Notox™

Global Mycotoxin Report

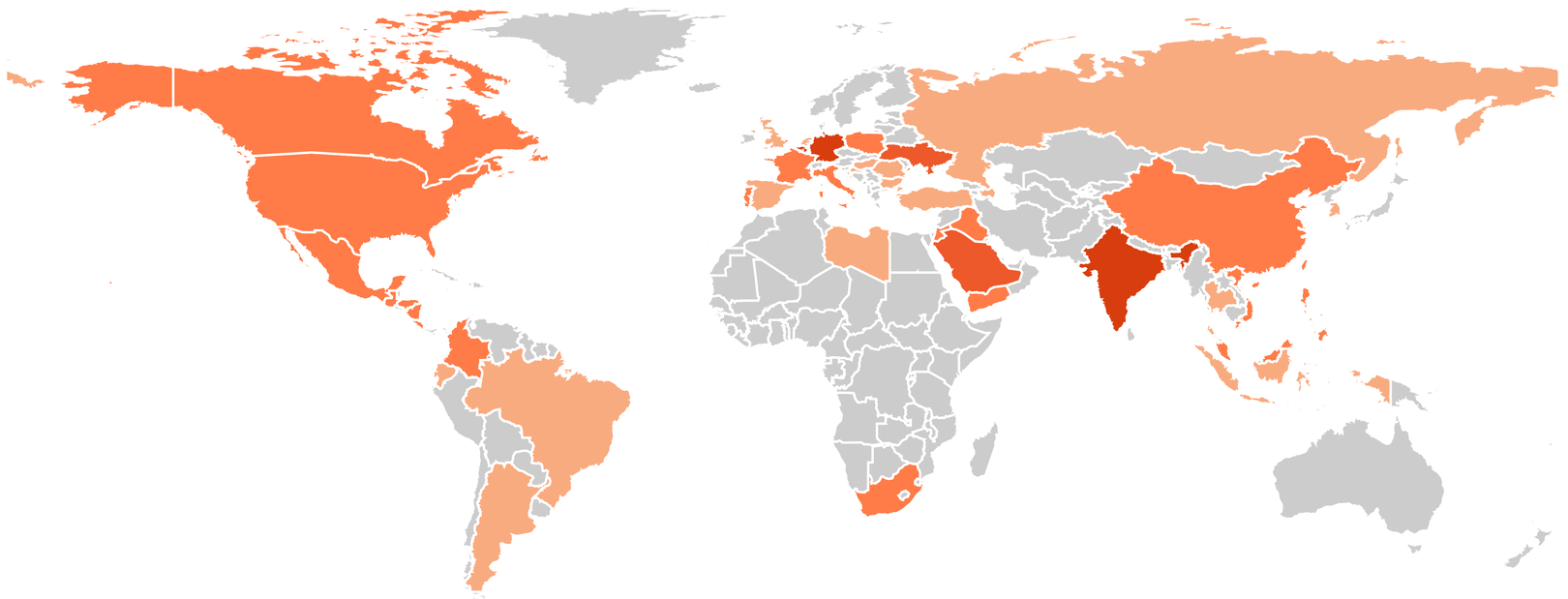
January - December 2024

Cargill Micronutrition & Health Solutions

Global Mycotoxin Performance Risk

Date

1/1/2024 — 12/31/2024



Percent Analyses Above Cargill Performance Risk Threshold		
Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

Cargill Performance Risk Thesholds: Cargill's performance risk thresholds are based upon extensive in vivo research and equations that model performance loss determined by mycotoxin levels found in feed ingredients. Low ~ 0.5% performance loss; Medium 1% performance loss; and High ~2% performance loss;

Analysis: 404,343 **Countries:** 43 **Total Samples:** 152,083

Toxins Tested	Toxins Analyses
Aflatoxin (AFL)	125,843
Fumonisin (FUM)	55,073
Ochratoxin (OTA)	18,212
T2 Toxin (T2)	21,955
Vomitoxin (DON)	122,569
Zearalenone (ZEN)	60,691

Total Analysis by Ingredient Group

Corn	Cereals	Oilseeds	Forages	Others
255,065	91,258	28,732	25,995	3,293

Total Analysis by Region

Asia	N° Samples
AFL	16,650
DON	3,627
FUM	3,264
OTA	2,671
T2	2,941
ZEN	3,810
Total	**32,963**

Central & South America	N° Samples
AFL	13,245
DON	10,746
FUM	9,922
OTA	5,039
T2	5,734
ZEN	9,460
Total	**54,146**

China	N° Samples
AFL	30,969
DON	31,784
FUM	1,242
OTA	148
T2	224
ZEN	26,449
Total	**90,816**

Europe	N° Samples
AFL	14,604
DON	22,269
FUM	5,304
OTA	4,691
T2	4,700
ZEN	6,739
Total	**58,307**

Middle East & Africa	N° Samples
AFL	2,906
DON	1,101
FUM	1,868
OTA	1,692
T2	1,719
ZEN	2,728
Total	**12,014**

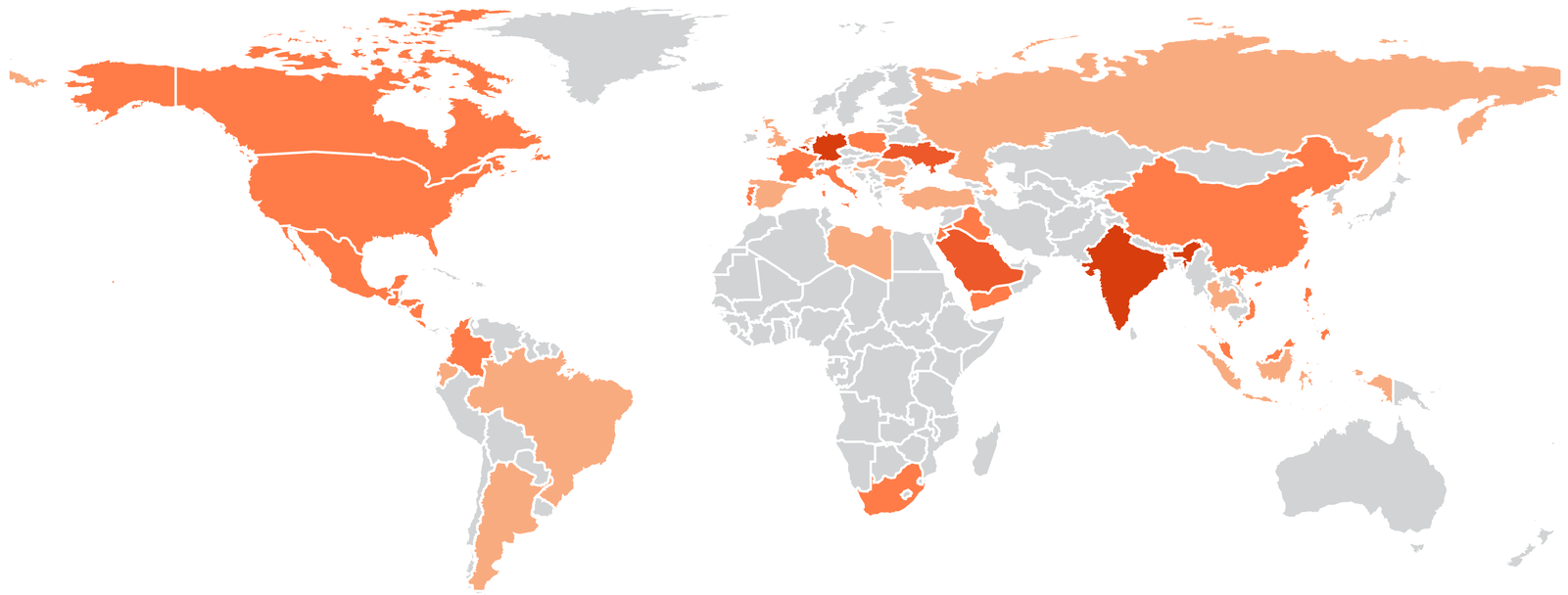
North America	N° Samples
AFL	44,789
DON	50,546
FUM	32,682
OTA	1,691
T2	4,016
ZEN	9,001
Total	**142,725**

Russia	N° Samples
AFL	2,680
DON	2,496
FUM	791
OTA	2,280
T2	2,621
ZEN	2,504
Total	**13,372**

Global Mycotoxin Prevalence

Region: All

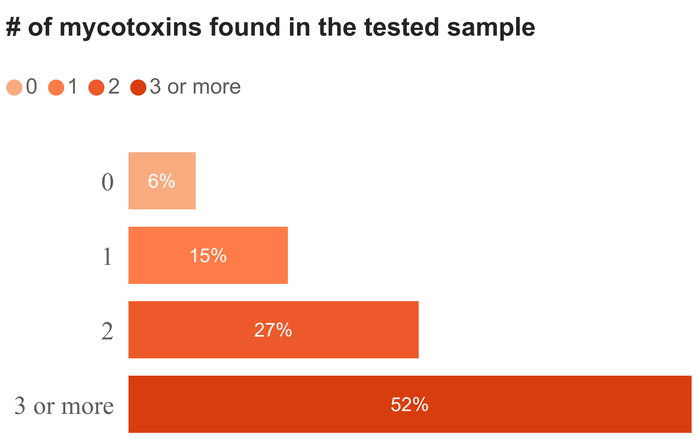
Date: 1/1/2024 – 12/31/2024



Percent Analyses Above Cargill Performance Risk Threshold		
Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

Multiple Mycotoxin Contamination: % of samples with 0, 1, 2, 3 or more mycotoxins

(For samples tested for 3 or more Mycotoxins)



Mycotoxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average Contamination (ppb)	Maximum Result (ppb)
Aflatoxin (AFL)	125,843	65%	13%	11.7	500
Fumonisin (FUM)	55,073	74%	44%	1,481.0	90,840
Ochratoxin (OTA)	18,212	60%	1%	3.3	1,460
T2 Toxin (T2)	21,955	48%	20%	35.2	1,722
Vomitoxin (DON)	122,569	79%	56%	906.3	25,000
Zearalenone (ZEN)	60,691	74%	43%	108.8	45,429
Total	**404,343**	**70%**	**35%**	**539.6**	**90,840**

Percent Analyses Above Cargill Performance Risk Threshold

Asia	Percent Above
AFL	55%
DON	35%
FUM	42%
OTA	2%
T2	14%
ZEN	34%

Central & South America	Percent Above
AFL	6%
DON	39%
FUM	66%
OTA	0%
T2	13%
ZEN	45%

China	Percent Above
AFL	14%
DON	65%
FUM	48%
OTA	1%
T2	3%
ZEN	48%

Europe	Percent Above
AFL	3%
DON	48%
FUM	34%
OTA	0%
T2	13%
ZEN	35%

Middle East & Africa	Percent Above
AFL	8%
DON	17%
FUM	33%
OTA	0%
T2	31%
ZEN	43%

North America	Percent Above
AFL	4%
DON	62%
FUM	40%
OTA	3%
T2	15%
ZEN	42%

Russia	Percent Above
AFL	2%
DON	22%
FUM	10%
OTA	1%
T2	56%
ZEN	19%

Global Analysis by Mycotoxin and Ingredient

Region: All

Date: 1/1/2024 – 12/31/2024

CORN

(Corn and corn byproducts)

Mycotoxin Analyzed	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average Contamination (ppb)	Maximum Result (ppb)
Aflatoxin (AFL)	79,039	64%	8%	7.3	500
Fumonisin (FUM)	45,628	80%	50%	1,558.7	90,840
Ochratoxin (OTA)	8,740	56%	1%	3.7	1,460
T2 Toxin (T2)	12,014	48%	21%	36.1	1,061
Vomitoxin (DON)	72,194	79%	61%	1,100.3	25,000
Zearalenone (ZEN)	37,450	78%	46%	120.2	45,429

CEREALS

(Wheat, barley, oat, rice, sorghum, triticale, byproducts, other)

Mycotoxin Analyzed	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average Contamination (ppb)	Maximum Result (ppb)
Aflatoxin (AFL)	25,927	78%	31%	21.3	488
Fumonisin (FUM)	3,925	34%	6%	317.8	12,815
Ochratoxin (OTA)	4,493	55%	1%	3.3	930
T2 Toxin (T2)	4,523	57%	30%	41.7	1,381
Vomitoxin (DON)	39,090	83%	52%	472.9	20,030
Zearalenone (ZEN)	13,300	64%	28%	59.2	8,000

OILSEEDS

(soybean, rapeseed, canola, sunflower, cottonseed, palm, kernel, byproducts, other)

Mycotoxin Analyzed	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average Contamination (ppb)	Maximum Result (ppb)
Aflatoxin (AFL)	10,093	68%	19%	19.9	474
Fumonisin (FUM)	3,088	45%	7%	408.9	49,532
Ochratoxin (OTA)	3,112	71%	1%	2.9	868
T2 Toxin (T2)	2,167	60%	15%	22.7	371
Vomitoxin (DON)	4,727	45%	10%	153.3	3,242
Zearalenone (ZEN)	5,545	81%	50%	84.2	3,266

