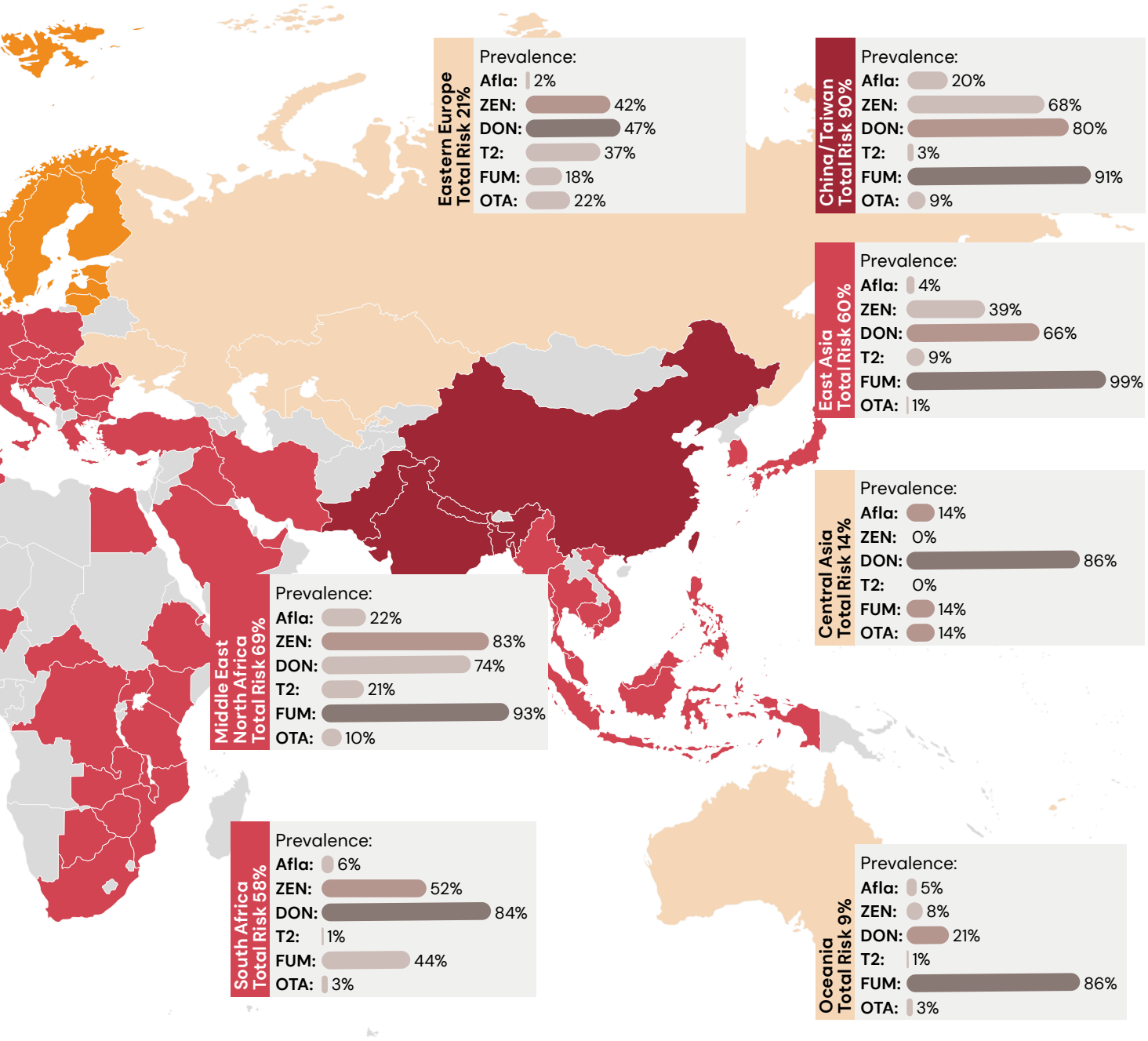
Recommended risk threshold of major mycotoxins in ppb

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

Co-contamination



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


Eastern Europe
Total Risk 21%
Prevalence:
Afla: 2%
ZEN: 42%
DON: 47%
T2: 37%
FUM: 18%
OTA: 22%
China/Taiwan
Total Risk 90%
Prevalence:
Afla: 20%
ZEN: 68%
DON: 80%
T2: 3%
FUM: 91%
OTA: 9%
East Asia
Total Risk 60%
Prevalence:
Afla: 4%
ZEN: 39%
DON: 66%
T2: 9%
FUM: 99%
OTA: 1%
Central Asia
Total Risk 14%
Prevalence:
Afla: 14%
ZEN: 0%
DON: 86%
T2: 0%
FUM: 14%
OTA: 14%
Middle East
North Africa
Total Risk 69%
Prevalence:
Afla: 22%
ZEN: 83%
DON: 74%
T2: 21%
FUM: 93%
OTA: 10%
South Africa
Total Risk 58%
Prevalence:
Afla: 6%
ZEN: 52%
DON: 84%
T2: 1%
FUM: 44%
OTA: 3%
Oceania
Total Risk 9%
Prevalence:
Afla: 5%
ZEN: 8%
DON: 21%
T2: 1%
FUM: 86%
OTA: 3%
Southern Europe
Total Risk 65%
Prevalence:
Afla: 47%
ZEN: 69%
DON: 65%
T2: 18%
FUM: 71%
OTA: 17%
South Asia
Total Risk 85%
Prevalence:
Afla: 76%
ZEN: 29%
DON: 7%
T2: 60%
FUM: 58%
OTA: 64%
South-East Asia
Total Risk 65%
Prevalence:
Afla: 45%
ZEN: 50%
DON: 53%
T2: 2%
FUM: 88%
OTA: 14%

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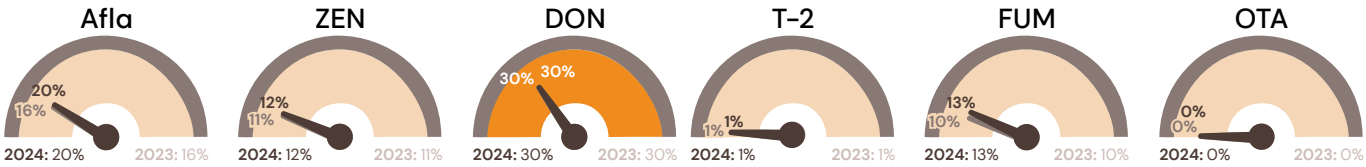
Comparison of development 2023 to 2024 of prevalence and average concentration levels based on all raw commodities and finished feed globally

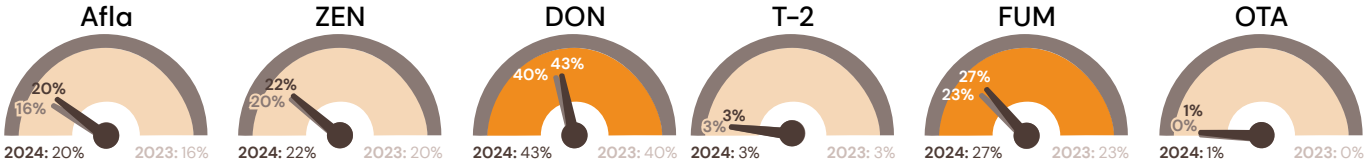
2024	Afla	ZEN	DON	T-2	FUM	OTA
Prevalence	29%	60%	63%	23%	61%	17%
Average of positive (ppb)	18	110	730	32	1 516	11

2023	Afla	ZEN	DON	T-2	FUM	OTA
Prevalence	24%	52%	56%	22%	55%	11%
Average of positive (ppb)	26	107	696	34	1 473	12

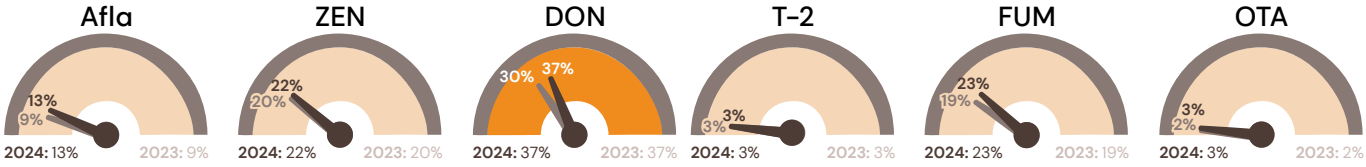
Ruminant risk development 2023 to 2024 based on all raw commodities and finished feed globally



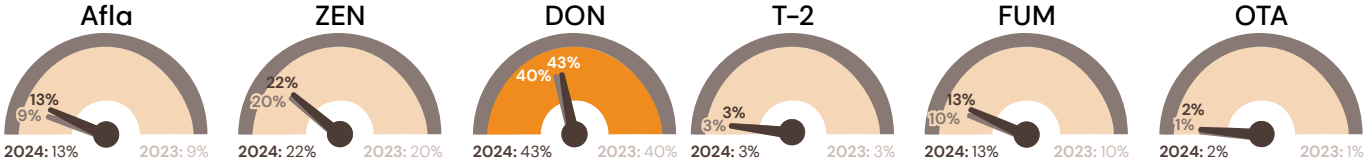
Swine risk development 2023 to 2024 based on all raw commodities and finished feed globally



