



2021 Asian Aqua Mycotoxin Analysis

How can
mycotoxin
insights help to

Mitigate

the hidden threat
in aquaculture?



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Understanding the mycotoxin risk

Thank you for taking the time to read our 2021 Asian Aqua Mycotoxin Analysis report. This will provide you with insights into mycotoxin contamination risk throughout Asia and across multiple aquatic species. Utilizing the Alltech 37+® mycotoxin analysis and Alltech RAPIREAD®, we investigated almost 200 feed samples from Bangladesh, China, India, Indonesia, Malaysia and Vietnam. Gaining an understanding of this data will help you make the most effective management decisions regarding future feeding strategies.



Aquaculture is the fastest-growing protein globally, and by 2030, 60% of fish available for food consumption will be farmed.

Developing more sustainable fish feed results in the reduction of traditional marine ingredients and a higher inclusion of plant-based materials in aquatic diets. This increases the exposure pathway for mycotoxins, and if we consider that the industry is moving towards 0% fishmeal diets, this risk will be undoubtedly higher.

Mycotoxins are a hidden threat to aquaculture production as the effects can often go undiagnosed over a long period and may not always result in acute symptoms. However, increasingly more research is revealing that this long-term exposure can be detrimental to the health and performance of your animal. Mycotoxins impair optimum animal performance by affecting intestinal, organ and immune systems — which, in turn, has a subsequent negative impact on business profitability.

Mycotoxin contamination is an ever-present threat to the productivity of even the best-run aquaculture operations and should now be on every feed producer and farmer's radar.

Common impacts in aquaculture



Reduced
feed intake



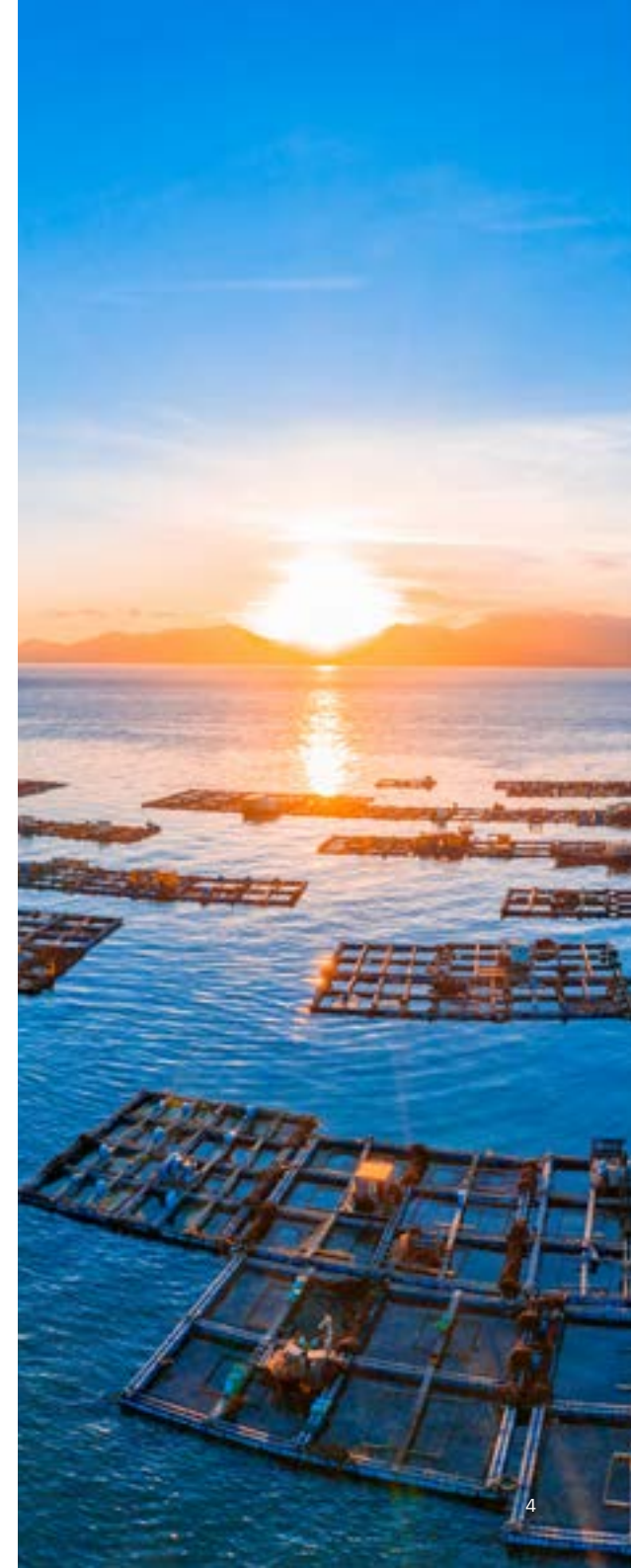
Damage to intestines
and internal organs



Immune
suppression



Infertility and
reproductive
challenges



Overview

In 2021, aquafeed production increased 3.7% globally.