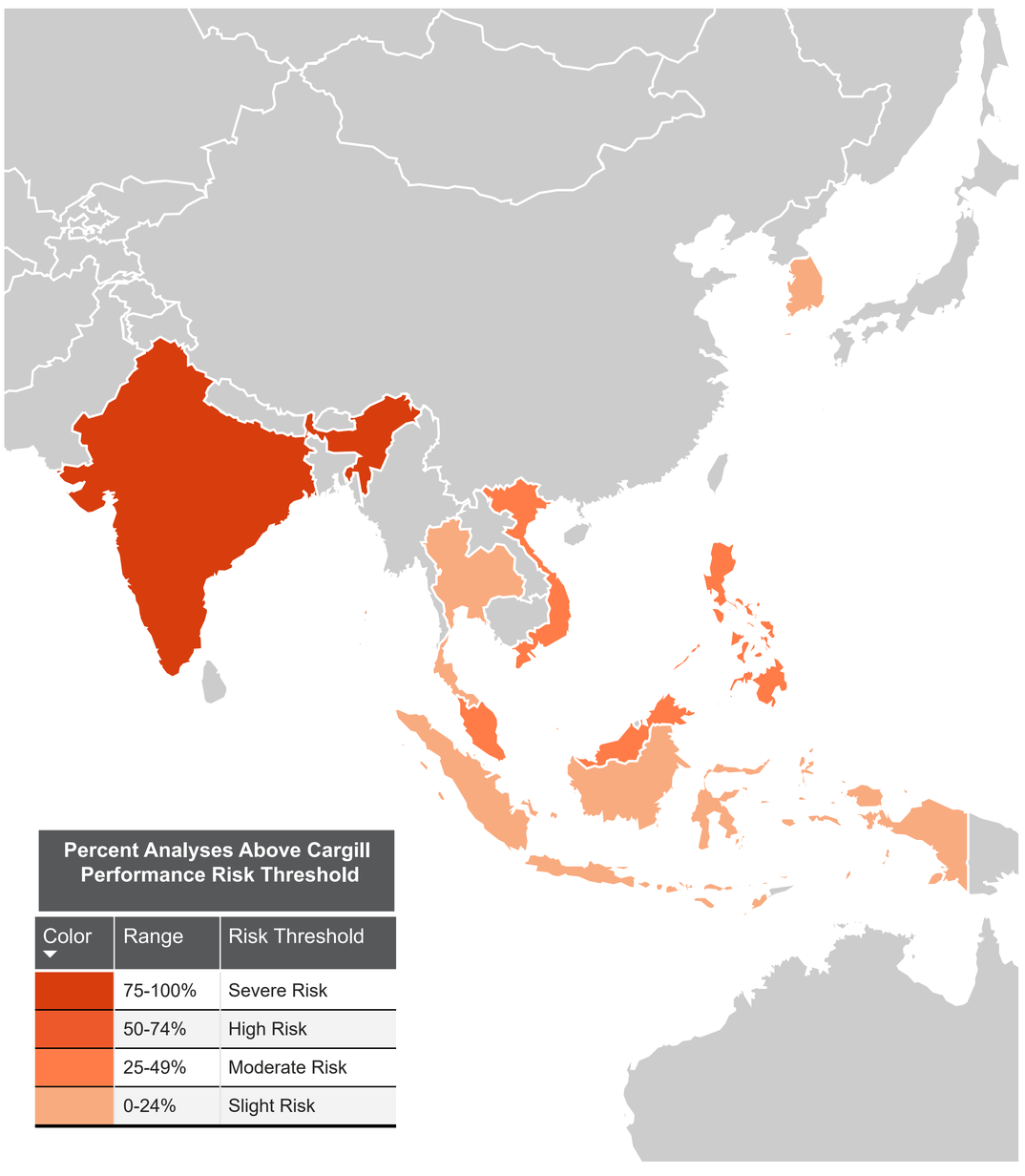
FORAGE

(Corn silage, grass silage, hay, others)

Mycotoxin Analyzed	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average Contamination (ppb)	Maximum Result (ppb)
Aflatoxin (AFL)	9,982	31%	1%	2.2	194
Fumonisin (FUM)	1,944	56%	42%	1,838.9	49,809
Ochratoxin (OTA)	1,576	77%	0%	1.6	32
T2 Toxin (T2)	2,970	20%	4%	25.2	1,722
Vomitoxin (DON)	5,781	77%	72%	1,969.9	23,893
Zearalenone (ZEN)	3,742	58%	44%	195.9	11,647

Regional Data: Asia

Region: Asia | Country: All | Date: 1/1/2024 – 12/31/2024



Percent Analyses Above Cargill Performance Risk Threshold

Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

Total Analysis	32,963

Total Contaminated Analysis Above Detection Limit	27,146

% Analyses Above Cargill Performance Risk Threshold

41%

Percent Contaminated Analysis Above Detection Limit

82%

Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	16,650	93%	55%	50%
DON	3,627	67%	35%	35%
FUM	3,264	71%	42%	37%
OTA	2,671	73%	2%	12%
T2	2,941	66%	14%	21%
ZEN	3,810	80%	34%	33%
Total	**32,963**	**82%**	**41%**	**39%**

Analysis by Main Feed Material

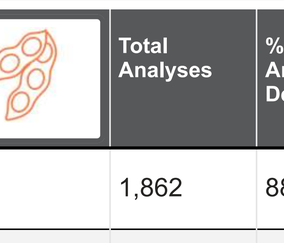
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	7,588	92%	41%	23.4	482
DON	1,595	72%	55%	1,977.8	20,603
FUM	1,769	95%	75%	4,096.0	90,840
OTA	1,097	60%	3%	8.3	470
T2	1,430	54%	17%	31.4	484
ZEN	1,654	83%	50%	369.1	10,535

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	7,010	96%	74%	51.5	488
DON	1,167	70%	28%	345.6	6,000
FUM	636	46%	3%	204.4	10,066
OTA	798	81%	1%	4.1	930
T2	743	83%	11%	18.0	801
ZEN	1,104	75%	26%	63.0	3,082

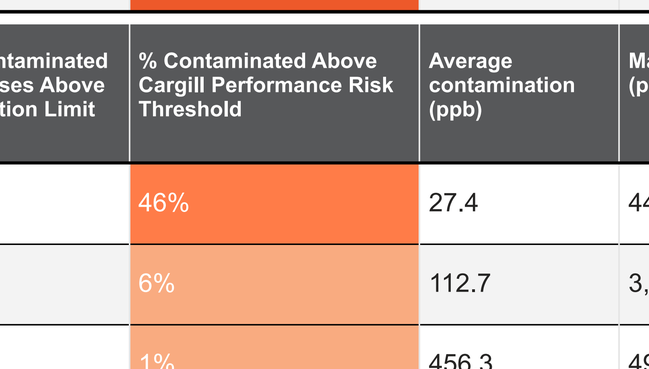
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	1,862	88%	46%	27.4	446
DON	706	53%	6%	112.7	3,242
FUM	698	41%	1%	456.3	49,532
OTA	604	86%	2%	4.9	868
T2	675	70%	9%	13.8	287
ZEN	884	82%	15%	24.9	520

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	64	64%	0%	2.7	8
DON	64	38%	13%	236.1	680
FUM	64	38%	33%	2,440.8	10,574
OTA	64	42%	2%	3.6	25
T2	0	0%	0%	-	-
ZEN	64	48%	33%	107.7	1,215

Cargill Performance Risk Level By Species**

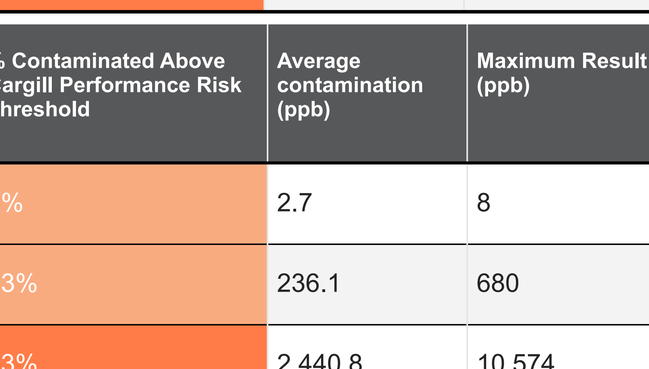


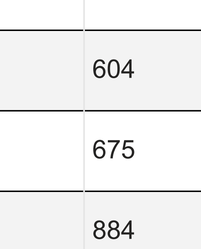
Calf/Heifer



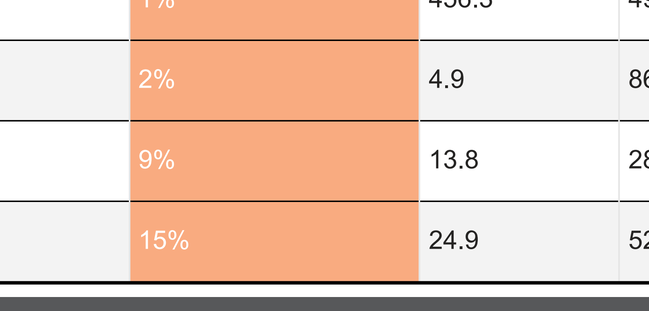
Beef

Dairy

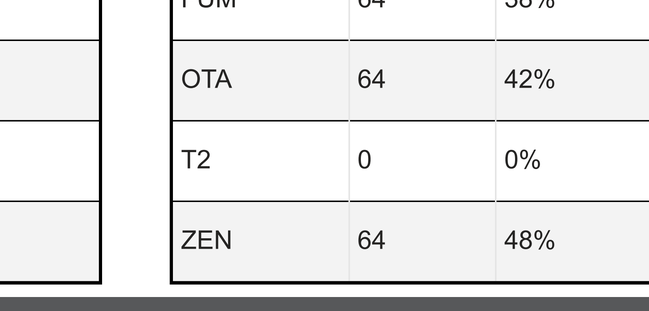




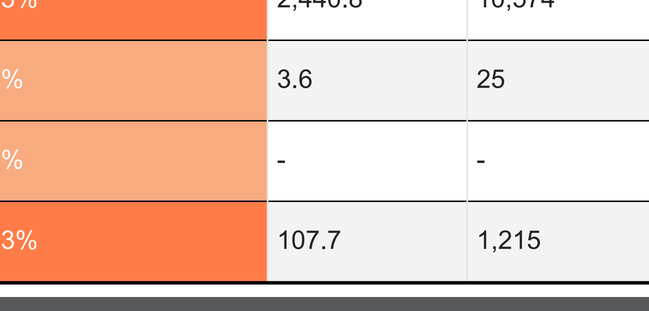
Broiler



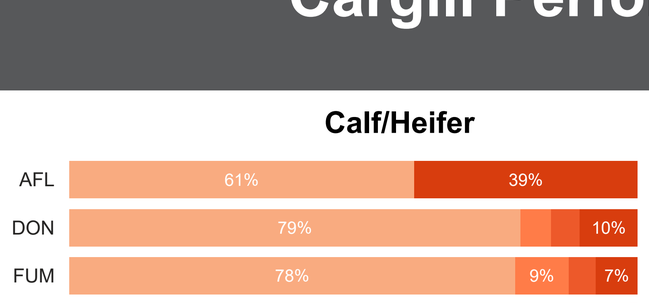
Layer



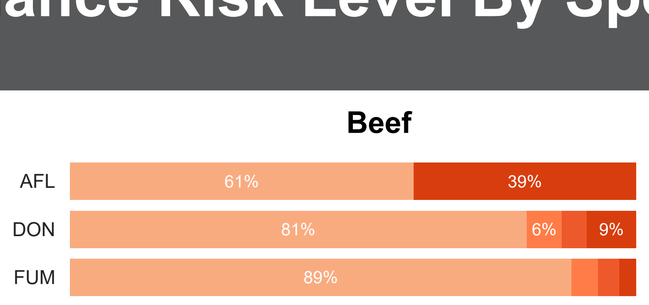
Breeder



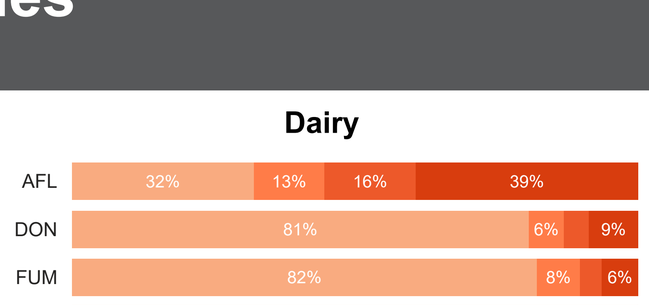
Nursery



Hog



Sow

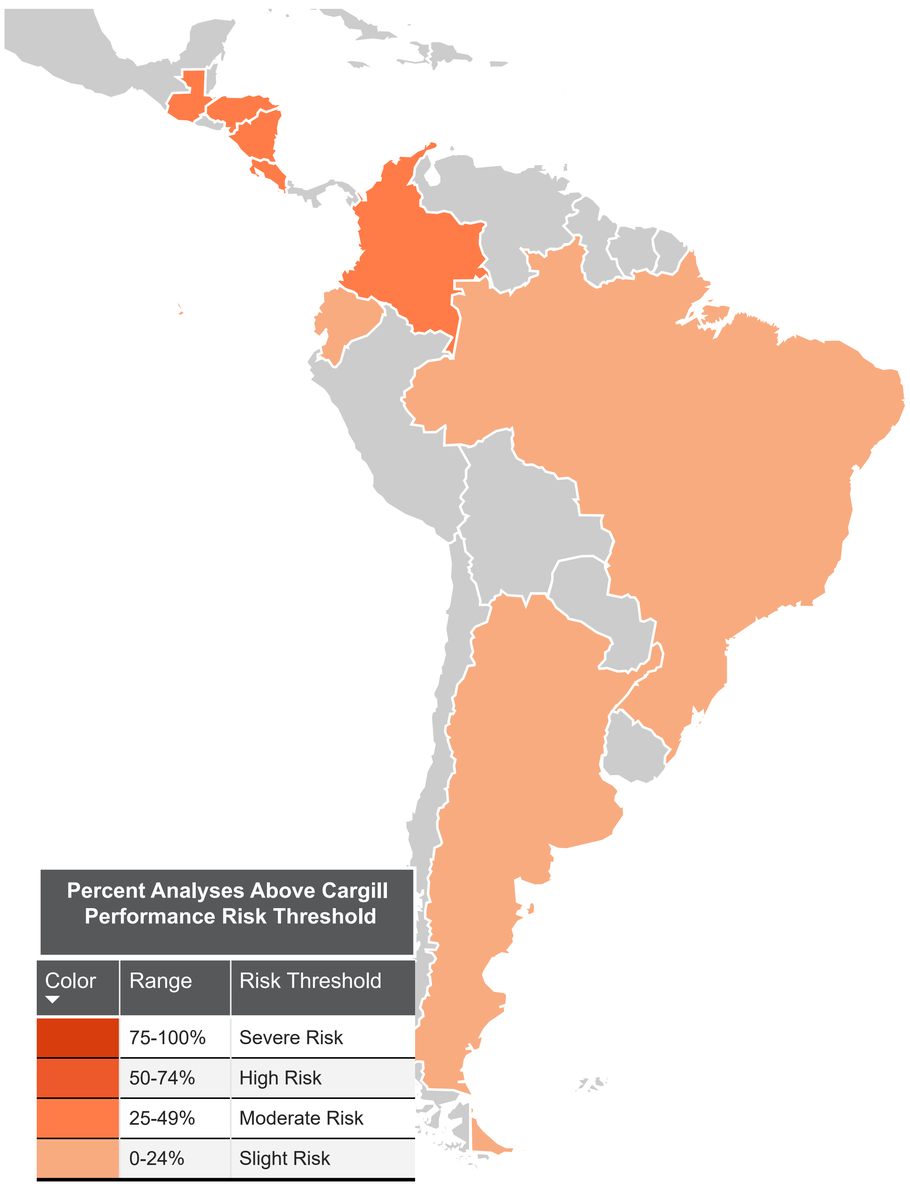


*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

Regional Data: Central & South America

Region: Central &… | Country: All | Date: 1/1/2024 – 12/31/2024



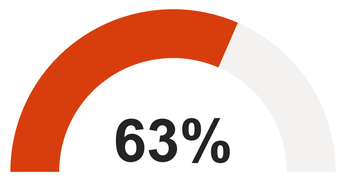
Percent Analyses Above Cargill Performance Risk Threshold

Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

Total Analysis	Total Contaminated Analysis Above Detection Limit
54,146	34,144

% Analyses Above Cargill Performance Risk Threshold

Percent Contaminated Analysis Above Detection Limit



Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	13,245	51%	6%	6%
DON	10,746	63%	39%	37%
FUM	9,922	85%	66%	62%
OTA	5,039	58%	0%	-
T2	5,734	42%	13%	23%
ZEN	9,460	72%	45%	53%
Total	**54,146**	**63%**	**30%**	**33%**

Analysis by Main Feed Material

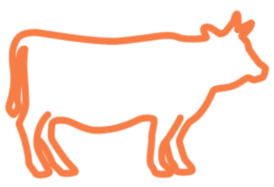
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	9,510	50%	3%	4.5	198
DON	8,317	65%	46%	630.7	11,900
FUM	8,354	90%	74%	1,636.0	44,000
OTA	4,232	56%	0%	2.8	1,460
T2	5,066	44%	14%	21.1	413
ZEN	7,601	72%	45%	83.0	1,650

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	1,076	62%	1%	2.5	95
DON	1,240	77%	24%	270.1	4,200
FUM	429	65%	28%	613.9	3,000
OTA	382	48%	0%	1.4	9
T2	375	31%	3%	16.7	259
ZEN	974	67%	32%	122.7	4,621

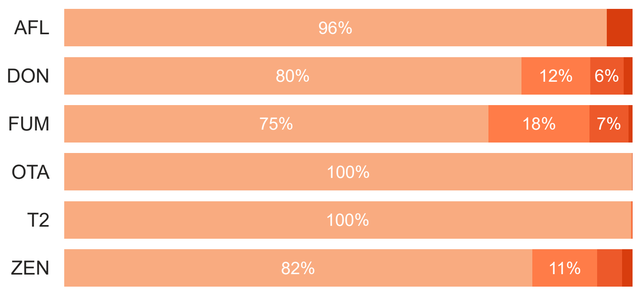
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	2,292	52%	18%	48.6	474
DON	1,136	34%	5%	129.1	1,400
FUM	983	58%	15%	423.3	5,800
OTA	424	83%	0%	0.9	3
T2	199	50%	4%	22.2	315
ZEN	776	81%	54%	76.6	632

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	348	27%	13%	10.9	27
DON	35	83%	83%	1,893.0	5,181
FUM	156	68%	54%	1,144.2	4,380
OTA	0	0%	0%	-	-
T2	94	3%	3%	173.4	377
ZEN	90	43%	43%	369.2	1,127

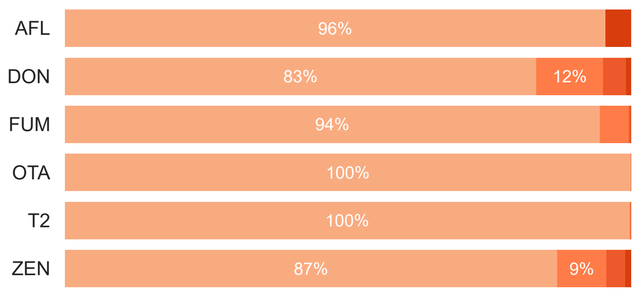
Cargill Performance Risk Level By Species**



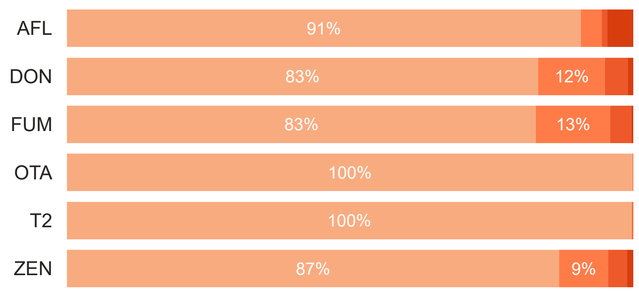
Calf/Heifer

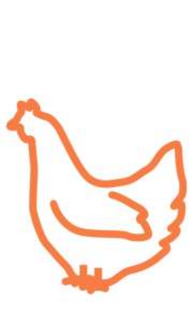


Beef

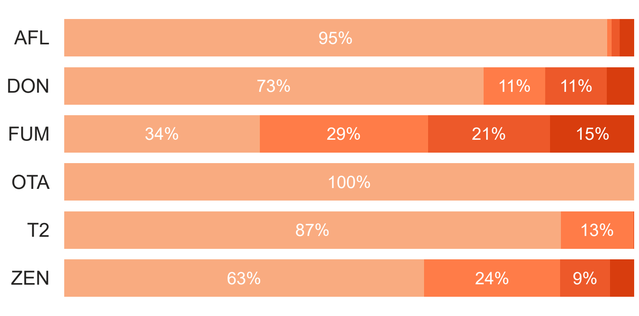


Dairy





Broiler



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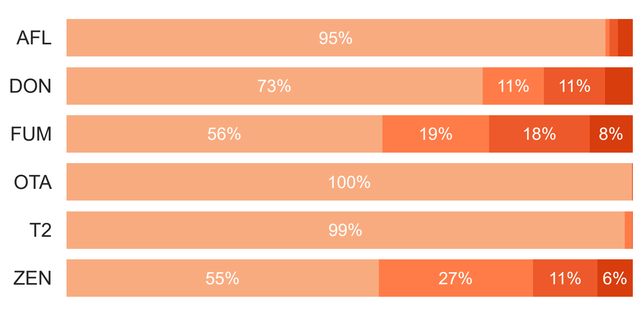
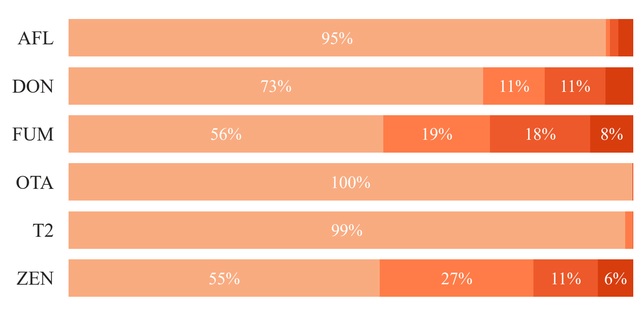
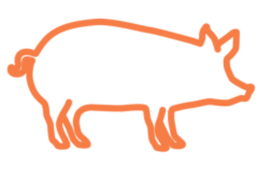
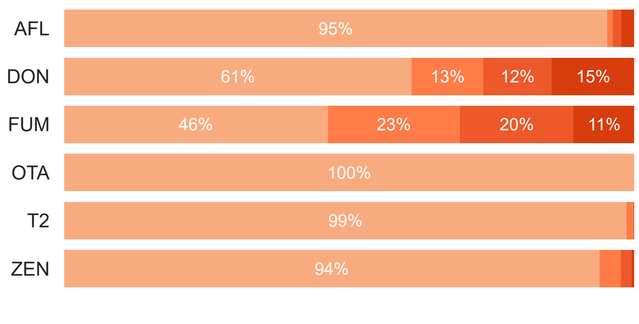


Breeder

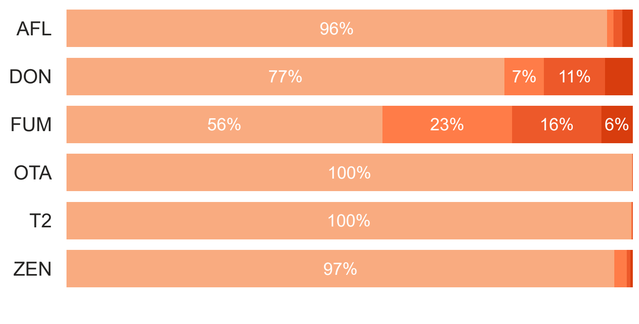




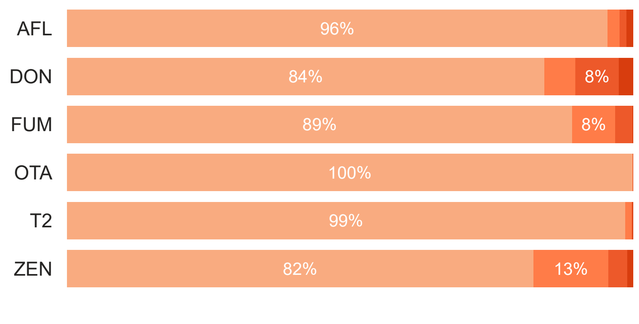
Nursery



Hog



Sow



*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

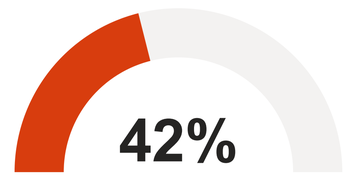
Regional Data: Greater China

Region: Greater … | Country: All | Date: 1/1/2024 – 12/31/2024

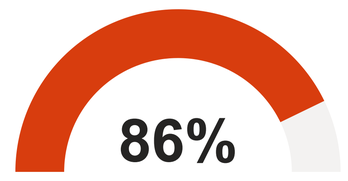
Total Analysis	90,816

Total Contaminated Analysis Above Detection Limit	77,753

% Analyses Above Cargill Performance Risk Threshold



Percent Contaminated Analysis Above Detection Limit



Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	30,969	80%	14%	6%
DON	31,784	89%	65%	70%
FUM	1,242	71%	48%	54%
OTA	148	47%	1%	-
T2	224	71%	3%	6%
ZEN	26,449	89%	48%	44%
Total	**90,816**	**86%**	**42%**	**40%**

Analysis by Main Feed Material

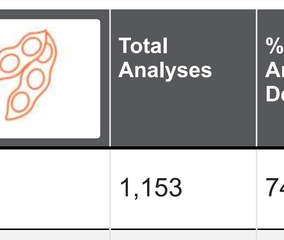
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	18,311	79%	8%	5.4	463
DON	18,887	92%	70%	608.5	16,412
FUM	892	87%	62%	1,300.2	29,002
OTA	62	45%	2%	2.9	21
T2	89	73%	4%	11.7	41
ZEN	18,537	90%	49%	93.7	8,440

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	10,561	86%	24%	7.5	450
DON	11,245	88%	61%	401.1	4,700
FUM	175	22%	3%	338.2	2,614
OTA	68	47%	0%	2.7	16
T2	65	71%	0%	8.4	20
ZEN	5,859	85%	38%	42.3	2,162

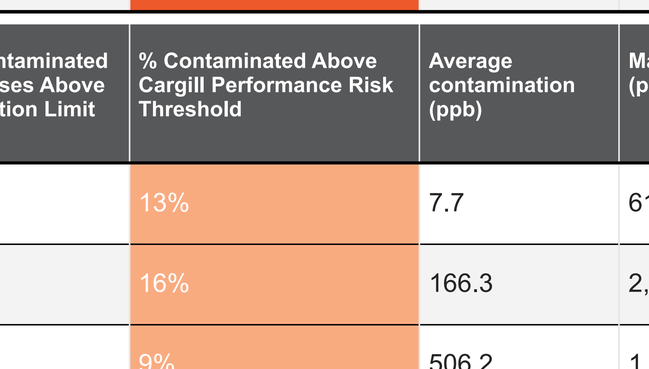
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	1,153	74%	13%	7.7	61
DON	935	42%	16%	166.3	2,538
FUM	128	20%	9%	506.2	1,177
OTA	15	53%	0%	1.8	5
T2	47	57%	0%	9.3	18
ZEN	1,336	86%	45%	84.8	3,266

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	814	52%	2%	3.9	194
DON	596	94%	86%	1,304.8	15,487
FUM	41	85%	54%	836.6	3,522
OTA	3	67%	0%	2.3	3
T2	22	95%	9%	12.9	44
ZEN	596	88%	86%	362.3	9,099