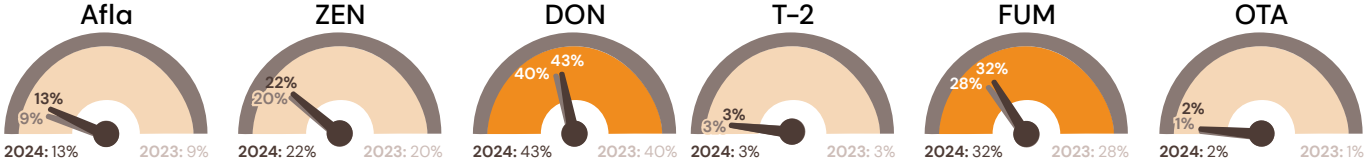
Poultry risk development 2023 to 2024 based on all raw commodities and finished feed globally



Fish risk development 2023 to 2024 based on all raw commodities and finished feed globally

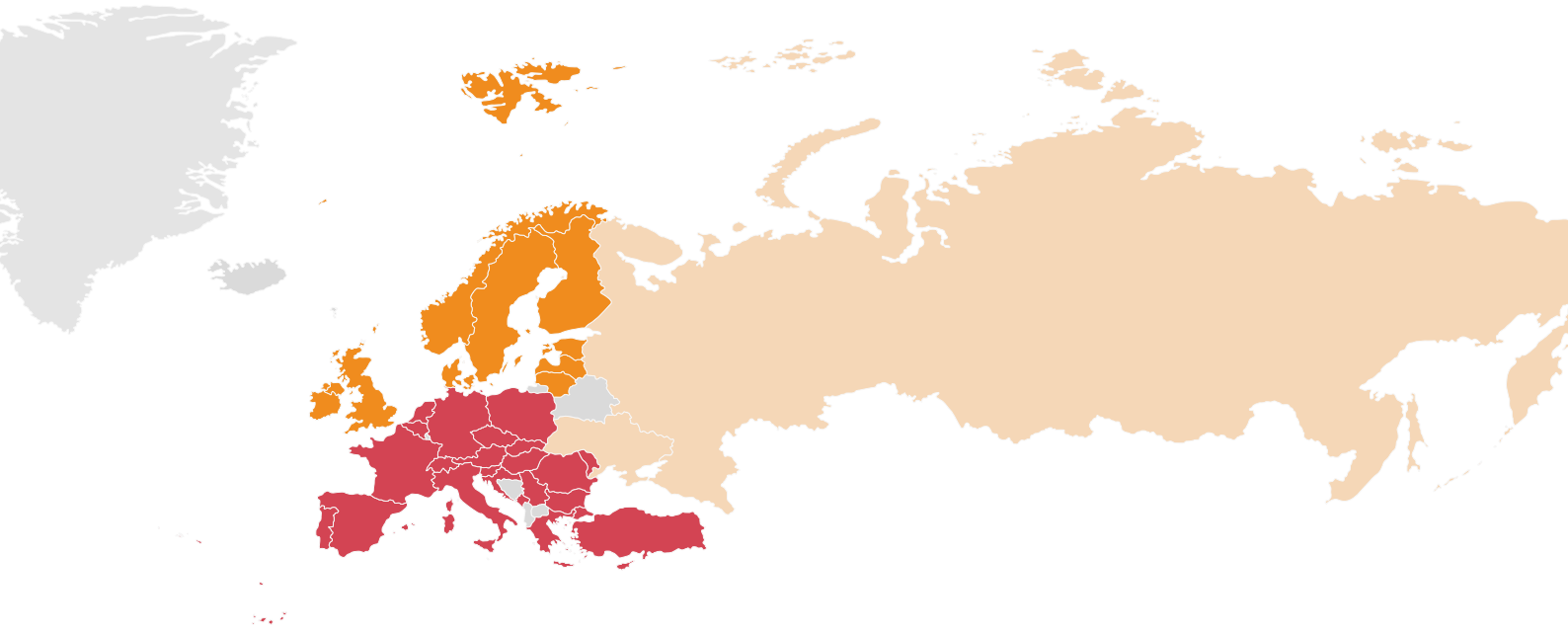


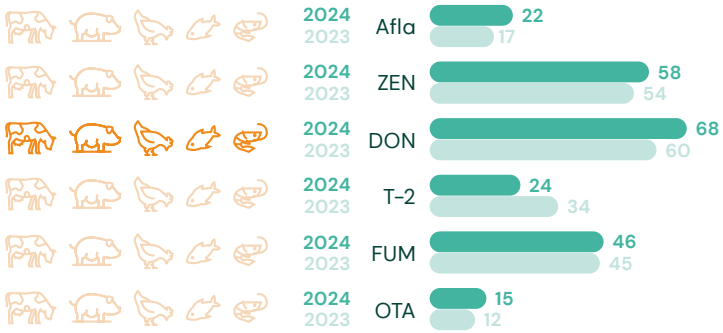
Shrimp risk development 2023 to 2024 based on all raw commodities and finished feed globally



The Global Threat – January to December 2024

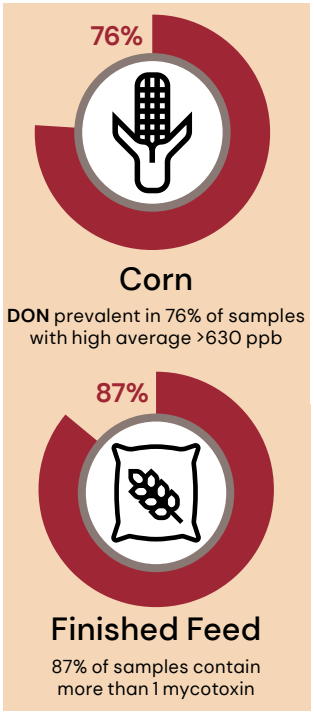
Europe





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–December 2024 ■ and January–December 2023 ■

	Total samples: 3 664	Afla	ZEN	DON	T-2	FUM	OTA
Wheat grains	Number of samples tested	770	1 338	1 425	957	758	713
	% Contaminated samples	11%	31%	61%	12%	6%	8%
	Average of positive (ppb)	7	31	383	13	61	28
	Median of positive (ppb)	7	11	99	10	23	4
	Maximum (ppb)	15	641	14 667	63	440	928
Corn kernels	Number of samples tested	1 351	1 612	1 620	1 064	1 358	1 022
	% Contaminated samples	30%	59%	76%	38%	77%	9%
	Average of positive (ppb)	14	98	639	54	473	28
	Median of positive (ppb)	6	34	270	19	131	5
	Maximum (ppb)	741	2 143	14 257	1 731	21 172	331
Finished Feed	Number of samples tested	3 144	3 501	3 487	2 860	2 874	2 848
	% Contaminated samples	28%	74%	75%	25%	64%	23%
	Average of positive (ppb)	5	39	284	17	234	4
	Median of positive (ppb)	3	14	148	11	87	2
	Maximum (ppb)	270	4 619	5 660	892	11 088	173



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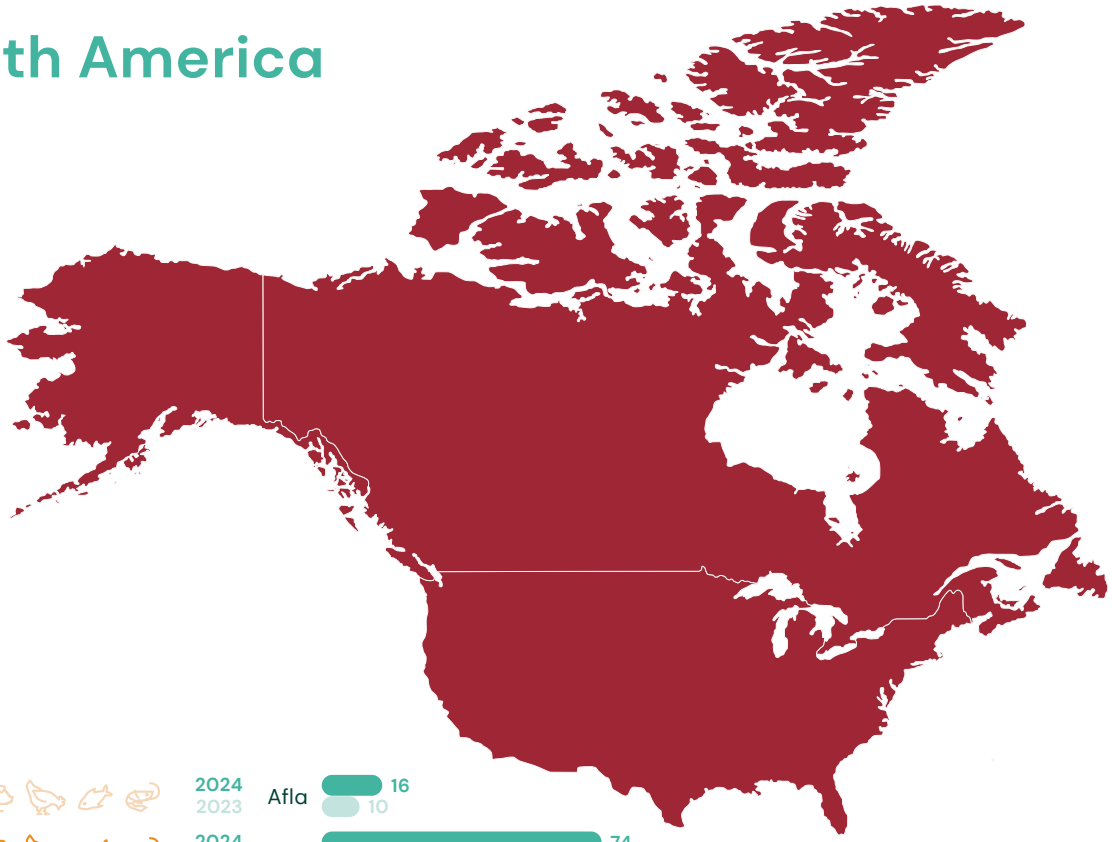
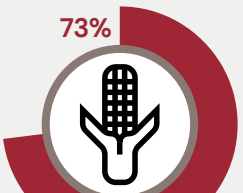
World Mycotoxin Survey