According to the Alltech Global Agri-Food Outlook 2022, Asia Pacific remains the largest region to produce aquafeed, with 3.3% growth on 2021 figures. This growth provides a greater significance and responsibility to ensure a safe protein supply into the human food chain.

The numbers:

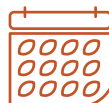
6
countries
across the Asia
Pacific region



Over
180
samples from
raw materials
and complete
feed samples



Date range:
July 21–
December 21



Top 5 most prevalent mycotoxins:

1. Type-B trichothecenes
2. Fumonisin
3. Emerging mycotoxins
4. Zearalenone
5. Aflatoxin



Key insights

Key insights from 2021

By-products must not be overlooked

Overall, corn represented a low risk to all species (shrimp, freshwater and marine). Similarly, wheat represented a greater than 50% lower risk across tested samples. However, corn and wheat by-products contained an increased risk of more than 90%. By-products of wheat and corn are most common in aquafeed. When crops such as corn and wheat are manufactured into a by-product, the mycotoxin risk is magnified as the same mycotoxin presence is now concentrated into a lesser mass. This is something producers must consider when selecting these types of ingredients, and routine testing will be crucial to manage the potential challenge.

Low risk does not mean no risk

Overall, plant proteins contain a lower risk level for freshwater and marine species, with a slightly increased risk for shrimp. However, low risk does not mean no risk, and research shows that prolonged exposure, particularly in early life, reduces growth levels of the species throughout their lifecycle. A mitigation plan should still be considered.

Shrimp highly sensitive to mycotoxins

The finished feed sample analysis highlighted a broader range of mycotoxins in shrimp feed, but this contributes to a moderate risk level overall across all samples tested. Shrimp are highly sensitive species, and exposure to multiple mycotoxins can lead to increased mortality in the juvenile stage and longer health impacts over their lifecycle.



Corn

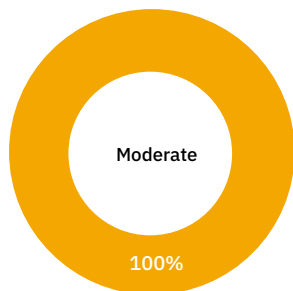
Corn

Although global levels display low to moderate risk levels, corn represents a risk even at lower levels due to the number of variables in its origin, transport and storage. However, corn by-products represent a higher percentage of inclusion in aquaculture diets. This represents a significantly higher risk across all species (shrimp, freshwater, marine).

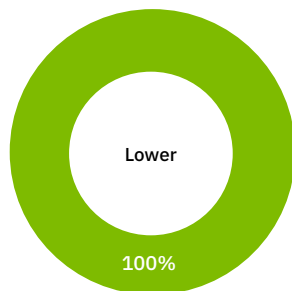
Risk assessment for corn: Global levels



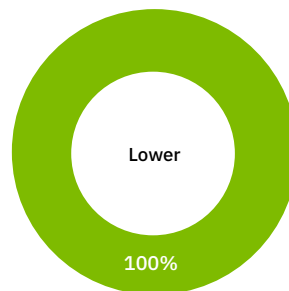
Percentage of samples at lower, moderate or higher risk REQ for Shrimp



