



# Prevent recalls with data & AI

## The salmonella-in-choco case

**Mihalis Papakonstantinou,**  
*Head of Data*

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## WHAT WE DO

We **predict food risks** to help inform **preventive measures**

Mihalis Papakonstantinou, Agroknow - 17/06/2022



# COMPANIES TURN TO AGROKNOW...

...in order to prioritize risk mitigation measures, they need to **be early informed about external risks that may affect their supply chain**



## CHALLENGES THEY FACE

“Uncertainty whether food safety incident alerts received are accurate, complete and up-to-date”

“Difficulties at identifying data that is relevant to various teams and roles from extremely large and highly heterogeneous data pools”

“Performing critical ingredient & supplier risk assessment using spreadsheets”

“Lack an integrated system for risk and vulnerability assessment of suppliers”

“Lack a systematic & informed way to design/update food risk prevention plans in near real time”

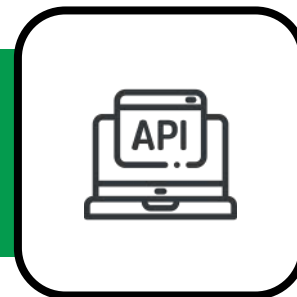
“Increased concern about unexpected, unforeseen food safety risks that may emerge in supply chain”

**RISK ASSESSMENT**

**RISK MONITORING**

**RISK PREVENTION**

# OUR OFFERINGS



**FOOD RISK INTELLIGENCE  
PLATFORM**

**FOOD RISK DATA  
AS A SERVICE**

# FOODAKAI MODULES

## 1. REAL TIME INCIDENTS MONITORING & ALERTING

Am I aware of all the relevant food safety incidents for my supply chain?

## 2. EMERGING HAZARDS

Which are the emerging hazards for my ingredients & products (per region)?

## 7. RISK PREDICTION

Which will be the next food safety incident in my supply chain?

## 6. RISK ASSESSMENT

How can I have fast & real time risk assessment for my ingredients, products & suppliers?



## 3. SUPPLIER EVALUATION

Which of my suppliers are more susceptible to risk?

## 5. GLOBAL LAB TEST INSIGHTS

Which are the hazards we should test for, according to global lab test results ?

## 4. AUTOMATED REPORTING

How can I have a quick overview of incidents & recalls for our brand vs competition?





**USING AI TO  
PREVENT THE  
NEXT RECALL**



# RECENT SALMONELLA RECALLS IN CHOCOLATE PRODUCTS HAD A HUGE IMPACT ON THE GLOBAL FOOD SUPPLY CHAIN

07

Salmonella caused the recall of

more than  
**180**  
different products

distributed in over  
**110**  
countries

more than  
**\$60M**  
damages to companies

The salmonella outbreak **started from the UK** and **expanded to 16 countries**

**300**  
people sickened  
*in Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Norway, Spain, Switzerland, Sweden*



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# DECISION SCENARIOS WHICH CAN BE SUPPORTED BY AI

08

01

## Finished Products & Ingredients' Risk:

calculating the risk associated with all key ingredients (short-term / today, mid-term / next weeks, long-term / next months)

02

## Suppliers' / Facilities' Risk:

using ingredient risk & other key indicators to calculate and aggregate risk score/ranking for your suppliers and manufacturing facilities