North America



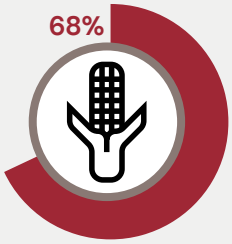
Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2).
% Contaminated samples January–December 2024 ■ and January–December 2023 ■

	Total samples: 723	Afla	ZEN	DON	T-2	FUM	OTA
Wheat grains	Number of samples tested	24	24	24	24	24	24
	% Contaminated samples	0%	75%	88%	33%	4%	29%
	Average of positive (ppb)		59	1 214	142	153	5
	Median of positive (ppb)		45	820	78	153	3
	Maximum (ppb)	0	278	4 526	481	153	17
Corn kernels	Number of samples tested	453	464	464	460	460	453
	% Contaminated samples	6%	68%	73%	11%	68%	1%
	Average of positive (ppb)	16	92	1 043	33	3 995	5
	Median of positive (ppb)	2	18	383	16	1 143	3
	Maximum (ppb)	111	2 305	21 146	360	96 316	16
Finished Feed	Number of samples tested	723	723	723	723	723	723
	% Contaminated samples	20%	78%	78%	9%	52%	4%
	Average of positive (ppb)	14	91	1 185	15	2 865	3
	Median of positive (ppb)	1	30	610	9	1 235	2
	Maximum (ppb)	349	2 310	20 963	131	31 557	14



Corn

DON detected in 73% of samples with high average >1 000 ppb



Corn

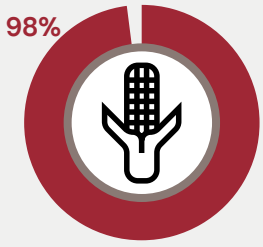
FUM detected in 68% of samples with high average >3 990 ppb

The Global Threat – January to December 2024

Central America

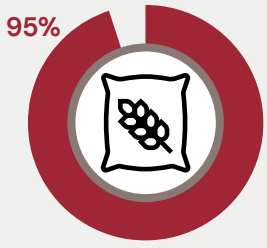
Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2).
% Contaminated samples January–December 2024 ■ and January–December 2023 ■

	Total samples: 698	Afla	ZEN	DON	T-2	FUM	OTA
Soybean	Number of samples tested	189	189	189	189	189	189
	% Contaminated samples	8%	42%	2%	1%	5%	4%
	Average of positive (ppb)	1	5	317	10	644	2
	Median of positive (ppb)	1	2	280	10	167	2
	Maximum (ppb)	6	48	534	10	2 356	4
Corn kernels	Number of samples tested	237	237	236	236	237	237
	% Contaminated samples	16%	81%	82%	10%	98%	0%
	Average of positive (ppb)	8	32	572	20	5 189	
	Median of positive (ppb)	1	15	406	19	1 976	
	Maximum (ppb)	54	371	4 914	45	244 701	0
Finished Feed	Number of samples tested	698	698	694	694	698	698
	% Contaminated samples	35%	95%	83%	6%	93%	2%
	Average of positive (ppb)	2	43	441	9	2 044	2
	Median of positive (ppb)	1	28	333	7	1 609	2
	Maximum (ppb)	45	1 653	6 229	35	13 851	6



Corn

FUM detected in 98% of samples with high average >5180 ppb



Finished Feed

Feed: 95% of samples contain more than 1 mycotoxin

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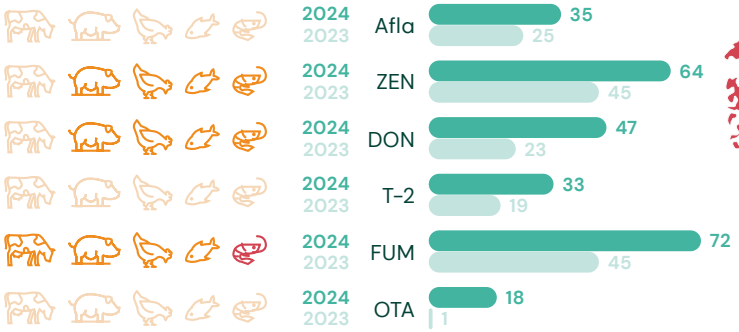
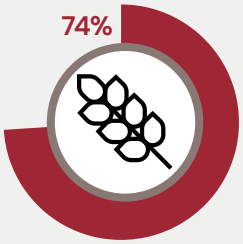
South America



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–December 2024 ■ and January–December 2023 ■

	Total samples: 725	Afla	ZEN	DON	T-2	FUM	OTA
Wheat grains	Number of samples tested	77	98	76	81	70	29
	% Contaminated samples	36%	69%	74%	40%	51%	7%
	Average of positive (ppb)	2	126	1 259	45	444	4
	Median of positive (ppb)	2	67	940	42	315	4
	Maximum (ppb)	5	1 174	4 070	104	1 810	6
Corn kernels	Number of samples tested	2 752	2 627	1 605	1 598	2 617	1 102
	% Contaminated samples	22%	51%	47%	26%	84%	11%
	Average of positive (ppb)	13	60	412	34	2 413	28
	Median of positive (ppb)	2	35	250	29	1 859	2
	Maximum (ppb)	583	1 370	5 020	400	17 820	800
Finished Feed	Number of samples tested	700	666	647	623	723	178
	% Contaminated samples	54%	76%	38%	13%	90%	13%
	Average of positive (ppb)	7	61	491	25	1 737	3
	Median of positive (ppb)	4	32	321	20	837	2
	Maximum (ppb)	216	1 084	6 675	84	66 390	6



Wheat grain

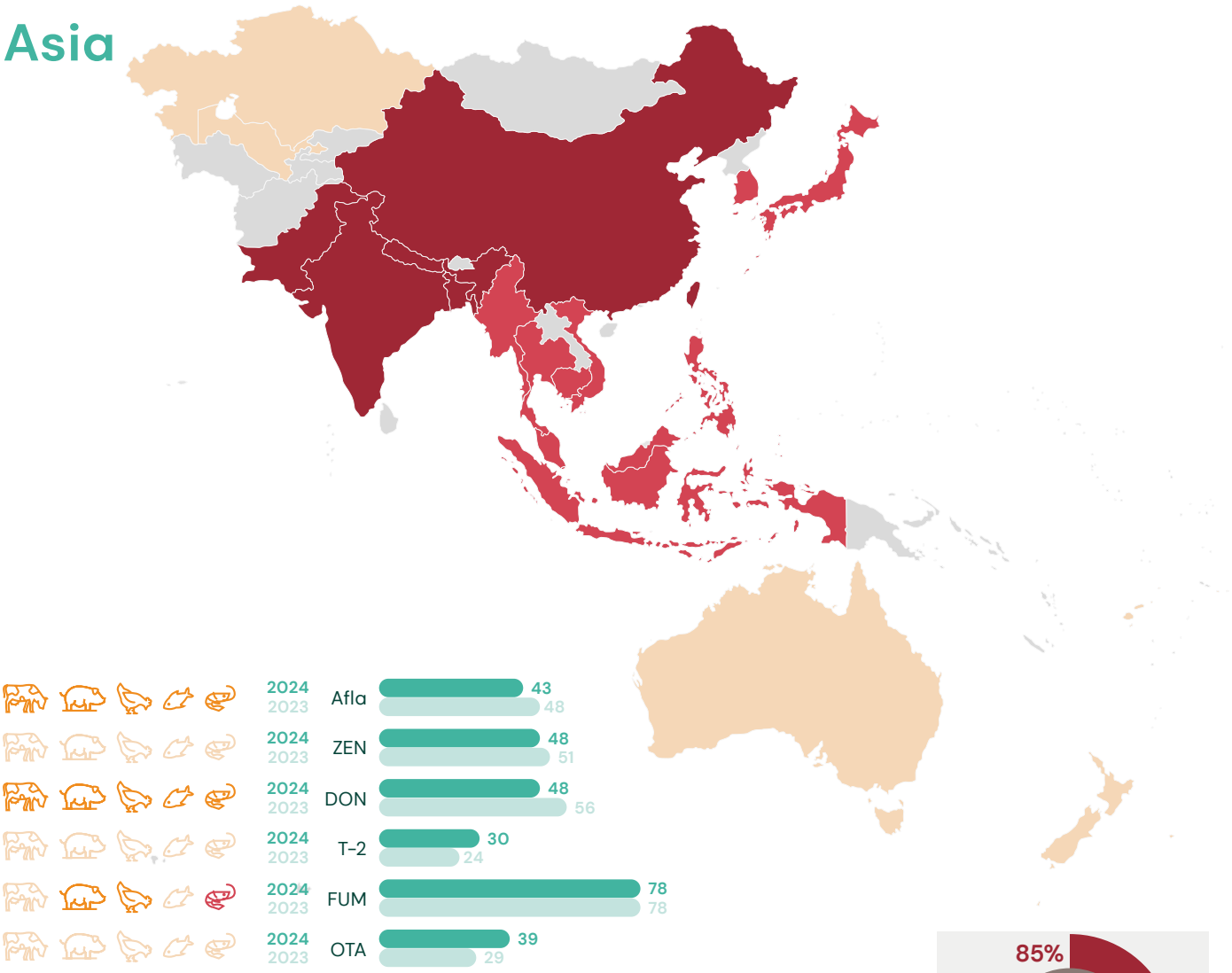
DON detected in 74% of samples with high average >1250 ppb