Cargill Performance Risk Level By Species**

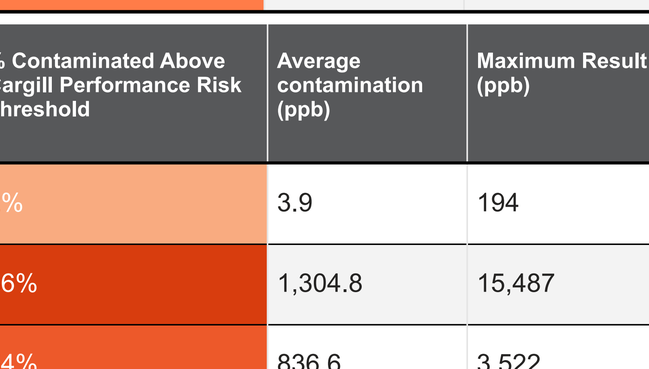


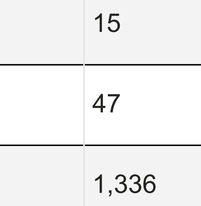
Calf/Heifer



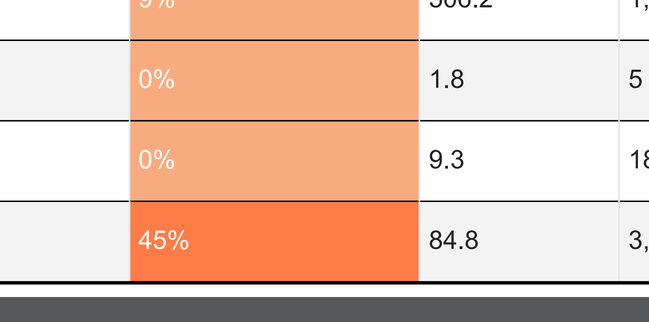
Beef

Dairy

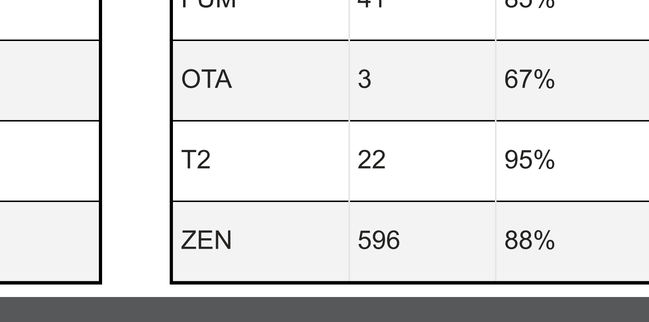




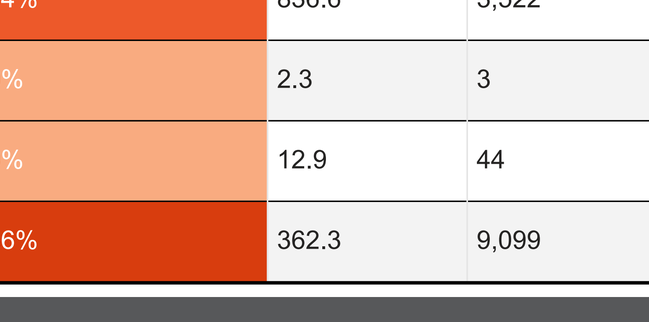
Broiler



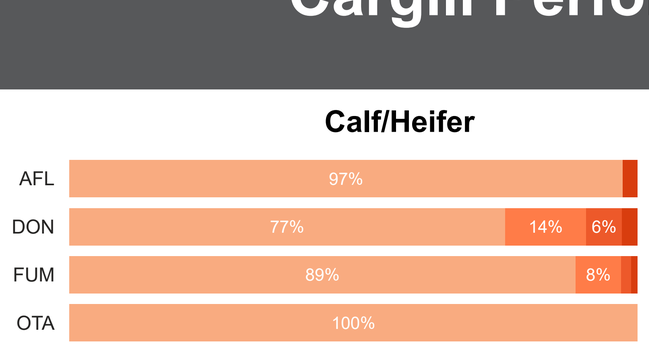
Layer



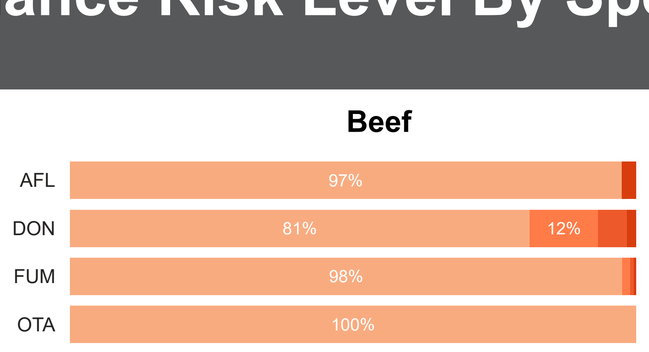
Breeder



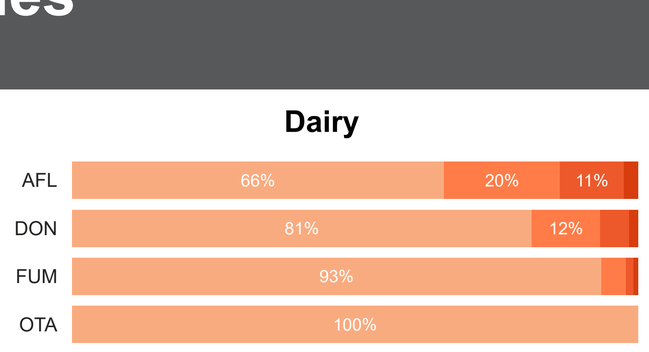
Nursery



Hog



Sow

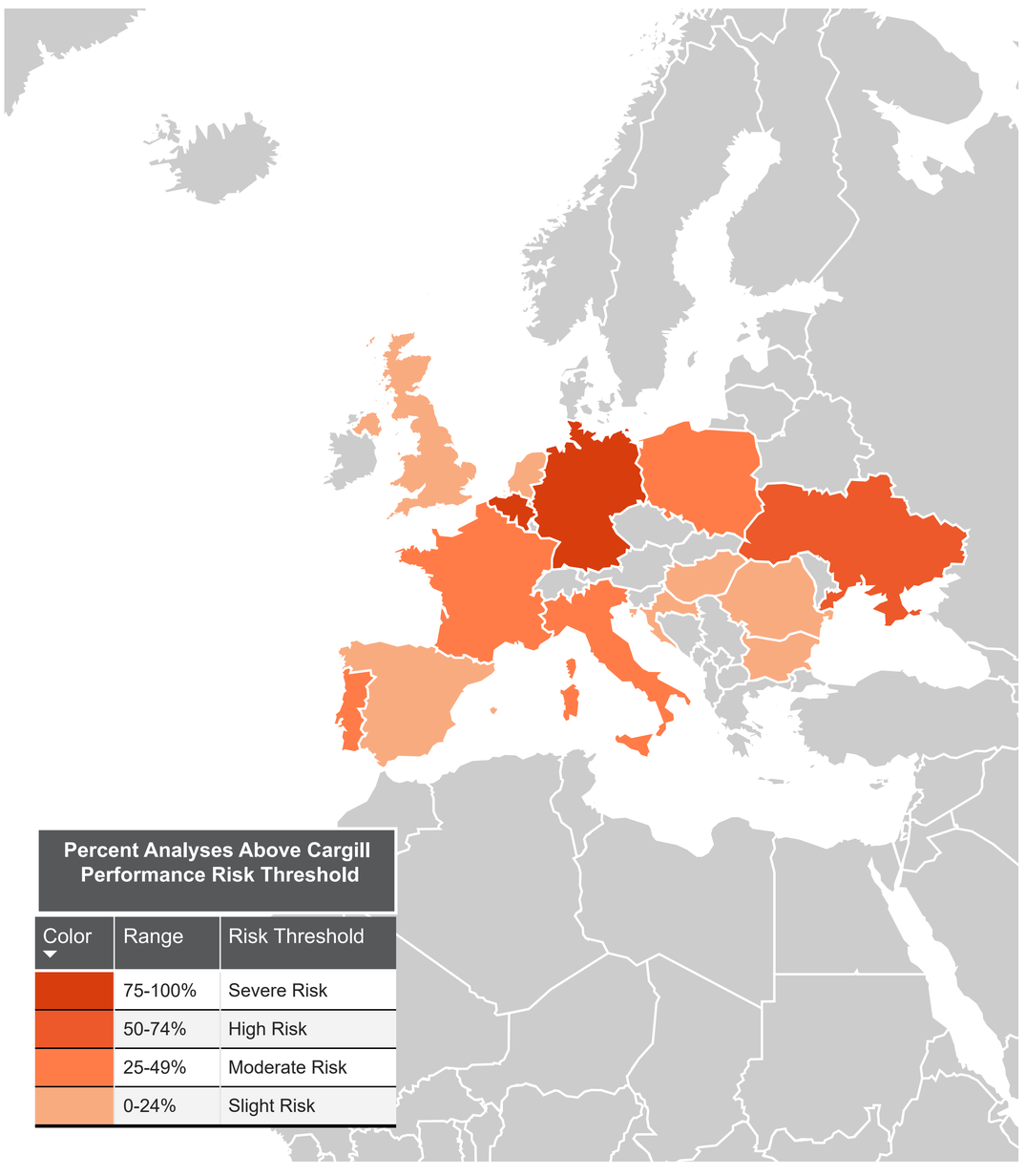


*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

Regional Data: Europe

Region: Europe | Country: All | Date: 1/1/2024 – 12/31/2024



Total Analysis	Total Contaminated Analysis Above Detection Limit
58,307	38,773

% Analyses Above Cargill Performance Risk Threshold

27%

Percent Contaminated Analysis Above Detection Limit

66%

Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	14,604	59%	3%	2%
DON	22,269	85%	48%	64%
FUM	5,304	50%	34%	36%
OTA	4,691	53%	0%	1%
T2	4,700	37%	13%	12%
ZEN	6,739	64%	35%	31%
Total	**58,307**	**66%**	**27%**	**34%**

Analysis by Main Feed Material

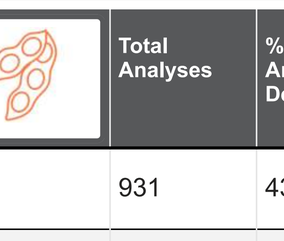
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	7,966	59%	4%	3.7	158
DON	7,961	87%	59%	1,067.9	23,220
FUM	2,440	61%	46%	3,504.3	62,548
OTA	1,846	49%	0%	2.4	153
T2	1,920	43%	18%	44.5	1,061
ZEN	2,510	66%	40%	167.4	10,000

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	2,868	40%	1%	3.4	23
DON	10,844	87%	34%	234.4	5,900
FUM	1,171	12%	1%	219.8	2,931
OTA	1,193	28%	0%	1.5	47
T2	1,131	24%	10%	67.5	1,381
ZEN	2,236	43%	10%	82.9	8,000

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	931	43%	5%	5.4	81
DON	694	43%	17%	282.0	2,900
FUM	353	36%	6%	297.3	1,920
OTA	315	34%	1%	2.2	33
T2	315	43%	22%	34.4	371
ZEN	528	51%	31%	67.3	564

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	2,734	86%	1%	1.5	70
DON	2,664	87%	80%	1,476.7	23,865
FUM	1,297	67%	52%	1,983.3	49,809
OTA	1,295	86%	0%	1.5	32
T2	1,291	37%	6%	18.2	813
ZEN	1,369	99%	68%	116.8	2,077

Cargill Performance Risk Level By Species**



Calf/Heifer

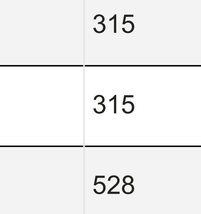
AFL	99%			
DON	78%	9%	6%	6%
FUM	82%	8%		
OTA	100%			
T2	98%			
ZEN	83%	8%		

Beef

AFL	99%			
DON	81%	9%	6%	
FUM	92%			
OTA	100%			
T2	98%			
ZEN	85%	7%		

Dairy

AFL	91%	6%		
DON	81%	9%	6%	
FUM	86%	7%		
OTA	100%			
T2	98%			
ZEN	85%	7%		



Broiler

AFL	99%			
DON	70%	12%	8%	10%
FUM	66%	12%	9%	13%
OTA	100%			
T2	87%	11%		
ZEN	72%	13%	7%	8%

Layer

AFL	99%			
DON	70%	12%	8%	10%
FUM	74%	8%	8%	9%
OTA	100%			
T2	94%			
ZEN	65%	17%	8%	10%

Breeder

AFL	99%			
DON	70%	12%	8%	10%
FUM	74%	8%	8%	9%
OTA	100%			
T2	94%	5%		
ZEN	65%	17%	8%	10%

Nursery

AFL	99%			
DON	52%	18%	13%	17%
FUM	71%	9%	9%	11%
OTA	100%			
T2	94%			
ZEN	90%			

Hog

AFL	99%			
DON	75%	7%	8%	10%
FUM	74%	10%	8%	8%
OTA	100%			
T2	98%			
ZEN	93%			

Sow

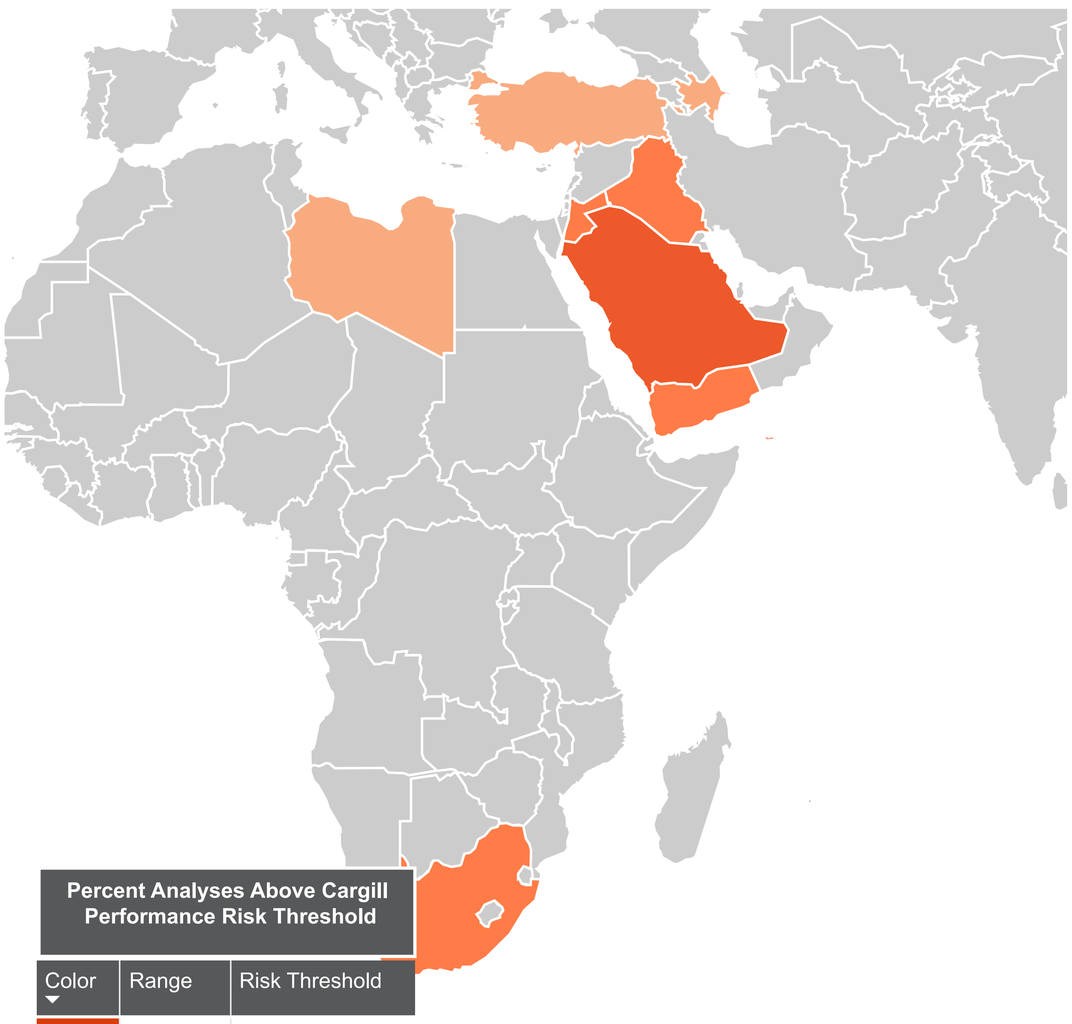
AFL	99%			
DON	82%	7%	8%	
FUM	89%			
OTA	100%			
T2	94%			
ZEN	83%	9%		