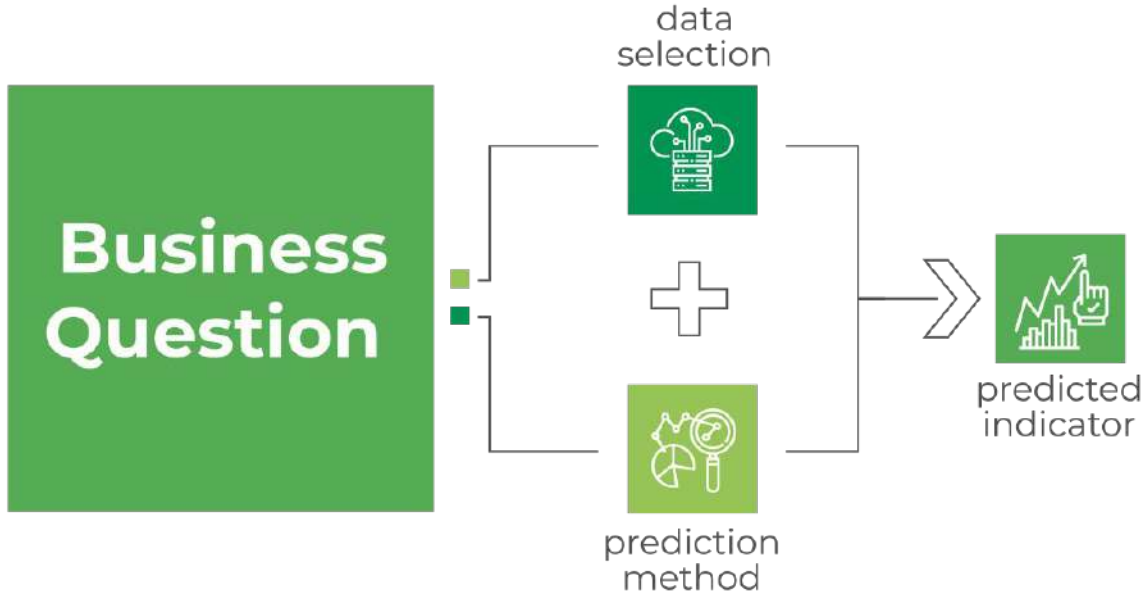
03

## Risk mitigation & risk prevention:

towards a more proactive decision-making process (e.g. for lab testing, supplier audit, facility audit priorities)

# BREAKING DOWN EACH DECISION

09



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# CASE STUDY: MANUFACTURER OF CHOCOLATE PRODUCTS

# 10



**Ingredients:** Fine Milk Chocolate 33.5% (Sugar, Cocoa Butter, **Milk Powder**, **Cocoa Mass**, Emulsifier: **Lecithins** (Soya), Vanillin), Sugar, Skimmed Milk Powder, Palm Oil, Cereals 7.5% (Barley, Rice, Wheat, spelt Wheat, Buckwheat), **Buttermilk**, Vanillin.

v - 17/06/2022

# CONTINUOUSLY MONITOR RISKS IN FINISHED PRODUCTS & INGREDIENTS



Get e-mail alerts with an **early notification** about an increasing risk by 200% for biological issues in chocolate products



## YOUR DAILY INCIDENT ALERTS

Alert sent to you based on your preference: Company ingredients

### INCREASING RISKS FOR REPORTED INGREDIENTS

Increasing	<a href="#">chocolate and chocolate products</a>	<a href="#">salmonella</a>	200%
Increasing	<a href="#">nuts, nut products and seeds</a>	<a href="#">unauthorised ingredient (fraud)</a>	200%
Increasing	<a href="#">groundnut</a>	<a href="#">aflatoxin b1</a>	100%
Increasing	<a href="#">candies</a>	<a href="#">unauthorised use of colour e 110</a>	50%