Finished Feed

FUM present in 90% of samples with high average >1730 ppb

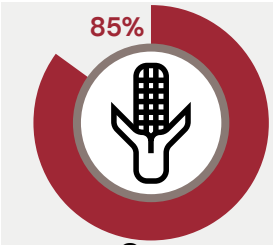
The Global Threat – January to December 2024

Asia



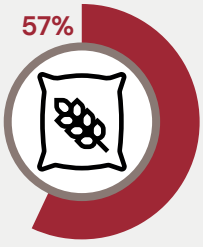
Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2).
% Contaminated samples January–December 2024 ■ and January–December 2023 ■

	Total samples: 2 023	Afla	ZEN	DON	T-2	FUM	OTA
Wheat grains	Number of samples tested	189	192	195	84	187	84
	% Contaminated samples	2%	54%	45%	5%	76%	11%
	Average of positive (ppb)	5	71	667	31	354	3
	Median of positive (ppb)	4	62	259	17	330	2
	Maximum (ppb)	11	536	5 348	79	2 200	7
Corn kernels	Number of samples tested	1 108	1 207	1 235	331	1 129	320
	% Contaminated samples	29%	43%	65%	29%	85%	14%
	Average of positive (ppb)	53	157	675	27	3 455	9
	Median of positive (ppb)	26	64	497	22	1 740	2
	Maximum (ppb)	517	3 750	13 614	96	489 698	133
Finished Feed	Number of samples tested	1 919	1 996	2 019	1 919	1 919	1 565
	% Contaminated samples	57%	52%	49%	28%	90%	43%
	Average of positive (ppb)	28	73	1 542	28	1 131	9
	Median of positive (ppb)	15	42	318	25	790	5
	Maximum (ppb)	1 160	1 800	476 954	99	11 919	579



Corn

FUM detected in 85% of samples with high average >3450 ppb



Finished Feed

Afla found in 57% of samples with high average of 28 ppb

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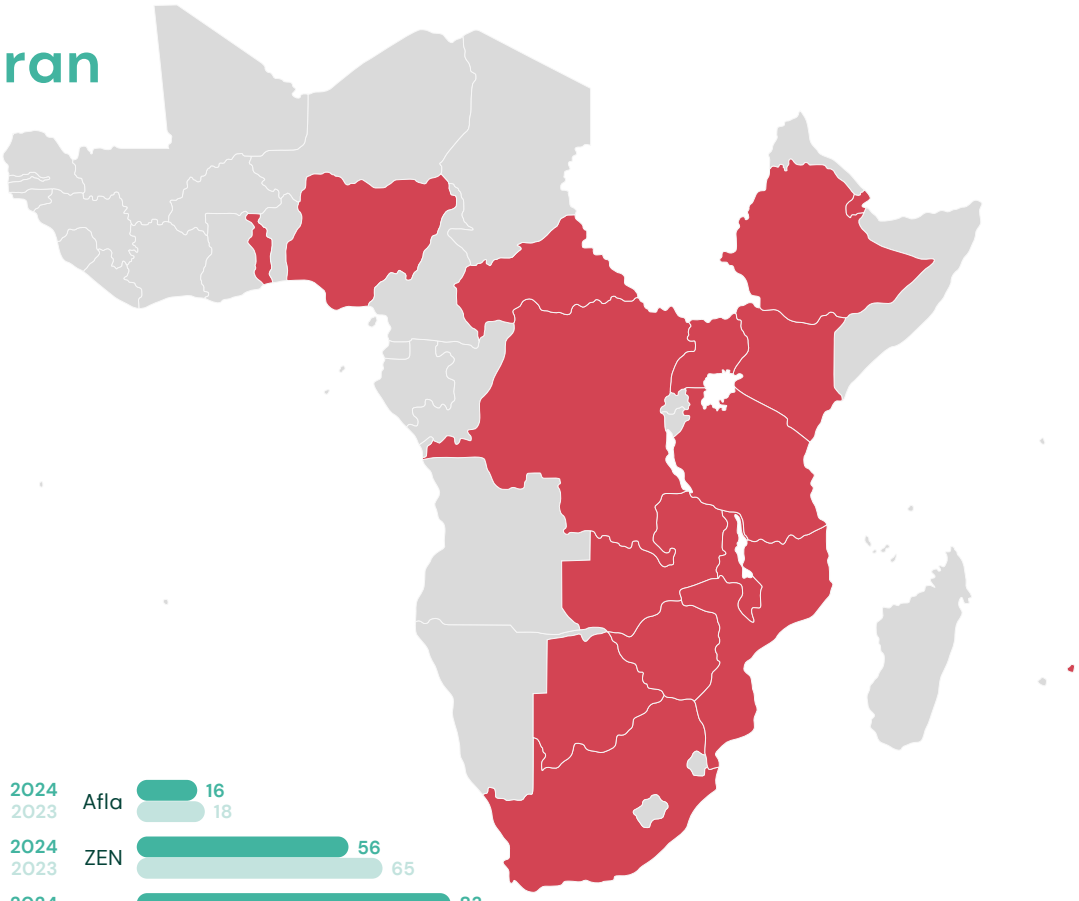
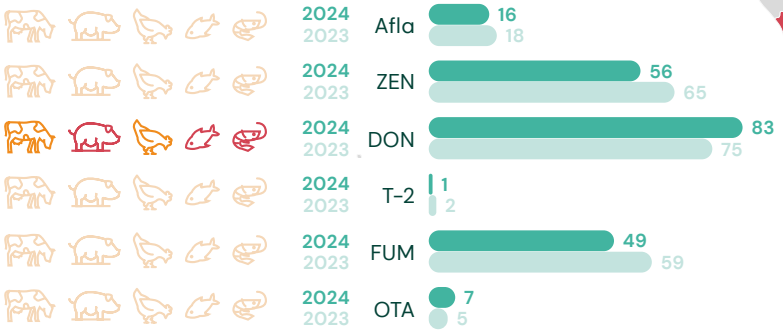
World Mycotoxin Survey

Sub-saharan Africa





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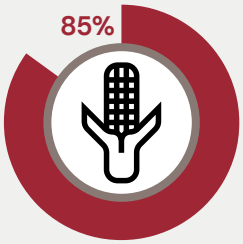
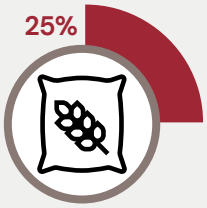
% Contaminated samples January–December 2024 ■ and January–December 2023 ■

	Total samples: 435	Afla	ZEN	DON	T-2	FUM	OTA
Wheat grains	Number of samples tested	16	16	16	16	16	16
	% Contaminated samples	0%	75%	100%	0%	25%	31%
	Average of positive (ppb)		7	362		49	2
	Median of positive (ppb)		7	218		56	2
	Maximum (ppb)	0	14	1 264	0	56	4
Corn kernels	Number of samples tested	472	472	472	472	472	472
	% Contaminated samples	10%	31%	85%	0%	47%	1%
	Average of positive (ppb)	62	44	374	15	439	6
	Median of positive (ppb)	12	12	177	15	131	5
	Maximum (ppb)	752	1 058	5 272	16	5 361	11
Finished Feed	Number of samples tested	435	435	435	435	435	434
	% Contaminated samples	25%	85%	89%	1%	67%	7%
	Average of positive (ppb)	43	30	389	10	194	3
	Median of positive (ppb)	6	10	202	11	70	2
	Maximum (ppb)	337	1 492	5 225	17	2 141	12