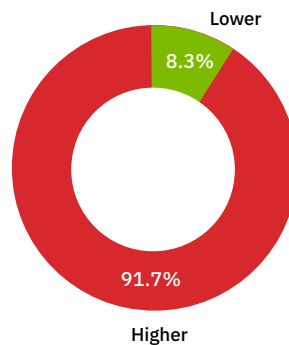
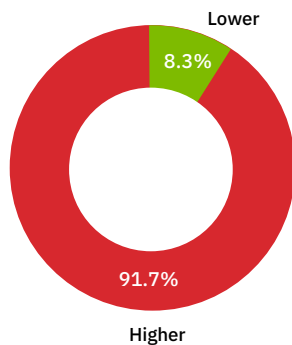
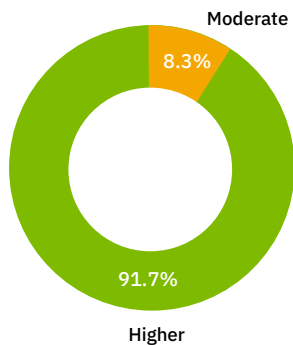
Percentage of samples at lower, moderate or higher risk REQ for Tilapia



Percentage of samples at lower, moderate or higher risk REQ for Seabass/Seabream



Risk assessment for corn by-products: DDGs, corn gluten meal, corn bran



Fusarium mycotoxins are the most prevalent group identified in corn by-product samples.

These are extremely potent and can cause serious harm to fish and shrimp health, posing a major risk in aquafeeds. The average number of mycotoxins compared to the maximum found is also significant and highlights the importance of continuous testing.

Summary of results of corn by-products (distillers dried grains, corn gluten meal) analyzed with Alltech RAPIREAD®

Average concentration of mycotoxins above LOQ

Average mycotoxin concentrations (ppb)		
Aflatoxins	5.2	
Deoxynivalenol	2,185.8	
Fumonisin	1,163.8	
Ochratoxin	3.4	
T2/HT2 toxins	65.4	
Zearalenone	485.0	

Maximum concentrations of mycotoxins

Maximum levels detected (ppb)		
Aflatoxins	8	
Deoxynivalenol	4,400	
Fumonisin	4,500	
Ochratoxin	5	
T2/HT2 toxins	65	
Zearalenone	694	

Wheat

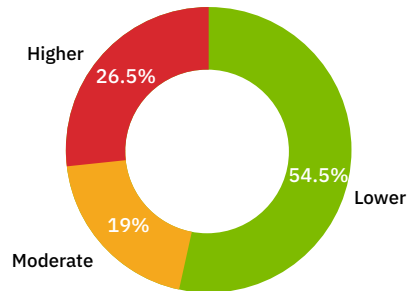
Wheat

Like corn, wheat represents a lower risk across all species but increased risk in by-products, with the greatest risk being to shrimp.

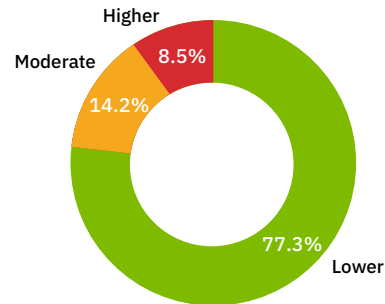
Risk assessment wheat: 2021 Global levels



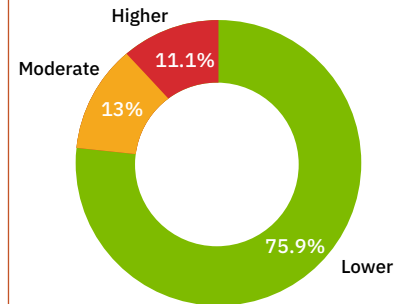
Percentage of samples at lower, moderate or higher risk REQ for Shrimp



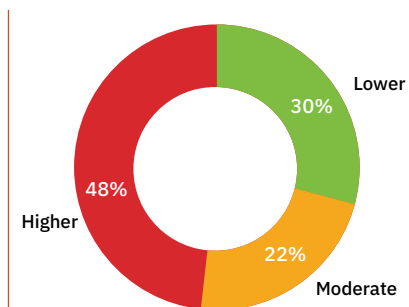
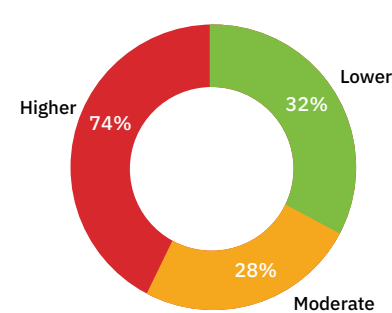
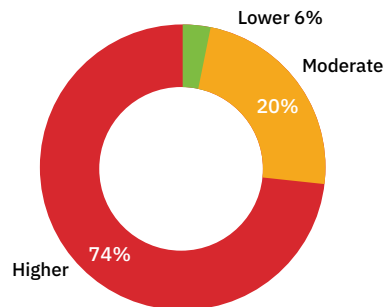
Percentage of samples at lower, moderate or higher risk REQ for Tilapia