*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

Regional Data: Middle East and Africa

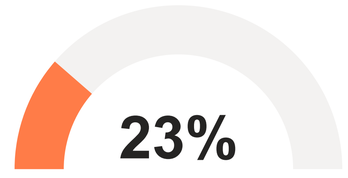
Region: Middle E… | **Country:** All | **Date:** 1/1/2024 – 12/31/2024



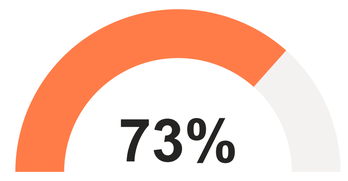
Total Analysis	12,014

Total Contaminated Analysis Above Detection Limit	8,790

% Analyses Above Cargill Performance Risk Threshold



Percent Contaminated Analysis Above Detection Limit



Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	2,906	80%	8%	8%
DON	1,101	68%	17%	11%
FUM	1,868	73%	33%	37%
OTA	1,692	75%	0%	-
T2	1,719	67%	31%	32%
ZEN	2,728	71%	43%	43%
Total	**12,014**	**73%**	**23%**	**23%**

Analysis by Main Feed Material

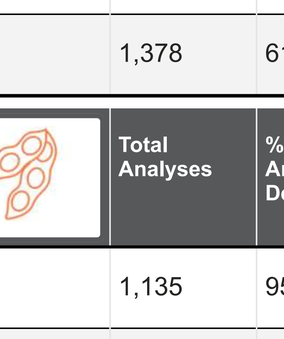
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	1,409	72%	10%	7.4	474
DON	611	71%	25%	949.2	25,000
FUM	1,355	80%	45%	1,255.7	30,000
OTA	447	83%	0%	2.0	11
T2	1,258	68%	36%	46.7	335
ZEN	1,378	61%	26%	117.2	45,429

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	335	68%	0%	1.8	8
DON	113	71%	24%	201.6	756
FUM	273	51%	0%	98.9	1,025
OTA	144	72%	0%	1.8	12
T2	173	60%	17%	35.0	146
ZEN	295	62%	22%	54.1	272

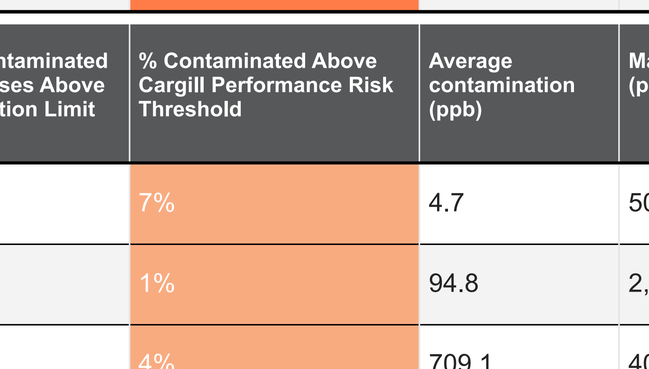
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	1,135	95%	7%	4.7	50
DON	366	62%	1%	94.8	2,012
FUM	234	63%	4%	709.1	40,000
OTA	1,097	72%	0%	1.6	12
T2	284	65%	18%	28.3	75
ZEN	1,042	86%	72%	105.2	321

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	11	45%	0%	2.3	5
DON	7	86%	43%	870.4	1,920
FUM	6	50%	17%	402.5	917
OTA	4	50%	0%	0.8	1
T2	4	100%	0%	8.2	10
ZEN	7	100%	43%	79.1	195

Cargill Performance Risk Level By Species**

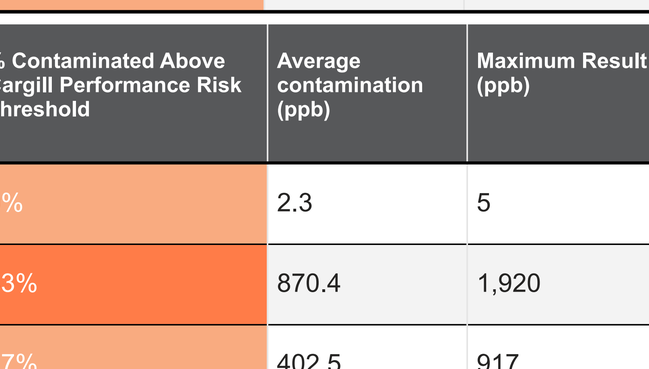


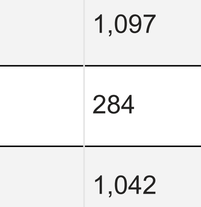
Calf/Heifer



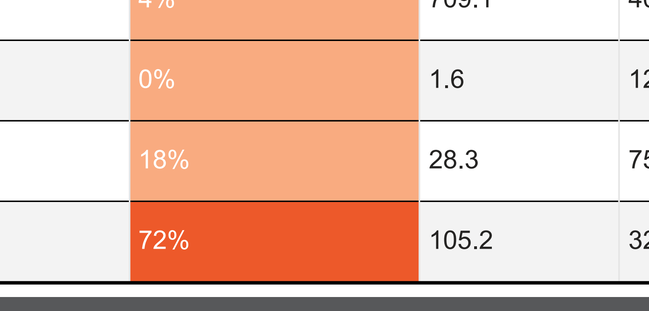
Beef

Dairy

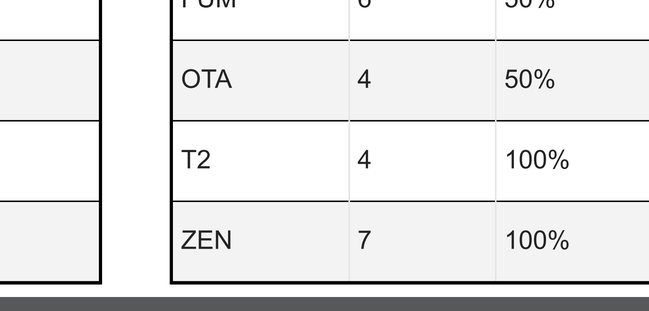




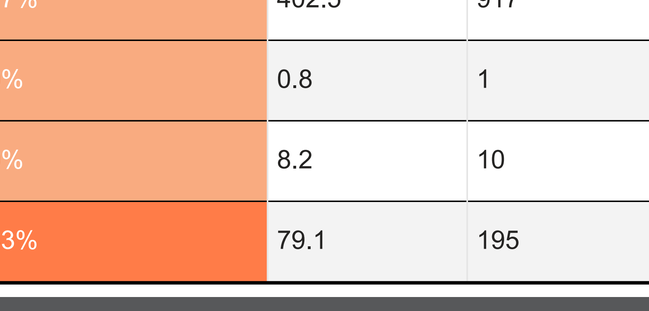
Broiler



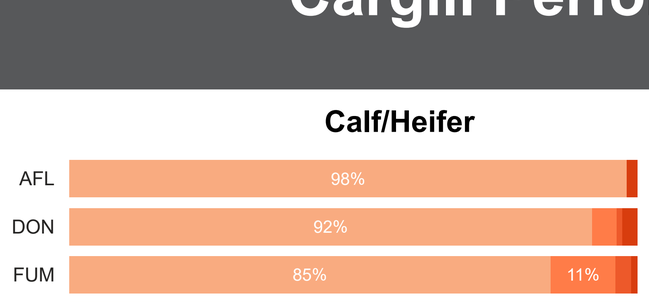
Layer



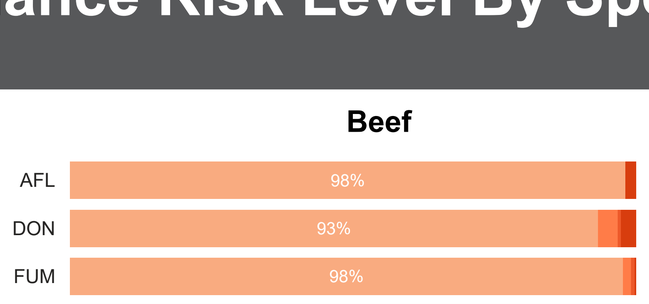
Breeder



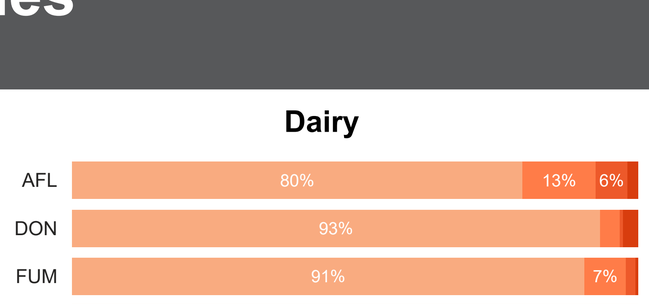
Nursery



Hog



Sow



*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

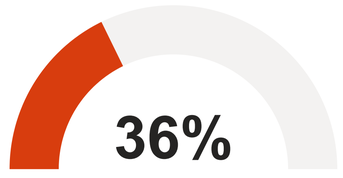
% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

Regional Data: North America

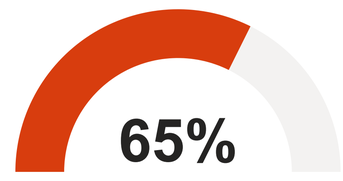
Region: North Am… | Country: All | Date: 1/1/2024 – 12/31/2024

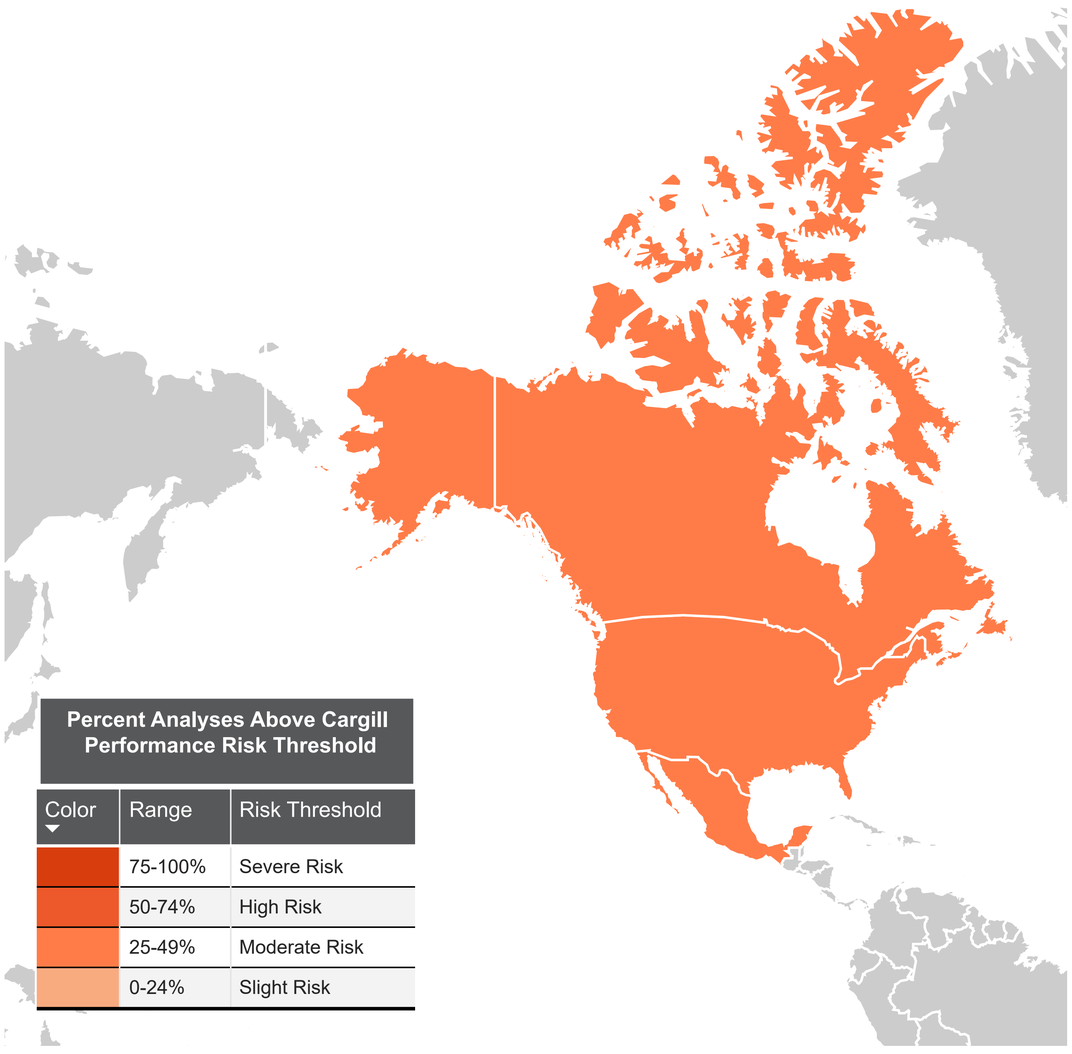
Total Analysis	Total Contaminated Analysis Above Detection Limit
142,725	92,359