Corn

DON found in 85% of samples

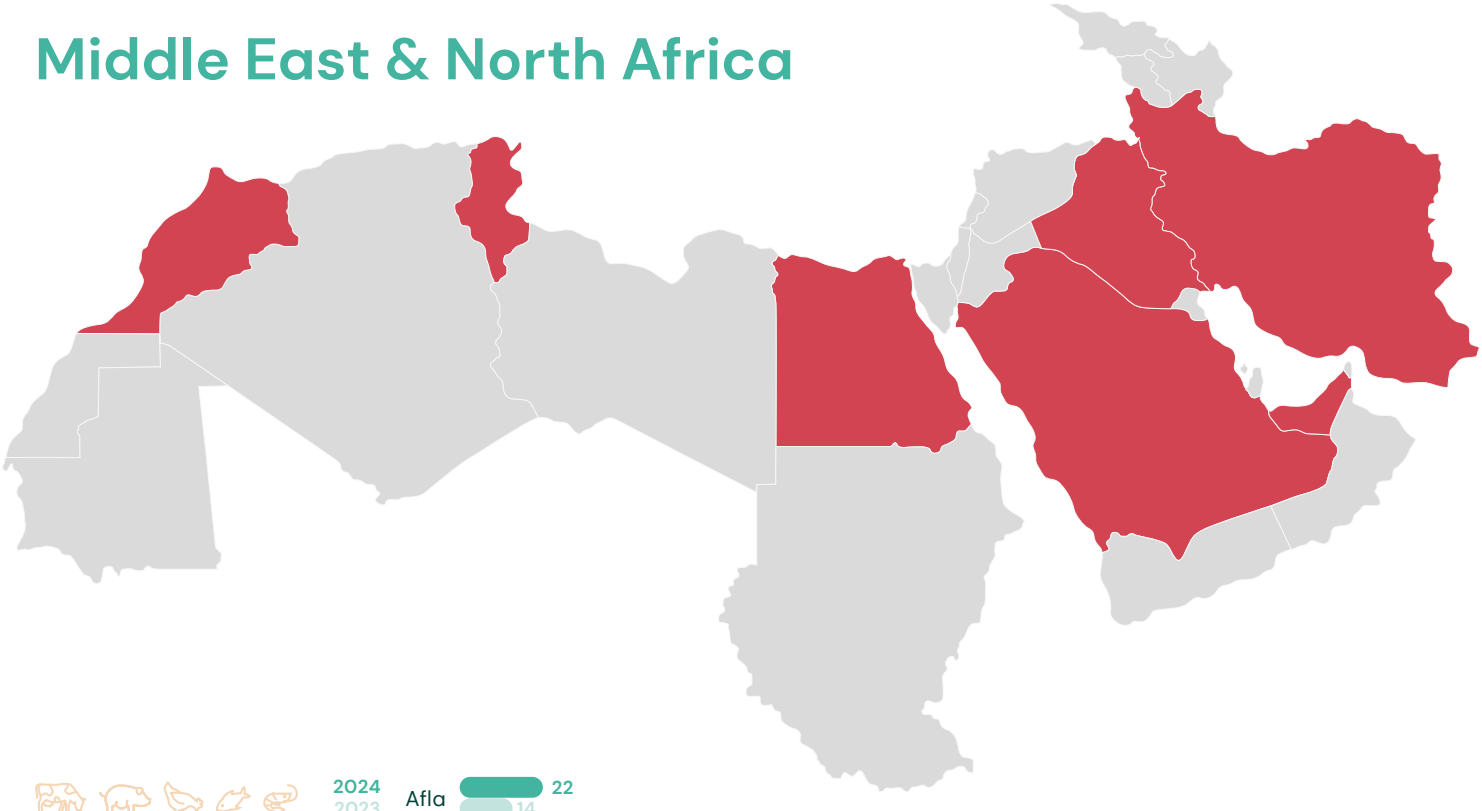


Finished Feed

Afla in 25% of samples with high average of 43 ppb

The Global Threat – January to December 2024

Middle East & North Africa



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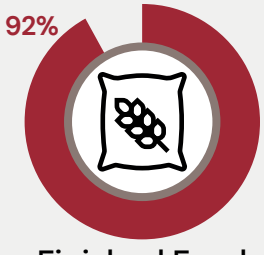
% Contaminated samples January–December 2024 ■ and January–December 2023 ■

	Total samples: 10 188	Afla	ZEN	DON	T-2	FUM	OTA
All commodities	Number of samples tested	198	198	198	194	198	194
	% Contaminated samples	22%	83%	74%	21%	93%	10%
	Average of positive (ppb)	2	36	334	15	563	3
	Median of positive (ppb)	1	14	239	11	245	2
	Maximum (ppb)	13	863	4 028	95	22 030	11
Corn kernels	Number of samples tested	24	24	24	23	24	23
	% Contaminated samples	13%	67%	83%	35%	100%	13%
	Average of positive (ppb)	4	111	636	39	553	5
	Median of positive (ppb)	4	15	407	34	222	5
	Maximum (ppb)	6	863	4 028	95	4 580	7
Finished Feed	Number of samples tested	157	157	157	157	157	157
	% Contaminated samples	25%	90%	71%	19%	93%	8%
	Average of positive (ppb)	2	27	273	9	448	2
	Median of positive (ppb)	1	14	225	7	280	2
	Maximum (ppb)	13	219	1 293	28	3 698	11

Corn

FUM prevalent in all samples



Finished Feed

92% of samples contain more than 1 mtx

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World Mycotoxin Survey

Focus: major grain & soy producing countries

Corn

Country		Afla	ZEN	DON	T2	FUM	OTA
Brazil	Number of samples	246	240	246	245	246	46
	% Contaminated samples	22%	22%	14%	3%	69%	2%
	Average of positives (ppb)	14	100	417	55	1 044	14
	Median of positives (ppb)	6	40	317	45	826	14
	Maximum (ppb)	212	1 370	1 961	109	6 959	14
Argentina	Number of samples	2 029	1 973	964	954	1 836	676
	% Contaminated samples	15%	51%	42%	24%	81%	0%
	Average of positives (ppb)	3	61	482	40	2 392	
	Median of positives (ppb)	2	38	273	38	1 850	
	Maximum (ppb)	50	1 005	4 190	109	17 820	
Ukraine	Number of samples	35	36	36	33	36	33
	% Contaminated samples	20%	22%	67%	21%	72%	6%
	Average of positives (ppb)	16	20	143	21	463	12
	Median of positives (ppb)	14	10	93	11	267	12
	Maximum (ppb)	40	96	460	55	3 186	22
USA	Number of samples	419	419	419	419	419	419
	% Contaminated samples	7%	70%	71%	11%	73%	1%
	Average of positives (ppb)	16	87	1 003	25	4 097	5
	Median of positives (ppb)	2	16	358	15	1 209	3
	Maximum (ppb)	111	2 305	21 146	97	96 316	16

Wheat

Country		Afla	ZEN	DON	T2	FUM	OTA
USA	Number of samples	21	21	21	21	21	21
	% Contaminated samples	0%	81%	95%	38%	5%	33%
	Average of positives (ppb)		57	1 064	142	153	5
	Median of positives (ppb)		36	814	78	153	3
	Maximum (ppb)	0	278	4 526	481	153	17
Australia	Number of samples	44	44	44	44	44	44
	% Contaminated samples	2%	2%	7%	0%	77%	0%
	Average of positives (ppb)	1	50	68		31	
	Median of positives (ppb)	1	50	41		25	
	Maximum (ppb)	1	50	140	0	95	0
France	Number of samples	10	115	115	55	14	10
	% Contaminated samples	0%	30%	70%	4%	0%	10%
	Average of positives (ppb)		41	250	4		2
	Median of positives (ppb)		13	91	4		2
	Maximum (ppb)	0	640	4 956	5	0	2

Soybean

Country		Afla	ZEN	DON	T2	FUM	OTA
Argentina	Number of samples	1 408	1 544	548	1 201	390	353
	% Contaminated samples	42%	77%	55%	37%	4%	1%
	Average of positives (ppb)	2	113	181	41	179	2
	Median of positives (ppb)	2	94	160	36	47	2
	Maximum (ppb)	9	506	510	104	1 530	2
Brazil	Number of samples	123	123	123	123	123	22
	% Contaminated samples	14%	38%	4%	8%	19%	0%
	Average of positives (ppb)	5	93	657	29	393	
	Median of positives (ppb)	5	43	390	25	199	
	Maximum (ppb)	12	963	2 082	72	2 201	0
USA	Number of samples	53	53	53	53	53	53
	% Contaminated samples	6%	40%	2%	0%	23%	15%
	Average of positives (ppb)	2	12	46		111	3
	Median of positives (ppb)	3	3	46		46	2
	Maximum (ppb)	4	48	46	0	684	11

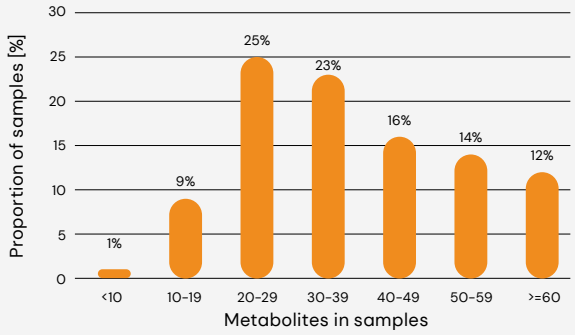
The Global Threat – January to December 2024

Total 1 271 samples from 38 countries; 1 016 800 points of analysis

Multiple mycotoxin occurrence

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

1 271	1 016 800	38
Samples	**Analysis points**	**Countries**



47
average number
of Mycotoxins and Metabolites per sample

9,8
out of
10
samples contaminated with *Fusarium* toxins

98 %
Contained
10
or more mycotoxins and metabolites

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.