Percentage of samples at lower, moderate or higher risk REQ for Seabass/ Seabream



Risk assessment for wheat by-products



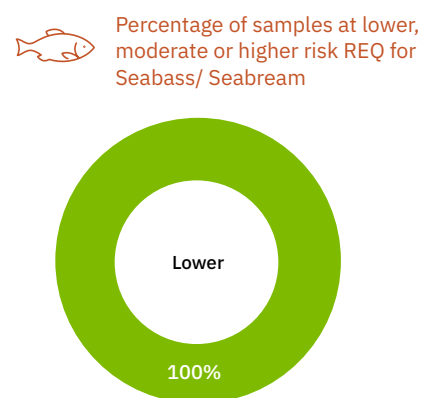
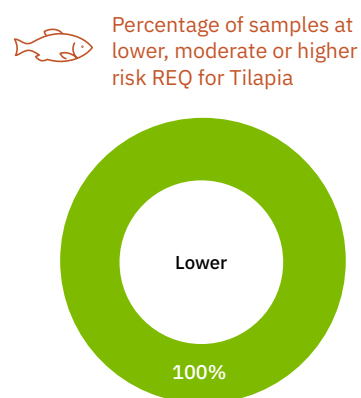
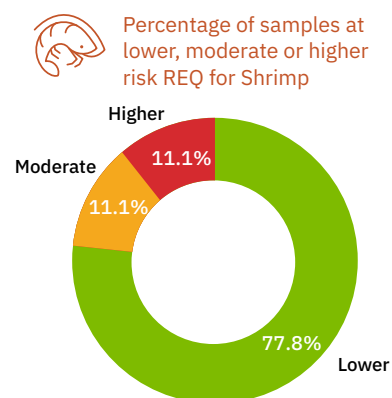
Plant proteins

(soybean meal, rapeseed meal)

Plant proteins

Soybean meal, rapeseed meal

Globally, plant proteins are typically lower in mycotoxins due to their growing seasons when the mycotoxin exposure levels are decreased. Although this is a lesser concern, the increased inclusion of these ingredients will enhance the overall risk in aquafeed. Research shows us that the synergistic effect of multiple mycotoxins can be particularly harmful. The most prevalent form of mycotoxin is DON, with some emerging mycotoxins and *Penicillium*s also appearing. *Penicillium* mycotoxins can increase rapidly during storage, so regular sampling of these ingredients is necessary in long-term storage.



Mycotoxin occurrence %		
Type-B trichothecenes	66.67	<div></div>
Fusaric acid	33.33	<div></div>
Fumonisin	22.22	<div></div>
Zearalenone	22.22	<div></div>
Emerging mycotoxins	11.11	<div></div>
Other <i>Penicillium</i>	11.11	<div></div>

Average concentration of mycotoxins above LOQ (ppb) (Analyzed with Alltech RAPIREAD®)		
Aflatoxins	4.2	<div></div>
Deoxynivalenol	670	<div></div>
Fumonisin	716.5	<div></div>
Ochratoxin	33.6	<div></div>
Zearalenone	146.3	<div></div>

Maximum concentration of mycotoxins detected (ppb)		
Aflatoxins	5	<div></div>
Deoxynivalenol	1,000	<div></div>
Fumonisin	3,500	<div></div>
Ochratoxin	119	<div></div>
Zearalenone	279	<div></div>

Brans

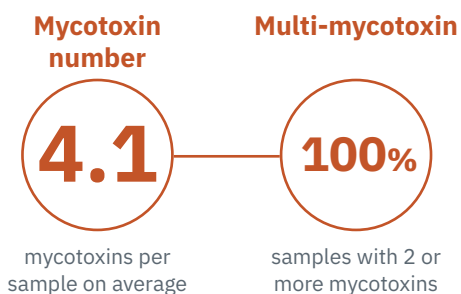
(rice bran, wheat bran, de-oiled rice bran)

Brans

Rice bran, wheat bran, de-oiled rice bran

These represent an increased risk to shrimp, with an overall moderate risk to marine and freshwater species. It is important to note the increase in risk, particularly in fumonisins. Fumonisin can impact the immune response in aquaculture species and reduce their ability to fight infection.