% Analyses Above Cargill Performance Risk Threshold



Percent Contaminated Analysis Above Detection Limit





Percent Analyses Above Cargill Performance Risk Threshold

Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	44,789	50%	4%	2%
DON	50,546	76%	62%	64%
FUM	32,682	76%	40%	45%
OTA	1,691	50%	3%	3%
T2	4,016	39%	15%	17%
ZEN	9,001	52%	42%	40%
Total	**142,725**	**65%**	**36%**	**37%**

Analysis by Main Feed Material

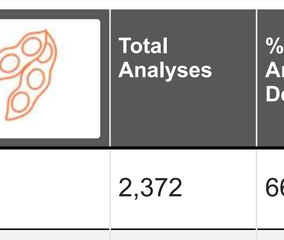
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	33,483	56%	3%	4.6	500
DON	34,031	74%	61%	1,517.9	23,301
FUM	30,342	79%	43%	1,265.2	55,000
OTA	475	42%	1%	3.3	40
T2	1,414	40%	17%	35.0	525
ZEN	5,028	57%	49%	204.7	13,057

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	2,696	57%	6%	4.7	250
DON	13,162	84%	67%	765.5	20,030
FUM	1,126	41%	6%	307.2	12,815
OTA	642	50%	2%	5.6	80
T2	651	82%	37%	30.1	525
ZEN	1,548	52%	35%	79.5	4,621

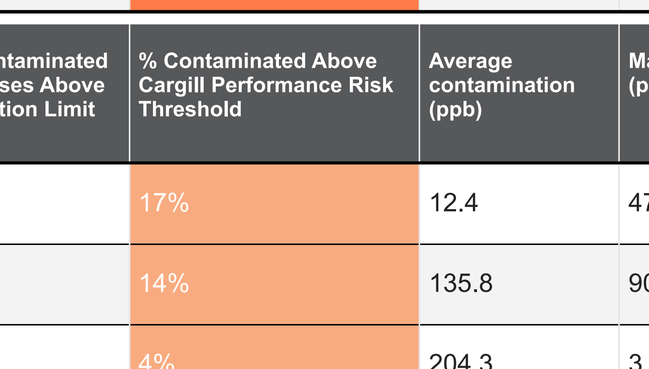
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	2,372	66%	17%	12.4	474
DON	606	64%	14%	135.8	900
FUM	591	37%	4%	204.3	3,233
OTA	324	62%	7%	6.6	80
T2	351	87%	26%	27.2	254
ZEN	602	95%	78%	123.7	958

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	5,931	3%	0%	3.1	84
DON	2,375	63%	62%	3,011.5	23,893
FUM	340	12%	6%	1,257.4	18,609
OTA	170	41%	0%	2.3	7
T2	1,519	5%	1%	61.1	1,722
ZEN	1,576	13%	8%	290.4	11,647

Cargill Performance Risk Level By Species**

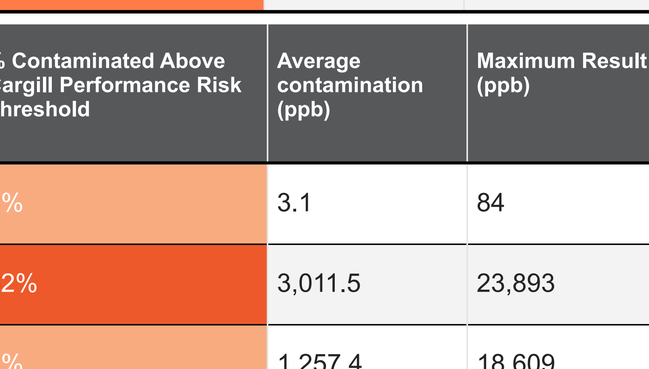


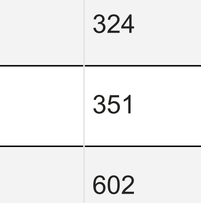
Calf/Heifer



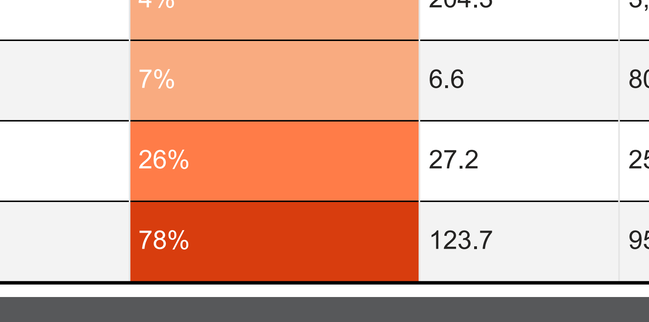
Beef

Dairy





Broiler



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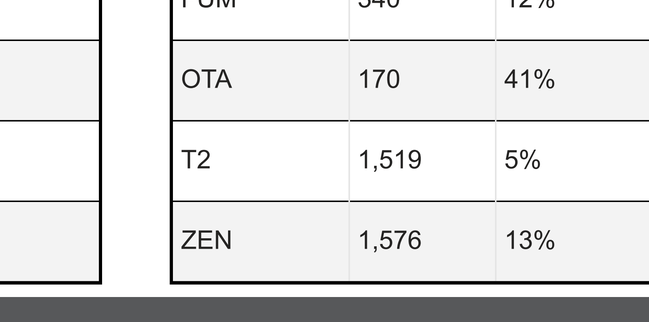
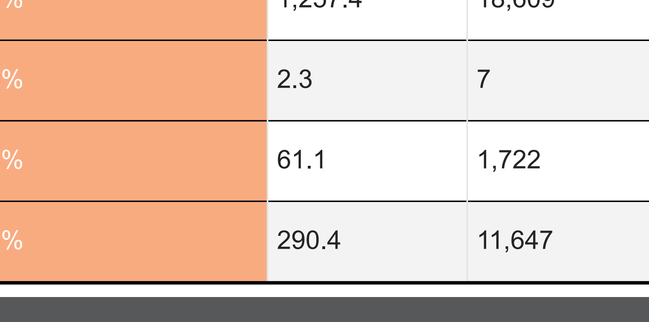
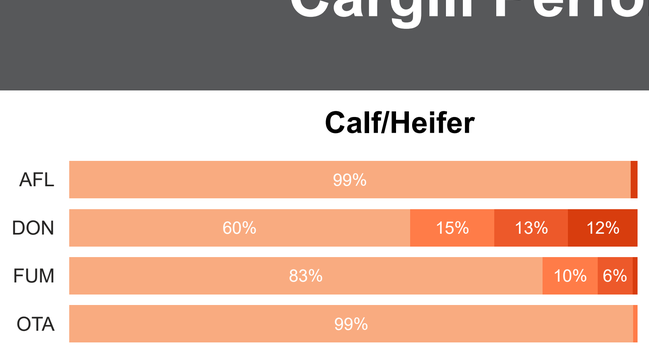


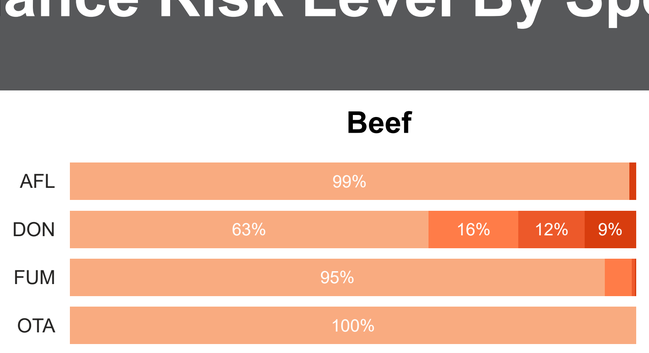
Breeder



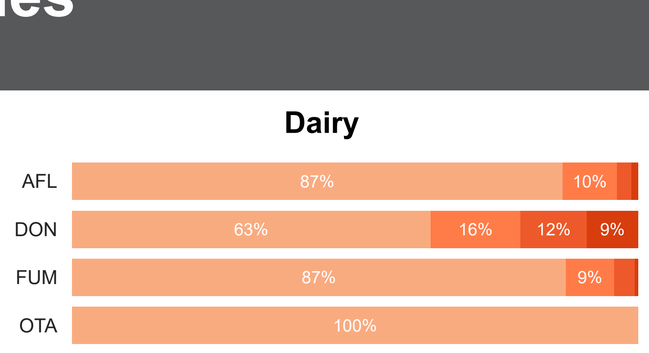
Nursery



Hog



Sow



*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

Regional Data: Russia

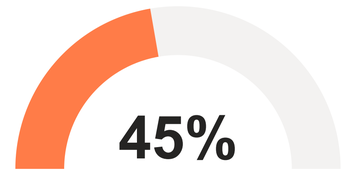
Region: Russia | Country: All | Date: 1/1/2024 – 12/31/2024

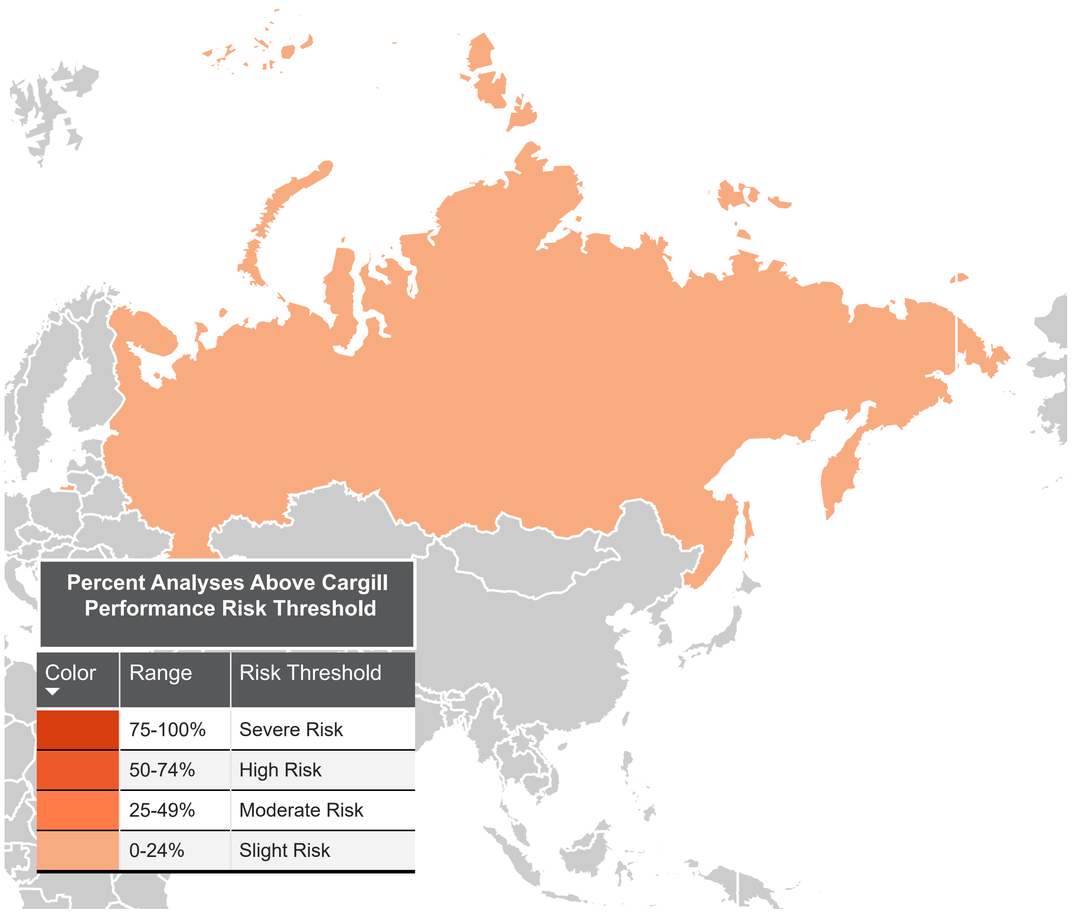
Total Analysis	13,372

Total Contaminated Analysis Above Detection Limit	5,955

% Analyses Above Cargill Performance Risk Threshold

Percent Contaminated Analysis Above Detection Limit





Toxin	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	% Contaminated Above Cargill Performance Risk Threshold - Same Period Last Year
AFL	2,680	53%	2%	1%
DON	2,496	24%	22%	22%
FUM	791	31%	10%	18%
OTA	2,280	65%	1%	2%
T2	2,621	59%	56%	48%
ZEN	2,504	27%	19%	22%
Total	**13,372**	**45%**	**20%**	**19%**

Analysis by Main Feed Material

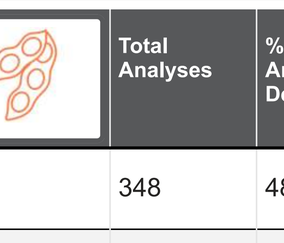
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	772	40%	3%	3.5	33
DON	792	51%	50%	831.2	4,374
FUM	476	44%	16%	644.2	6,582
OTA	581	65%	3%	5.7	115
T2	837	66%	64%	78.3	463
ZEN	742	34%	18%	58.6	574

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	1,381	66%	0%	3.9	15
DON	1,319	10%	9%	719.1	7,164
FUM	115	3%	0%	118.5	249
OTA	1,266	68%	1%	3.3	259
T2	1,385	63%	62%	63.4	300
ZEN	1,284	6%	5%	79.0	390

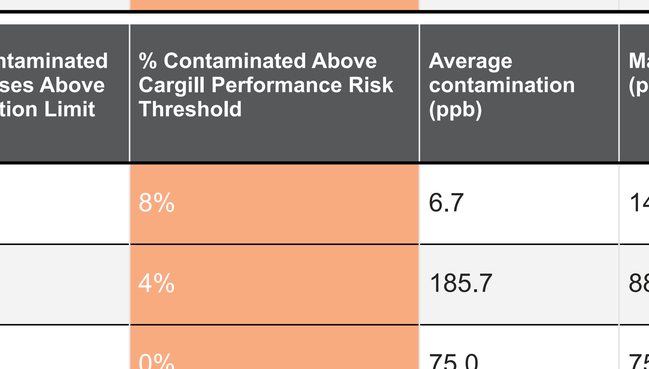
	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	348	48%	8%	6.7	14
DON	284	16%	4%	185.7	880
FUM	101	28%	0%	75.0	75
OTA	333	71%	0%	2.9	12
T2	296	29%	13%	29.6	95
ZEN	377	69%	64%	123.6	284