Mycotoxins & metabolites

Metabolite	Prevalence	Average	Maximum
Tryptophol	91%	351	78 200
Aurofusarin	76%	413	17 329
Enniatin B	71%	103	2 871
Abscisic acid	70%	301	7 685
Beauvericin	69%	18	1 016
Equisetin	69%	109	10 603
Culmorin	68%	116	3 800
Moniliformin	68%	96	2 279
Brevianamid F	64%	86	1 663
Enniatin B1	64%	53	1 283
Infectopyron	64%	8 394	631 680
Siccanol	63%	224	8 688
Emodin	61%	40	2197
Bikaverin	61%	32	605
Asperglaucide	60%	190	25 781
Asperphenamate	60%	144	12 557
Deoxynivalenol	60%	499	22 354
Flavoglaucin	59%	355	95 136
Zearalenone	59%	68	4 961
Altersetin	55%	48	5 052
15-Hydroxyculmorin	54%	482	14 770
Fellutanine A	53%	73	1 288
Daidzein	52%	3 669	26 110
Genistin	52%	37 732	322 600
Rugulusovin	52%	92	3 044
Genistein	52%	2 795	22 649
Antibiotic Y	52%	457	108 480
Neoechinulin A	51%	227	79 008
Daidzin	51%	3 669	26 110

Positive Samples [%] for metabolites present in >50% 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.

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World Mycotoxin Survey

Overview of the most frequently found mycotoxin emerging mycotoxins in all samples and finished

ALL samples (n=6 701)

Metabolite	Prevalence	Average	Maximum
Deoxynivalenol	75%	496	20 666
Beauvericin	70%	45	2 390
Enniatin B	66%	69	7 825
Enniatin B1	63%	26	1 763
Fumonisin B1	61%	448	335 053
Fumonisin B2	58%	168	114 907
Zearalenone	57%	77	9 099
Moniliformin	55%	112	3 440
Enniatin A1	47%	14	575
Alternariol	44%	36	4 723
Fumonisin B3	39%	97	39 738
Deoxynivalenol-3-Glucoside	31%	111	3 967
Enniatin A	30%	7	377
Aflatoxin B1	21%	12	2 945
Ochratoxin A	17%	6	579
15-Acetyl-Deoxynivalenol	16%	192	4 335
HT-2 Toxin	14%	84	3 081
Sterigmatocystin	12%	8	435
T-2 Toxin	10%	42	1 255
Nivalenol	10%	198	5 319
Mycophenolic Acid	7%	286	26 974
Ergometrine	6%	34	521
Ergosine	6%	31	751
Beta-Zearalenol	5%	35	2 834
Alpha-Zearalenol	4%	24	151

6 701	355 153	77
Samples	Analysis points	Countries

- **Ergot alkaloids**
- **Regulated or guideline mycotoxins**
- **Masked and modified mycotoxins**
  - **15-Acetyl-DON:** fungal metabolite of DON; shown to be converted to DON in intestinal tract of pigs and chickens
  - **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.
- **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*)
- **Zearalenone metabolites**

Top25 metabolites are presented according to their prevalence. 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.

The Global Threat – January to December 2024

s, their masked and modified forms as well as feed

Emerging myotoxins

Emerging myotoxins: 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

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 B_1 in animals, but lower acute toxicity; negative effects incl. bloody diarrhea, less milk production, less feed intake, hepatotoxicity, nephrotoxicity

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

FINISHED FEED (n=2 534)

Metabolite	Prevalence	Average	Maximum
Deoxynivalenol	81%	314	14 532
Fumonisin B1	77%	198	7 853
Enniatin B	77%	37	1 532
Enniatin B1	76%	16	448
Beauvericin	73%	24	537
Fumonisin B2	72%	80	2 862
Zearalenone	71%	31	1 728
Moniliformin	69%	69	1 348
Alternariol	58%	25	1 161
Enniatin A1	54%	9	274
Fumonisin B3	47%	56	1 204
Enniatin A	35%	5	61
Aflatoxin B1	31%	7	150
Deoxynivalenol-3-Glucoside	30%	75	2 363
Ochratoxin A	25%	4	579
15-Acetyl-Deoxynivalenol	12%	126	2 061
Sterigmatocystin	11%	6	77
HT-2 Toxin	8%	56	973
T-2 Toxin	8%	37	892
Ergometrine	8%	33	144
Mycophenolic Acid	7%	119	9 083
beta-Zearalenol	6%	24	220
Nivalenol	6%	122	2 436
Aflatoxin G1	5%	20	234
Aflatoxin B2	5%	4	16

Top25 metabolites are presented according to their prevalence. 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.

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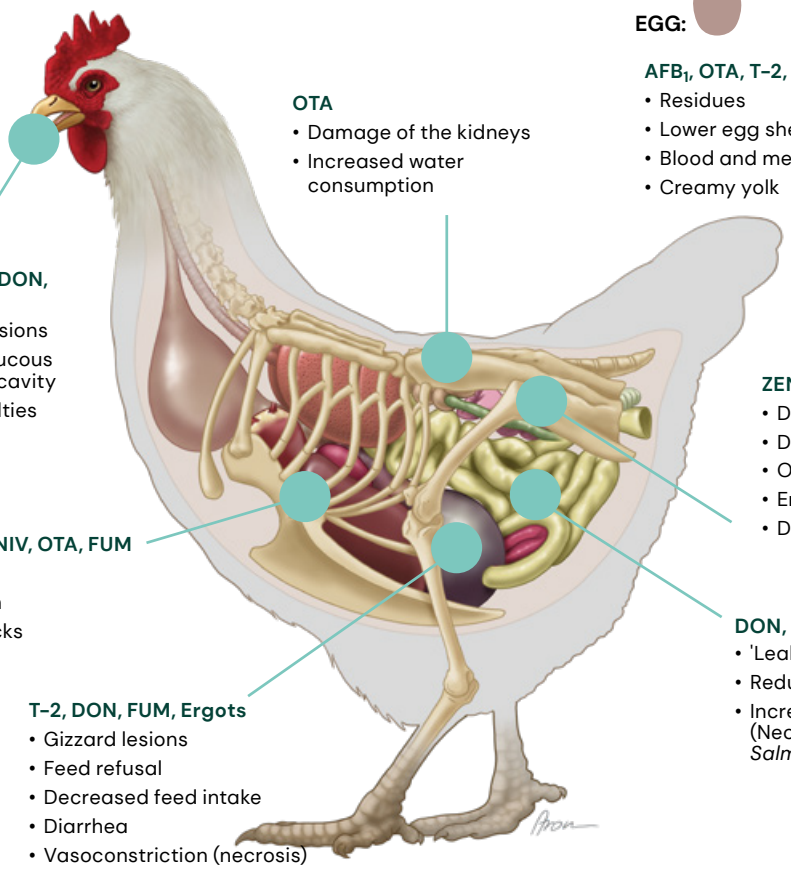
World Mycotoxin Survey

Meaning of abbreviations:

DON: Deoxynivalenol
ZEN: Zearalenone
AFB_1: Aflatoxin B_1
FUM: Fumonisins
T-2: T-2 Toxin
HT-2: HT-2 Toxin
NIV: Nivalenol
DAS: Diacetoxyscirpenol
OTA: Ochratoxin A
Ergots: Ergot Alkaloids



T-2, HT-2, NIV, DAS, DON, AFB1, Ergots
- Oral and dermal lesions
- Inflammation of mucous membrane of oral cavity
- Respiratory difficulties
- Bad feathering

OTA
- Damage of the kidneys
- Increased water consumption

EGG:

AFB_1, OTA, T-2, DON, ZEN
- Residues
- Lower egg shell quality
- Blood and meat spots
- Creamy yolk

ZEN, DON, T-2, DAS, Ergots
- Decreased hatchability
- Decreased egg production
- Ovarian cysts
- Embryonic loss
- Delayed sexual maturation

AFB_1, T-2, DON, DAS, NIV, OTA, FUM
- Fatty liver
- Immunosuppression
- Inhomogeneous flocks
- Impaired feathering
- Nervous syndrome