Rice bran



Rice bran, wheat bran, de-oiled rice bran

Average concentrations of mycotoxins above LOQ analyzed with Alltech RAPIREAD®

Average mycotoxin concentration (ppb)		
Aflatoxins	6.6	
Deoxynivalenol	410	
Fumonisin	744	
Ochratoxin	4.3	

Maximum concentration of mycotoxins detected		
Aflatoxins	9	
Deoxynivalenol	410	
Fumonisin	988	
Ochratoxin	4.3	
T2/HT2 toxins	34	
Zearalenone	41	

Mycotoxin occurrence %		
Type-B trichothecenes	100%	
Zearalenones	100%	
Fumonisin	50%	
Other <i>Aspergillus</i>	50%	
Alfatoxin B ₁	12.5%	
Aflatoxins, total	12.5%	
Emerging mycotoxins	12.5%	
Other <i>Penicillium</i>	12.5%	

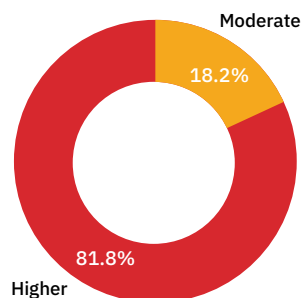
Wheat bran

Risk from DON

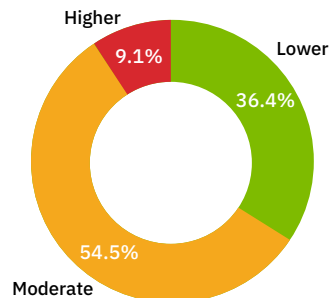
Low inclusion compared to other ingredients, but the levels can be variable due to the origin of wheat and practices that generate wheat flour. The risk is significant for shrimp and marine species but less so for freshwater due to low inclusion rates.



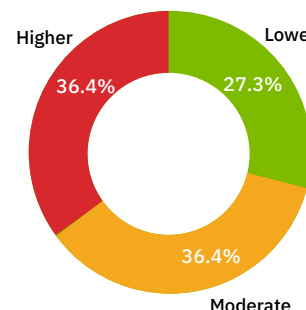
Percentage of samples at lower, moderate or higher risk REQ for Shrimp



Percentage of samples at lower, moderate or higher risk REQ for Tilapia



Percentage of samples at lower, moderate or higher risk REQ for Seabass/ Seabream



Mycotoxin number

3.3

mycotoxins per sample on average

Multi-mycotoxin

90.9%

samples with 2 or more mycotoxins

Average concentration of mycotoxins

Average concentration (ppb)	
Aflatoxins	0.0
Aflatoxins, total	0.0
Ochratoxins/Citrinin	0.0
Type-B tricothecenes	452
Type-A tricothecenes	0.0
Fumonisin	0.0
Zearalenone	5.0
Fusaric acid	0.0
Emerging mycotoxins	44.4
Other <i>Penicillium</i>	0.0
Other <i>Aspergillus</i>	0.0
Ergot toxins	0.0

Maximum levels detected (ppb)

Aflatoxins	0.0
Aflatoxins, total	0.0
Ochratoxins/Citrinin	0.0
Type-B tricothecenes	1137
Type-A tricothecenes	0.0
Fumonisin	0.0
Zearalenone	33
Fusaric acid	0.0
Emerging mycotoxins	253
Other <i>Penicillium</i>	0.0
Other <i>Aspergillus</i>	0.0
Ergot toxins	0.0

Mycotoxin occurrence %

Type-B tricothecenes	100%
Emerging mycotoxins	81.82%
Zearalenones	63.64%
Alfatoxin B ₁	9.09%
Aflatoxins, total	9.09%

Finished feed samples

Marine species

Lower risk overall in feed sampled, with the primary mycotoxins present being DON and zearalenones. Low risk does not imply no risk, and long-term exposure to juvenile species over a significant period will impact health and performance.



Marine species

REQ estimate: 3.3
Risk level: Lower

Lower

3.3

Freshwater

The samples tested from freshwater species represented an overall high risk. Although there is a lower risk from aflatoxins, fumonisins and zearalenones and a moderate risk from DON, it is the combination of these mycotoxins that presents an increased risk to the species. This can result in increased mortality rates and decreased growth rates across their entire lifecycle.