	Total Analyses	% Contaminated Analyses Above Detection Limit	% Contaminated Above Cargill Performance Risk Threshold	Average contamination (ppb)	Maximum Result (ppb)
AFL	80	13%	0%	4.4	8
DON	40	23%	23%	2,272.1	4,958
FUM	40	8%	8%	1,086.8	1,278
OTA	40	3%	3%	27.2	27
T2	40	45%	45%	66.4	148
ZEN	40	100%	55%	143.6	3,994

Cargill Performance Risk Level By Species**

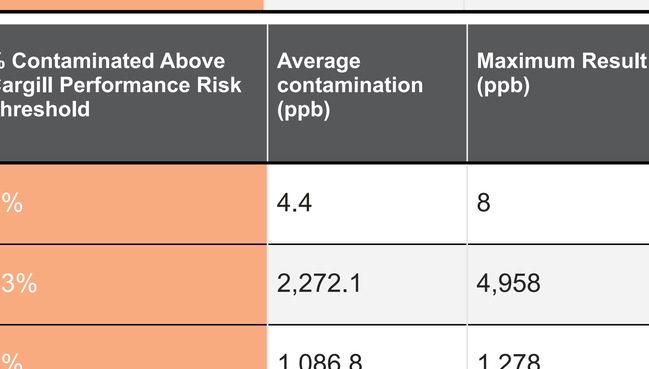


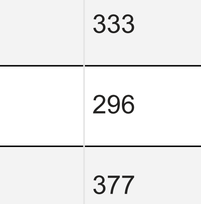
Calf/Heifer



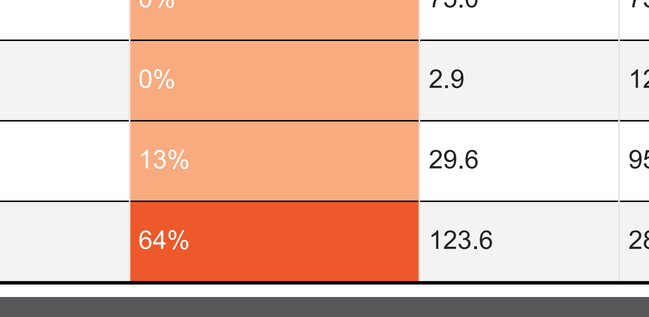
Beef

Dairy





Broiler



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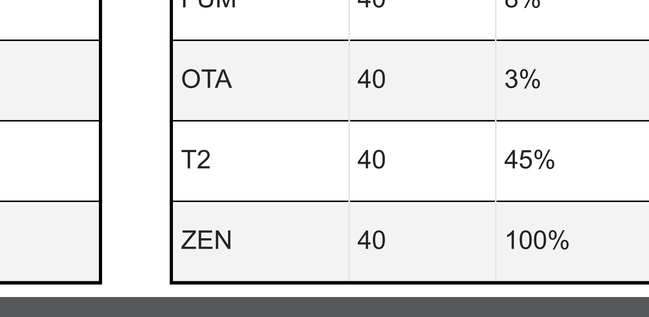
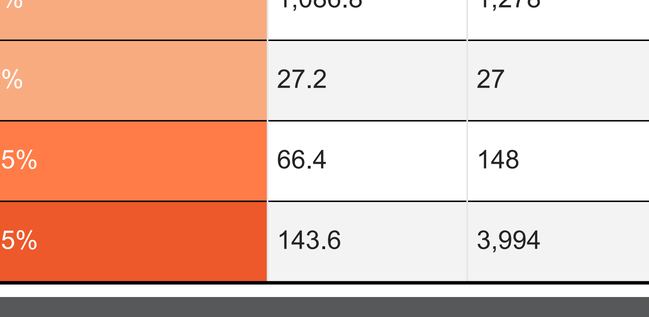
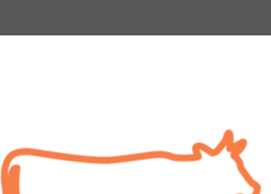
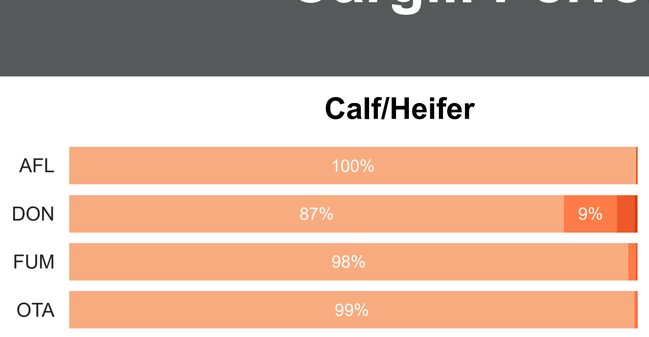


Breeder

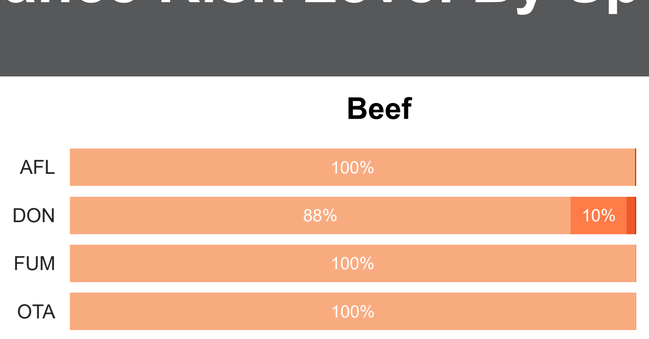




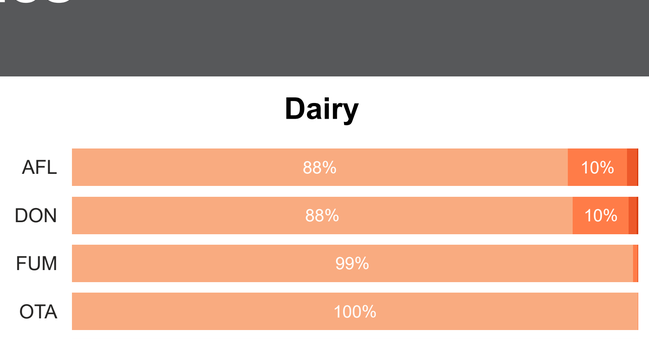
Nursery



Hog



Sow



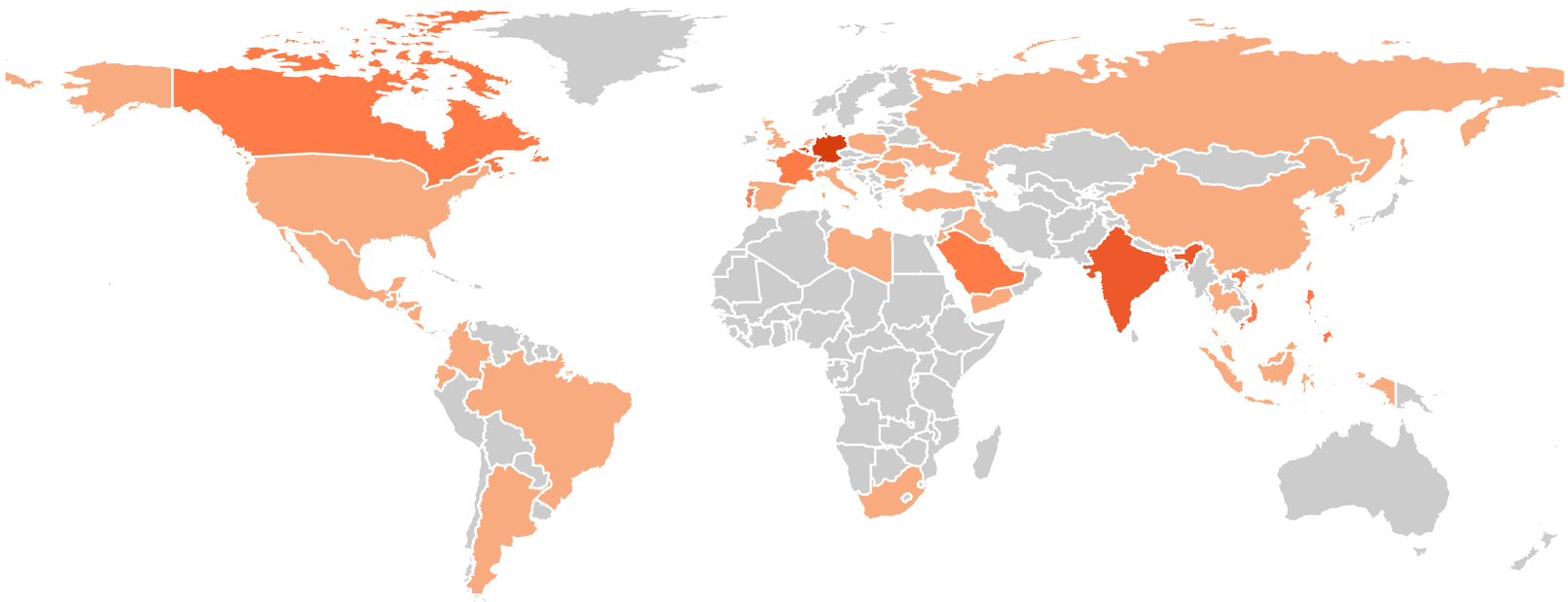
*Based on Cargill research, low, medium and high risk equate to an estimated 0.5%, 1% and 2% performance loss respectively

% Analyses Contaminated Within Cargill Performance Risk Thresholds: Minimum Low Medium High

Ruminant Global and Regional Mycotoxin Risk

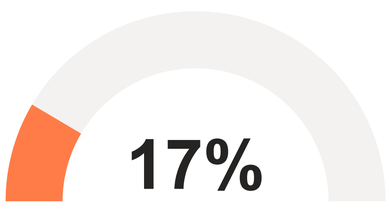
Date

1/1/2024 — 12/31/2024



Percent Analyses Above Cargill Performance Risk Threshold(Calf/Heifer)		
Color	**Range**	**Risk Threshold**
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

% Analyses Contaminated Above Ruminant Performance Risk Threshold (Calf/Heifer)



Toxin	Total Analyses	% Analyses Contaminated Above Calf/Heifer Performance Threshold	% Analyses Contaminated Above Beef Performance Threshold	% Analyses Contaminated Above Dairy Performance Threshold
AFL	125,843	7%	7%	25%
DON	122,569	29%	26%	26%
FUM	55,073	18%	6%	14%
OTA	18,212	0%	0%	0%
T2	21,955	2%	2%	2%
ZEN	60,691	20%	16%	16%

Percent Analyses Above Cargill Performance Risk Threshold

Asia	Percent Above
AFL	39%
DON	21%
FUM	22%
OTA	1%
T2	3%
ZEN	21%

Central & South America	Percent Above
AFL	4%
DON	20%
FUM	25%
OTA	0%
T2	0%
ZEN	18%

China	Percent Above
AFL	3%
DON	23%
FUM	11%
OTA	0%
T2	0%
ZEN	21%

Europe	Percent Above
AFL	1%
DON	22%
FUM	18%
OTA	0%
T2	2%
ZEN	17%

Middle East & Africa	Percent Above
AFL	2%
DON	8%
FUM	15%
OTA	0%
T2	4%
ZEN	21%

North America	Percent Above
AFL	1%
DON	40%
FUM	17%
OTA	1%
T2	2%
ZEN	22%

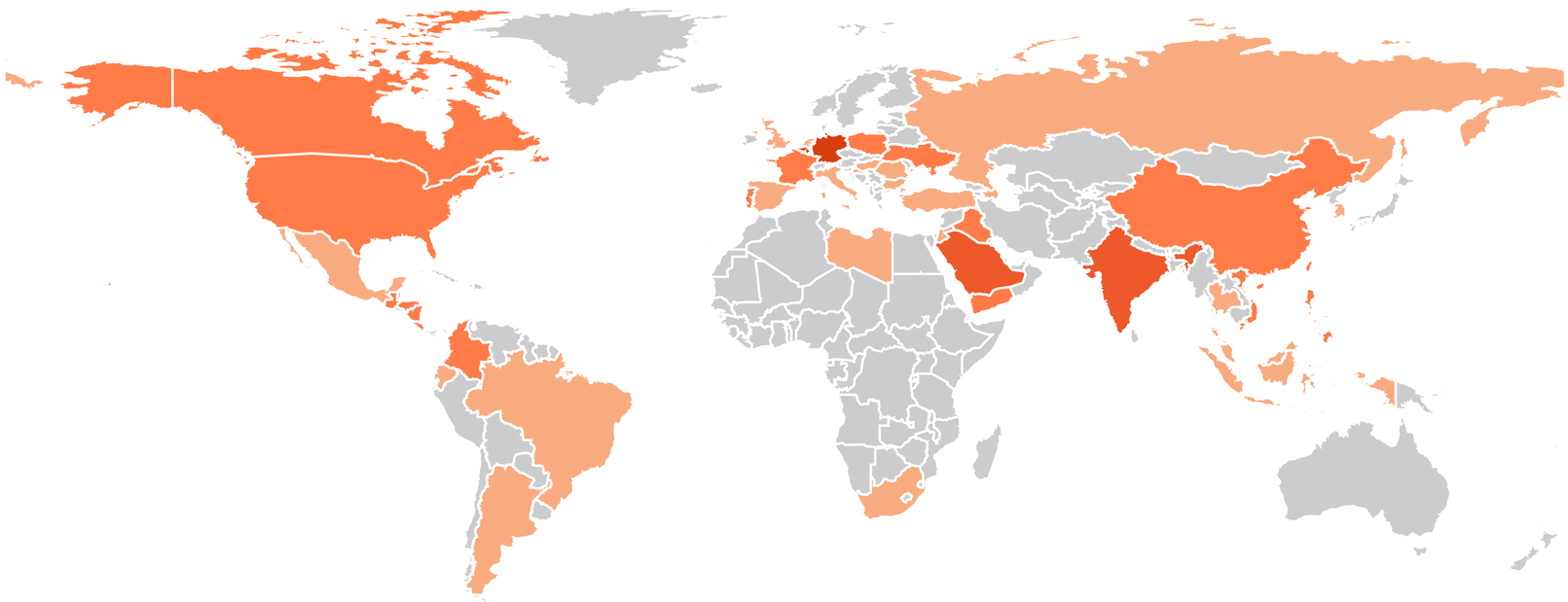
Russia	Percent Above
AFL	0%
DON	13%
FUM	2%
OTA	1%
T2	5%
ZEN	8%

Mycotoxin	Multiple Mycotoxin Impact on Ruminants
AFL	• AFL is poorly metabolized in the rumen and reduces ingestion, immunity, and reproduction and alters hepatic activity. Clinical symptoms include liver damage, depression, anorexia, lameness, rough hair coat, dry skin and rectum prolapse. • Aflatoxin M1 (AFL metabolite) is excreted into the milk.
FUM	• FUM is poorly degraded in the rumen and leads to decreased appetite, reducing milk production and reproduction and causing growth delays. • FUM is particularly toxic to the liver and kidneys and can lead to lethargy
OTA	• In adults, OTA is well metabolized in the rumen. In underperforming rumen or in high contamination scenarios, OTA leads to anorexia, diarrhea, and impaired performance. • In calves, it causes depression, lower growth, excessive urine production, dehydration and negative impact on the kidneys and immune system.
T2	• Clinical signs of T2 are bloody diarrhea and reduced feed intake and reproductive performance. It is also associated with gastroenteritis, lesions and hemorrhages in the gastrointestinal tract and death. • At low levels, T2 changes metabolism and immunity leading to lower performance.
DON	• DON impairs the rumen, altering pH, decreasing microbial protein synthesis and a decline in cellulolytic bacteria. DON also affects metabolism and immunity. • DON causes gastrointestinal problems, diarrhea, and overall performance decrease.
ZEN	• In the rumen, ZEN is mostly converted to α-zearalenol, a more osteogenic metabolite. • ZEN induces milk production loss, low conception rate, decrease in embryo survival, changes in reproductive organ morphology, abnormal mammary development, reproductive hormone decrease, feminization of young males, and infertility.