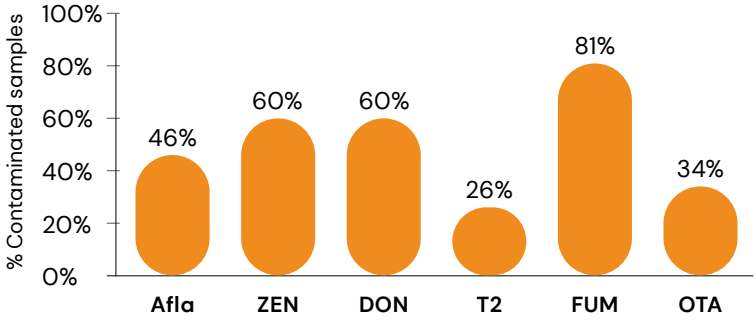
DON, FUM
- 'Leaky gut' condition
- Reduced nutrients absorption
- Increased gut health issues (Necrotic Enteritis, Coccidiosis, *Salmonella, E.coli*)

T-2, DON, FUM, Ergots
- Gizzard lesions
- Feed refusal
- Decreased feed intake
- Diarrhea
- Vasoconstriction (necrosis)
- Decreased performance

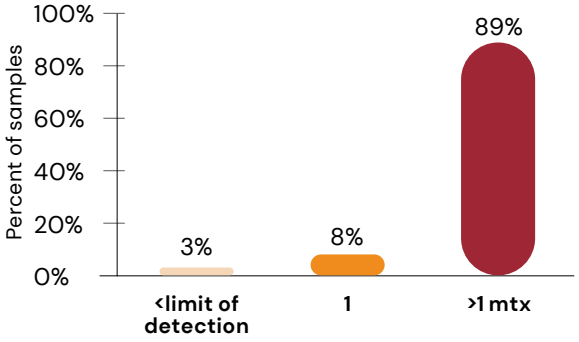
Summary for Finished Feed Poultry in World from Jan 2024 to Dec 2024

Total samples: 2 841	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples	2 834	2 821	2 841	2 777	2 776	2 477
% Contaminated samples	46%	60%	60%	26%	81%	34%
Average of positive (ppb)	22	52	821	25	833	8
Median of positive (ppb)	8	21	208	21	410	4
Maximum (ppb)	1 160	1 800	476 954	186	11 919	579

Prevalence of Mycotoxin Detected



No. of Mycotoxins per sample



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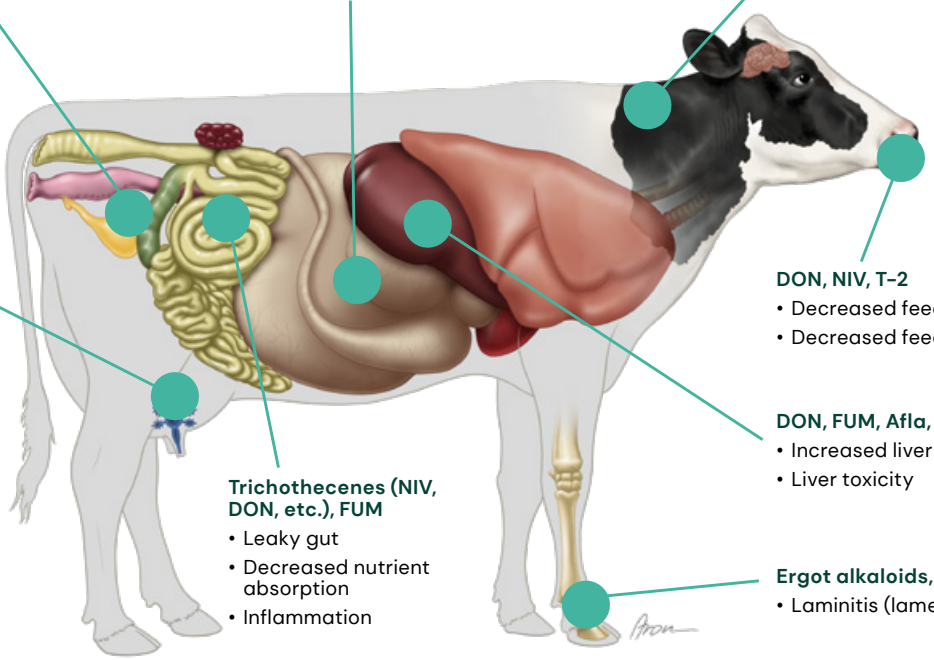


ZEN, Ergot alkaloids, Trichothecenes (DON, T-2, etc.), Afla
- Irregular heats
- Low conception rates
- Ovarian cysts
- Embryonic Loss
- Abortions
- Low testicular development
- Low sperm production

DON, NIV, T-2, Afla, ZEN, Ergot alkaloids, etc.
- Impaired rumen function
- Diarrhea
- Lower volatile fatty acid production
- Lower microbial protein production
- Decreased rumen pH

Ergot alkaloids
- Impaired thermoregulation
- Convulsions

Afla, DON, NIV, T-2, HT-2, among others.
- Milk contamination
- Decreased milk production
- Mastitis

DON, NIV, T-2
- Decreased feed intake
- Decreased feed efficiency

DON, FUM, Afla, etc.
- Increased liver enzymes
- Liver toxicity

Trichothecenes (NIV, DON, etc.), FUM
- Leaky gut
- Decreased nutrient absorption
- Inflammation

Ergot alkaloids, endotoxins, DON
- Laminitis (lameness)

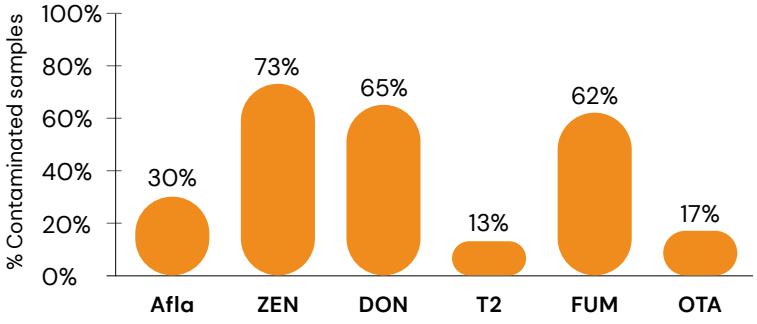
Meaning of abbreviations:

Afla: Aflatoxins
DON: Deoxynivalenol
FUM: Fumonisins
HT-2: HT-2 toxin
NIV: Nivalenol
T-2: T-2 toxin

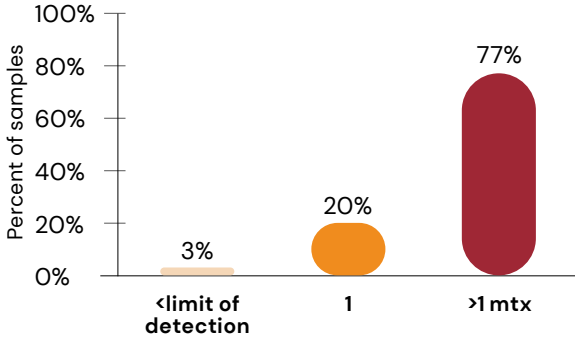
Summary for Finished Feed Ruminants in World from Jan 2024 to Dec 2024

	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples	1 593	1 623	1 605	1 458	1 471	1 168
% Contaminated samples	30%	73%	65%	13%	62%	17%
Average of positive (ppb)	33	94	825	43	985	13
Median of positive (ppb)	10	41	470	21	307	5
Maximum (ppb)	461	4 619	16 061	914	31 722	198

Prevalence of Mycotoxin Detected



No. of Mycotoxins per sample



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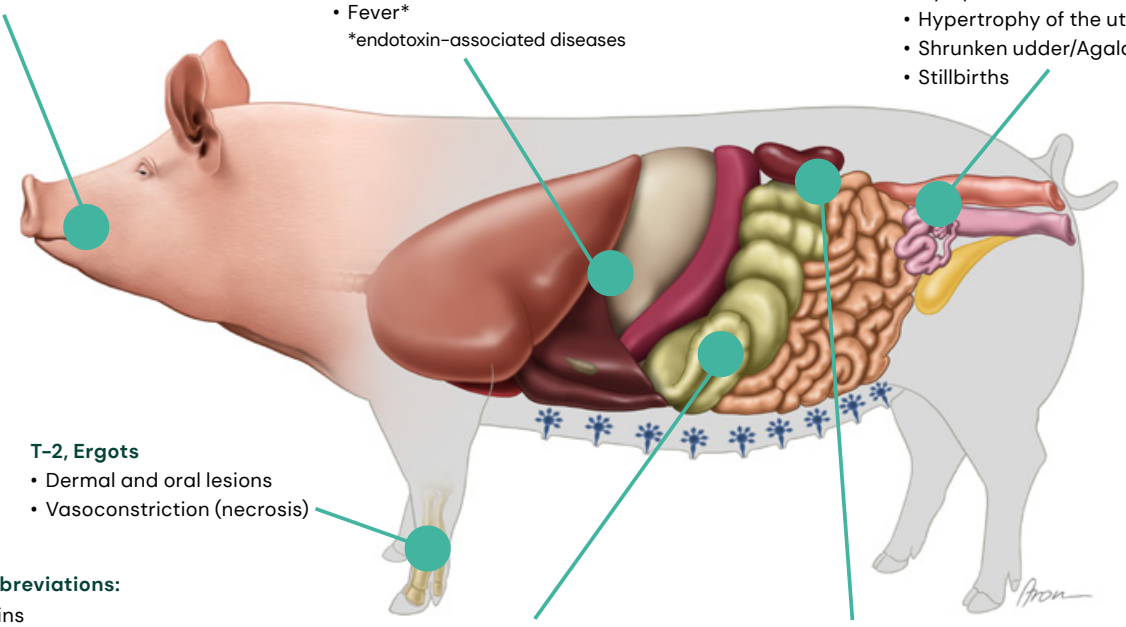
World Mycotoxin Survey