Freshwater

REQ estimate: 136.8
Risk level: Higher

Higher

136.8

Shrimp

Testing displayed a broader risk to this species. Although levels are on the lower side with a moderate risk of DON, combined, these represent moderate risk. This can be harmful to juvenile species, decreasing their chances of survival and presenting early performance setbacks that can impact their growth of the entire lifecycle.



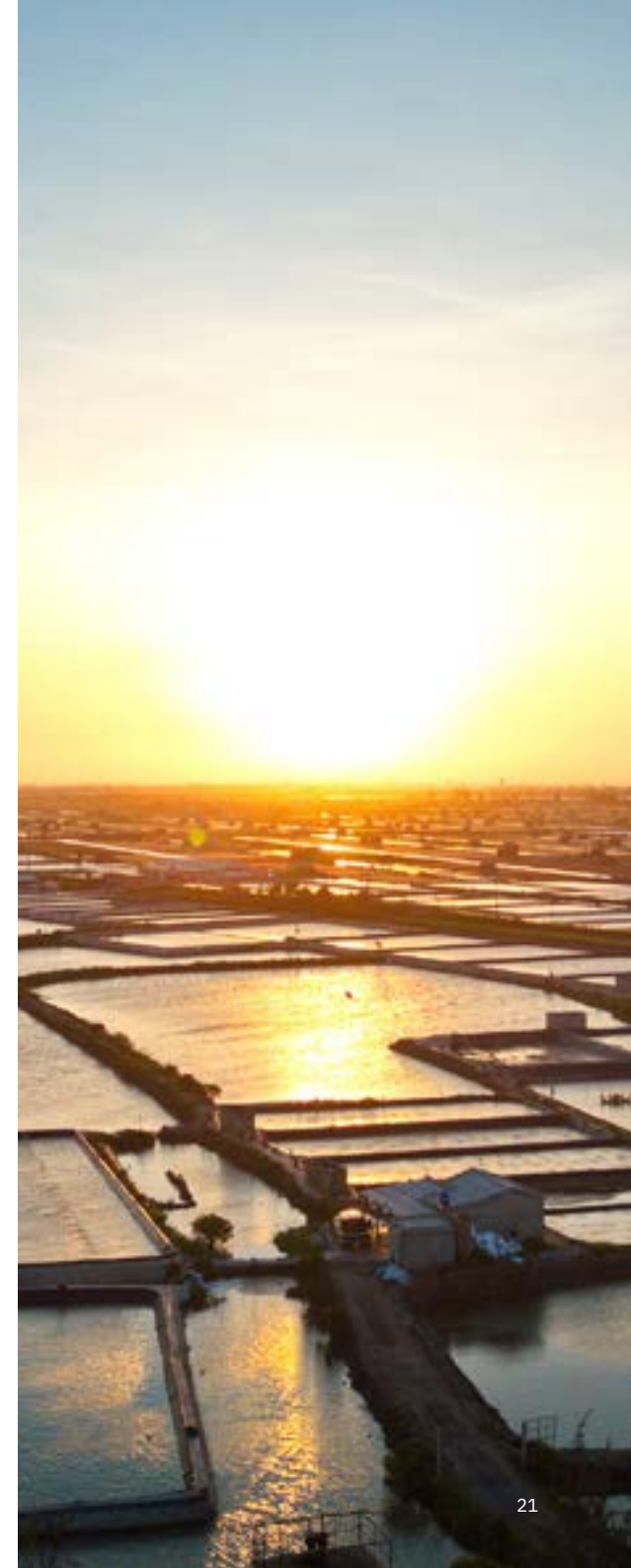
Shrimp

REQ estimate: 12.6
Risk level: Lower

Lower



Overall, the sampling indicates that the multiple mycotoxin effects can harm performance over the animal's lifetime. This shows the importance of continuous testing, understanding the levels of mycotoxins present in finished feeds and the knowledge to implement the correct mitigation program.