Poultry Global and Regional Mycotoxin Risk

Date

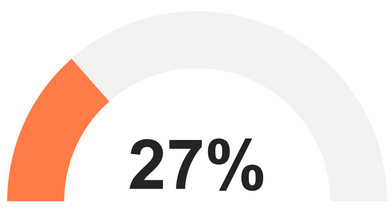
1/1/2024 — 12/31/2024



Percent Analyses Above Cargill Performance Risk Threshold(Broiler)

Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

% Analyses Contaminated Above Poultry Performance Risk Threshold (Broiler)



Toxin	Total Analyses	% Analyses Contaminated Above Broiler Performance Threshold	% Analyses Contaminated Above Breeder Performance Threshold	% Analyses Contaminated Above Layer Performance Threshold
AFL	125,843	9%	9%	9%
DON	122,569	40%	40%	40%
FUM	55,073	44%	30%	30%
OTA	18,212	1%	1%	1%
T2	21,955	20%	10%	10%
ZEN	60,691	35%	43%	43%

Percent Analyses Above Cargill Performance Risk Threshold

Asia	Percent Above
AFL	46%
DON	24%
FUM	42%
OTA	2%
T2	14%
ZEN	30%

Central & South America	Percent Above
AFL	5%
DON	27%
FUM	66%
OTA	0%
T2	13%
ZEN	37%

China	Percent Above
AFL	6%
DON	40%
FUM	48%
OTA	1%
T2	3%
ZEN	38%

Europe	Percent Above
AFL	1%
DON	30%
FUM	34%
OTA	0%
T2	13%
ZEN	28%

Middle East & Africa	Percent Above
AFL	3%
DON	11%
FUM	33%
OTA	0%
T2	31%
ZEN	35%

North America	Percent Above
AFL	2%
DON	50%
FUM	40%
OTA	3%
T2	15%
ZEN	36%

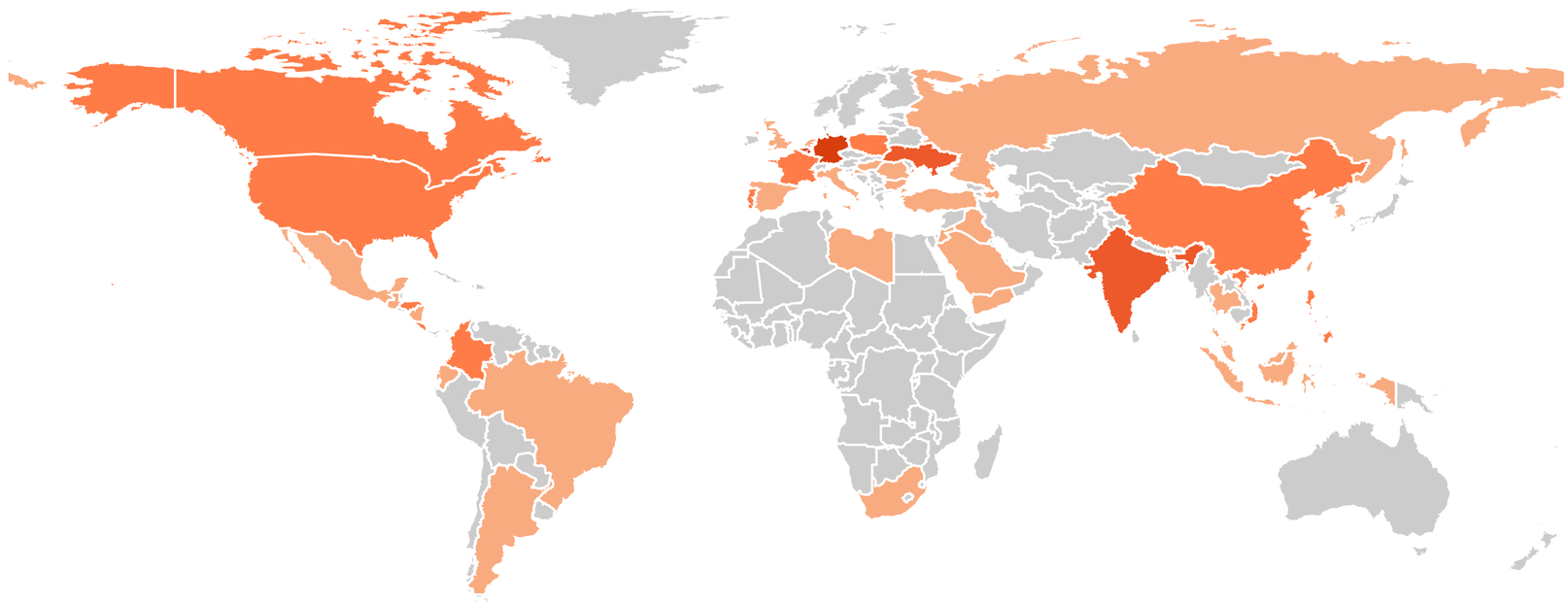
Russia	Percent Above
AFL	0%
DON	18%
FUM	10%
OTA	1%
T2	56%
ZEN	15%

Mycotoxin	Multiple Mycotoxin Impact on Poultry
AFL	• AFL targets the liver and the immune system. • Main symptoms are performance loss (i.e., weight loss, low feed efficiency, reduced egg production, and egg weight), greater disease susceptibility, and lower vaccination efficacy. • The liver can also be damaged, and organ weight drastically modified. • Carcass bruising and poor pigmentation are common symptoms.
FUM	• FUM causes disruption of sphingolipid metabolism. • FUM is poorly absorbed which greatly exposes and disrupts the digestive tract, leading to diarrhea and severe performance loss. • The liver and immune system are common targets
OTA	• OTA targets the kidneys (neurotoxin) to cause an increase in water consumption. Then it causes a sharp decrease in consumption, growth, egg production, and eggshell quality. • Weakens the immune response therefore impacting overall bird health.
T2	• T2 is very problematic and causes visible oral mucosa and digestive tract lesions. • T2 can reduce nutrient absorption and impact performance (weight, egg production, size) and disrupt the immune system and cause abnormal feathering.
DON	• DON degrades normal intestine function causing a decrease in nutrient absorption and intestine wall permeability. • Causes diarrhea and impacts animal performance. • DON decreases immunity, making vaccines less effective and animals more susceptible to disease. It is a predisposing factor for necrotic enteritis.
ZEN	• ZEN has a similar structure to the hormone estrogen. • Consequences in reproduction, including reduced fertility and egg hatchability, and eggshell quality decrease. ZEN can also cause ovarian cysts or cloaca enlargement. • Reduces growth performance, especially when it is accompanied by other mycotoxins

Swine Global and Regional Mycotoxin Risk

Date

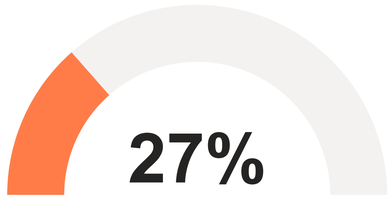
1/1/2024 — 12/31/202



Percent Analyses Above Cargill Performance Risk Threshold(Nursery)

Color	Range	Risk Threshold
	75-100%	Severe Risk
	50-74%	High Risk
	25-49%	Moderate Risk
	0-24%	Slight Risk

% Analyses Contaminated Above Swine Performance Risk Threshold (Nursery)



Toxin	Total Analyses	% Analyses Contaminated Above Sow Performance Threshold	% Analyses Contaminated Above Hog Performance Threshold	% Analyses Contaminated Above Nursery Performance Threshold
AFL	125,843	7%	7%	9%
DON	122,569	24%	34%	56%
FUM	55,073	10%	30%	35%
OTA	18,212	1%	0%	1%
T2	21,955	10%	2%	10%
ZEN	60,691	20%	4%	8%

Percent Analyses Above Cargill Performance Risk Threshold

Asia	Percent Above
AFL	46%
DON	35%
FUM	36%
OTA	2%
T2	6%
ZEN	13%

Central & South America	Percent Above
AFL	5%
DON	39%
FUM	54%
OTA	0%
T2	1%
ZEN	6%

China	Percent Above
AFL	6%
DON	65%
FUM	35%
OTA	0%
T2	0%
ZEN	8%

Europe	Percent Above
AFL	1%
DON	48%
FUM	29%
OTA	0%
T2	6%
ZEN	10%

Middle East & Africa	Percent Above
AFL	3%
DON	17%
FUM	28%
OTA	0%
T2	18%
ZEN	7%

North America	Percent Above
AFL	2%
DON	62%
FUM	32%
OTA	2%
T2	7%
ZEN	10%

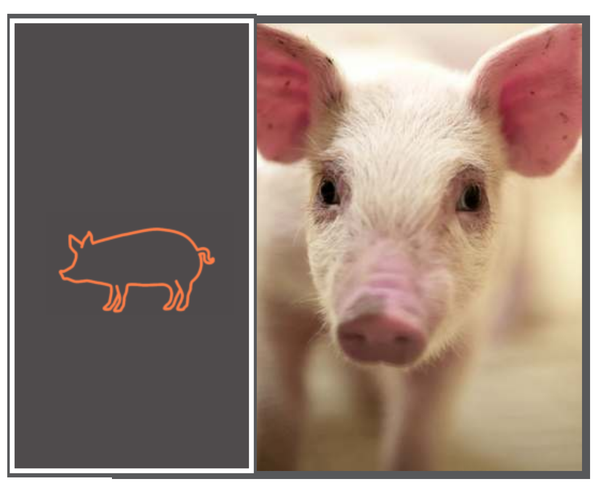
Russia	Percent Above
AFL	0%
DON	22%
FUM	6%
OTA	1%
T2	39%
ZEN	3%

Mycotoxin	Multiple Mycotoxin Impact on Swine
AFL	• Low AFL doses result in lower feed intake, growth rate, and vaccination response which can affect liver function and immunity. Nursery pigs are most susceptible as AFL passes through milk. • Acute aflatoxicosis can lead to hemorrhages, jaundice, and sudden death.
FUM	• FUM impacts the lungs, heart, and liver tissues. Acute toxicity causes porcine pulmonary edema resulting in respiratory symptoms, cyanosis, and often, death. • Chronic toxicity causes lower feed intake, growth rate, vaccination response, and muscle bleeding
OTA	• OTA A is toxic for kidneys and liver and undermines immunity. Significant poisoning results in higher mortality. • OTA can cause low growth rate, poor feed efficiency, and altered urine.
T2	• T2 is a strong immunosuppressive toxin with effects at low doses. Acute exposure causes liver/intestinal bleeds and chronic toxicity causes lower feed intake and weight loss. • T2 can cause reproductive issues, abnormalities, or birth defects.
DON	• DON impacts protein synthesis and immunity and disrupts neurotransmitter activity. Low dose exposure leads to feed consumption and growth performance decreases. • Severe exposure causes vomiting, diarrhea, digestive lesions, and sudden death.
ZEN	• ZEN impacts reproduction and can cause vulva swelling/redness and rectal/vaginal prolapses. False pregnancy and early embryo loss may occur. ZEN passes through milk and impacts newborns. • ZEN lowers growth performance severely when combined with other toxins.

Cargill Performance Risk Thresholds (ppb)

	AFL	DON	FUM	OTA	T2	ZEN
Global	10	200	500	20	25	35

	AFL	DON	FUM	OTA	T2	ZEN
Beef	20	700	4,000	250	100	125
Calf/Heifer	20	600	1,750	50	100	100
Dairy	5	700	2,250	250	100	125



	AFL	DON	FUM	OTA	T2	ZEN
Grower/Finisher	20	500	1,000	40	100	300
Nursery pig	15	200	750	25	50	200
Sow	20	750	3,000	25	50	100

	AFL	DON	FUM	OTA	T2	ZEN
Breeder	15	400	1,000	25	50	35
Broiler	15	400	500	20	25	50
Layer	15	400	1,000	25	50	35

Disclaimer: These thresholds may differ from government regulatory levels which vary from one country to another. Cargill Animal Nutrition mycotoxin risk thresholds have been established through in-depth scientific research on the mycotoxin impact on animals' health and performance and are based on an estimated 0.5% loss of performance. These thresholds are likely to evolve as scientific knowledge on mycotoxicosis increases.

We would like to thank our customers, technicians throughout our vast laboratory network, and data scientists, without which this report would not be possible.

Have questions or want to get in touch ?

Please reach out to mycotoxins@cargill.com.

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