T-2, DON, Ergots
- Decreased feed intake
- Dermal and oral lesions
- Feed refusal
- Vomiting
- Impaired growth

T-2, DON, Afla, OTA, FUM, Endotoxins
- Intestinal hemorrhages
- Damage of the kidneys
- Pale and fatty liver
- Porcine pulmonary edema (PPE)
- Increased water consumption
- Fever*

*endotoxin-associated diseases

ZEN, T-2, DON, Ergots
- Irregular heats
- Abortion
- Pseudo pregnancy
- Low conception rates
- Ovarian cysts
- Embryonic Loss
- Tail necrosis
- Nymphomania
- Hypertrophy of the uterus
- Shrunken udder/Agalactia
- Stillbirths



T-2, Ergots
- Dermal and oral lesions
- Vasoconstriction (necrosis)

Meaning of abbreviations:

Afla: Aflatoxins
DON: Deoxynivalenol
FUM: Fumonisins
HT-2: HT-2 toxin
NIV: Nivalenol
T-2: T-2 toxin

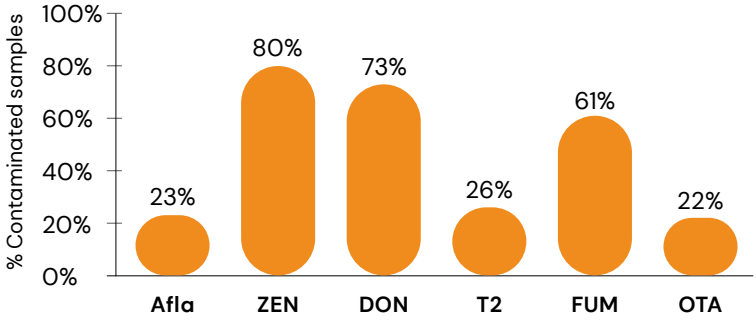
T-2, DON, Afla, OTA, FUM
- Decreased performance
- Immunosuppression
- Pancreatic necroses

Afla, T-2, OTA
- Diarrhea
- Blood in feces and urine
- Inflammation of bladder and kidneys

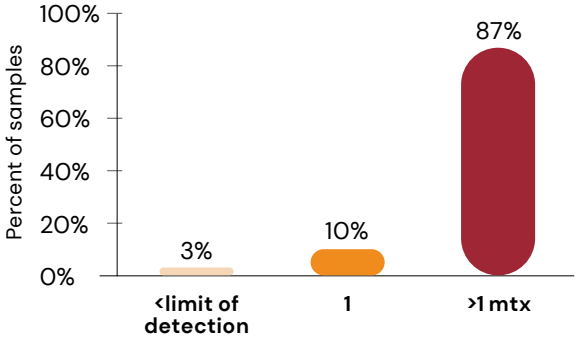
Summary for Finished Feed Swine in World from Jan 2024 to Dec 2024

	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples	1 656	1 904	1 902	1 512	1 530	1 362
% Contaminated samples	23%	80%	73%	26%	61%	22%
Average of positive (ppb)	7	33	466	15	442	5
Median of positive (ppb)	5	20	160	9	145	2
Maximum (ppb)	270	580	155 878	892	7 842	173

Prevalence of Mycotoxin Detected



No. of Mycotoxins per sample



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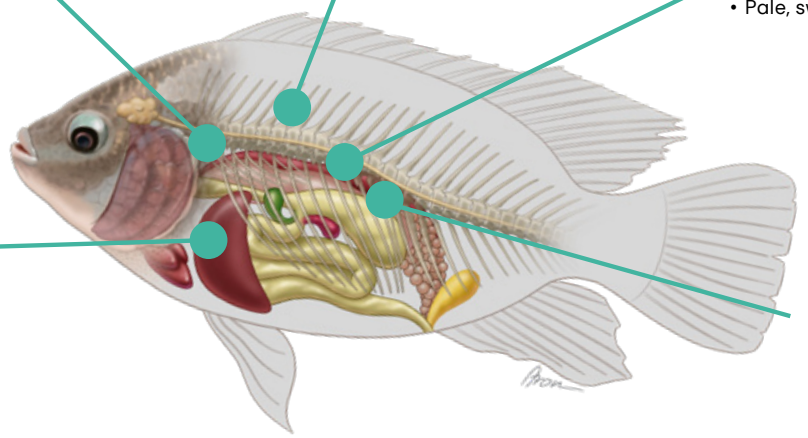
Trichothecenes (DON, T-2)
- Reduced feed consumption
- Decreased hemoglobin concentration, lower hematocrit value
- Poorer feed conversion rate

All mycotoxins
- Reduced growth
- Higher mortality
- Lower weight gain

Ochratoxin A
- Poorer feed conversion rate
- Severe histopathological lesions of liver and posterior kidneys
- Liver necrosis
- Pale, swollen kidneys

Aflatoxin B1
- Highly carcinogenic
- Liver tumors, liver lesions
- Severe hepatic necrosis
- Pale gills
- Impaired blood clotting
- Anemia
- Pale yellow kidney lesions

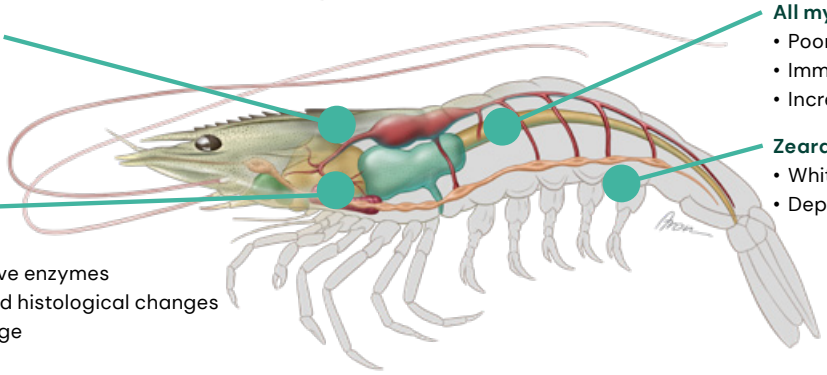


Fumonisins
- Lower hematocrit value
- Histopathological lesions
- Lesions in the exocrine and endocrine pancreas
- Lesions in inter-renal tissue

Trichothecenes (DON, T-2)
- Reduced body weight
- Inhomogeneous growth
- Physiological disorders
- Lower hematocrit value

All mycotoxins
- Poor growth
- Immunosuppression
- Increased mortality

Zearalenone
- White Shrimp - reduced growth
- Deposit in meat

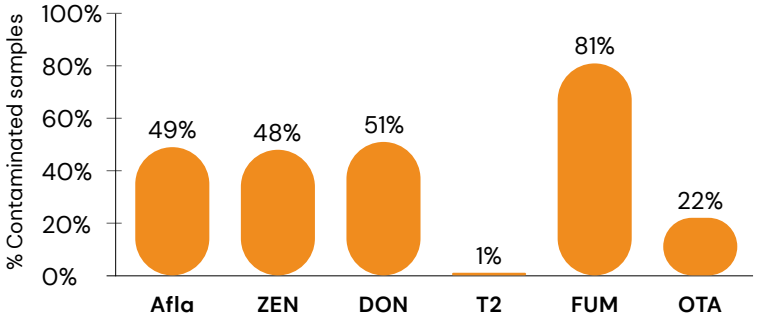


Aflatoxin B1
- Low digestibility
- Negative effect on digestive enzymes
- Physiological disorders and histological changes
- Hepato-pancreatic damage
- Lower hematocrit value
- Reduced growth
- Increased mortality

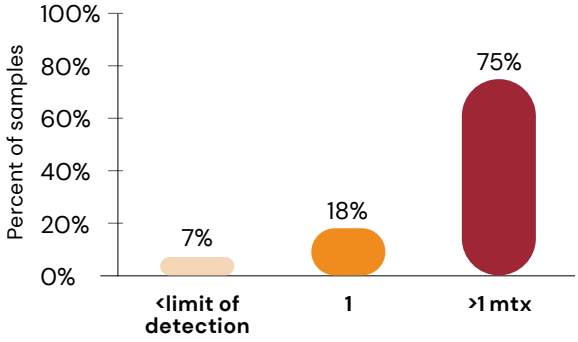
Summary for Finished Feed Aqua in World from Jan 2024 to Dec 2024

	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples	166	166	166	166	166	166
% Contaminated samples	49%	48%	51%	1%	81%	22%
Average of positive (ppb)	9	28	170	26	167	2
Median of positive (ppb)	2	10	101	26	121	2
Maximum (ppb)	105	329	733	26	1 193	6

Prevalence of Mycotoxin Detected



No. of Mycotoxins per sample



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