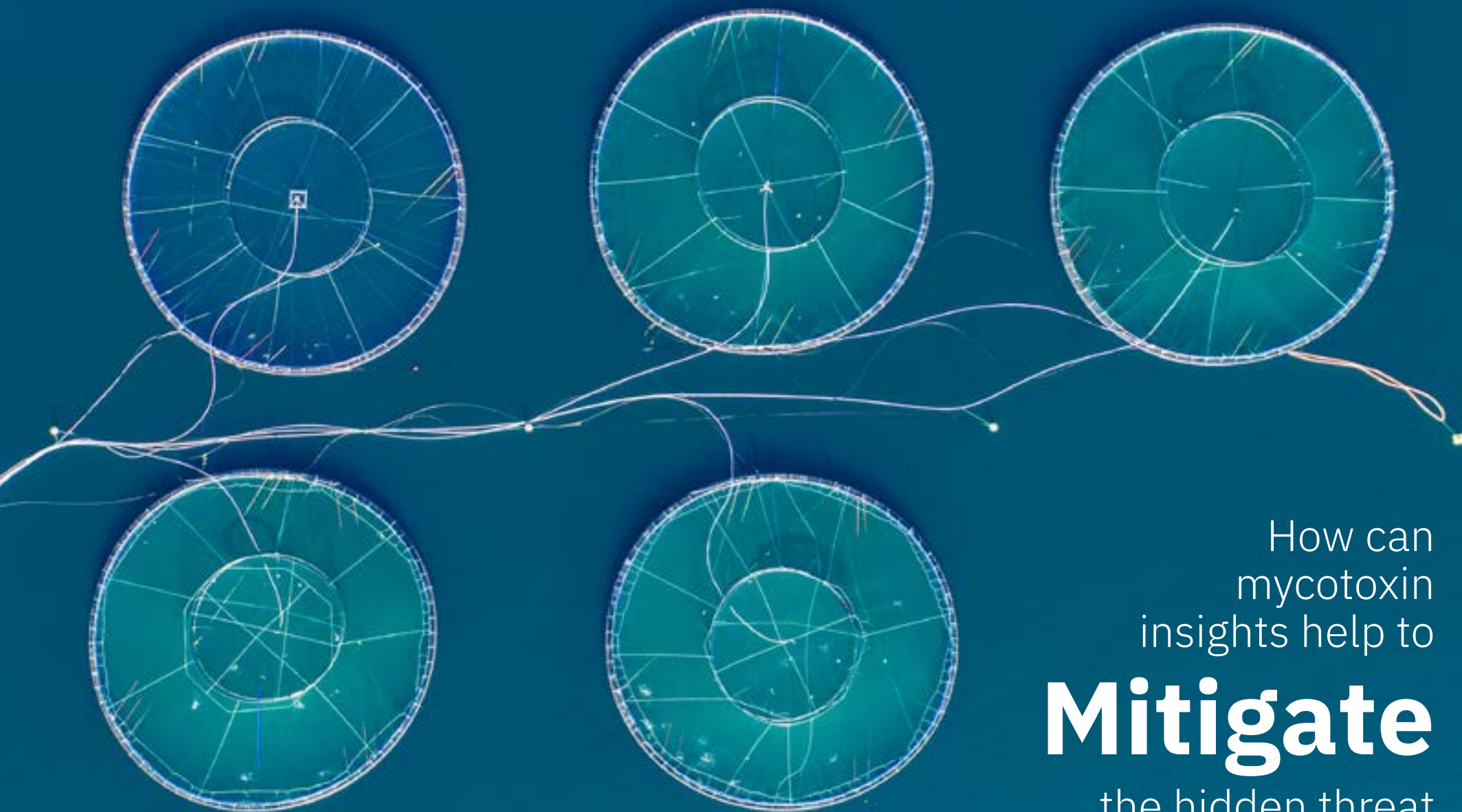
Alltech® Mycotoxin Management

In regions like Asia Pacific, routine mycotoxin testing is vital. Asia relies heavily on imported ingredients. This provides increased variables in terms of shipping times, transport and storage conditions, all of which can exacerbate the mycotoxin risk. It is increasingly clear that an effective mycotoxin control program is essential to protect the health and wellbeing of both animals and the consumer.

Alltech believes that effective mycotoxin management is about seeing the whole challenge, from the farm to the feed mill and from risk assessment to feed management. To effectively manage the inevitability of feed mycotoxin contamination, it is crucial to understand the level of mycotoxin challenges so that the right steps can be taken to mitigate any adverse effects on animal performance, production efficiency and food safety.

Learn more about Alltech® Mycotoxin Management, our services and solutions, and the latest information on the threat of mycotoxins on knowmycotoxins.com.





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For more information, please contact our office:
Alltech European Bioscience Centre
Sarney | Summerhill Road | Dunboyne | Co. Meath | Ireland
Tel: +353 (0)1 825 2244 | Fax: +353 (0)1 825 2245