TAKE ME TO FOODAKAI

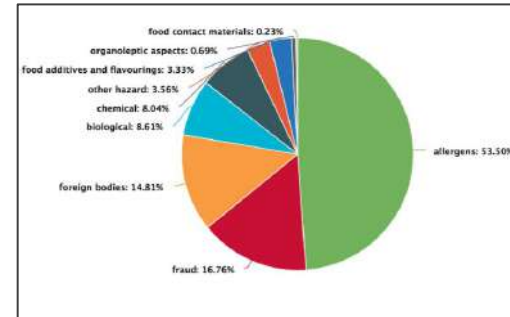
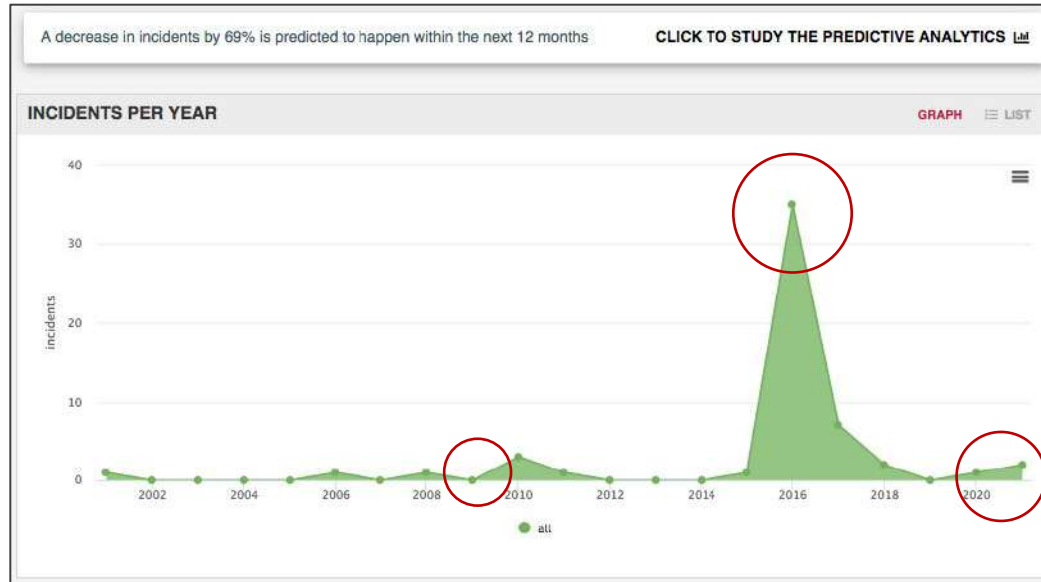
# CONTINUOUSLY MONITOR RISKS IN INGREDIENTS



Check dashboard for **emerging risks** for the lecithin used in chocolate products

INCREASING AND EMERGING RISKS				CUSTOMIZE	
Product	Hazard	10 years Risk	Tendency		
- lecithins (e322)	peanuts and products thereof	High (12)	New		VIEW DATA
	foreign protein	Medium (6)	New		VIEW DATA
+ guar gum (e412)	unauthorised ingredient (fraud)	High (10)	▲ 25%		VIEW DATA
+ natural colours	chemical	High (10)	▲ 1%		VIEW DATA
+ chia seeds	salmonella	Medium (9)	▲ 33%		VIEW DATA
+ eggs and egg products	salmonella	Medium (9)	▲ 33%		VIEW DATA




# HAZARDS ANALYSIS FOR CHOCOLATE PRODUCTS



Go deeper into the data to analyse and estimate the likelihood of having salmonella cases in **chocolate products**



## FURTHER ANALYZE THE SPECIFIC BIOLOGICAL ISSUES USING HISTORICAL INCIDENTS DATA

INCIDENTS <span style="float: right;">≡ LIST</span>				
Title	Product	Supplier	Date	Country
<a href="#">Salmonella enterica ser. agona in chocolates from Netherlands</a>	chocolates		17/3/2021	
Salmonella in chocolate by Thompson Chocolate Company from United States	chocolate	Thompson Chocolate Company	1/3/2021	
Salmonella in chocolates by CCV-Vertriebs GmbH from Germany	chocolates	CCV-Vertriebs GmbH	26/2/2020	

From **2019 until 2021** we had an increasing trend of salmonella cases in chocolate products

# MONITOR OUTBREAKS DATA FOR SALMONELLA CASES ACROSS THE GLOBE

**Salmonella** in eggs from Spain 28/9/2019

View printable version &nbsp; Share this post: Published Date: 2019-09-28 19:34:33Subject: PRO/AH/EDR> Salmonellosis - Netherlands: Spanish eggs  
 Archive Number: 20190928.6699492SALMONELLOSIS - NETHERLANDS: SPANISH EGGS\*\*\*\*\*A ProMED-mail posthttp://www.promedmail.orgProMED-mail is a program of theInternational Society for Infectious Diseaseshttp://www.isid.orgDate: Sat 28 Sep...

biological europe salmonella pathogenic bacteria more tags Read more

**Escherichia coli** and **salmonella** in watermelons from Latvia 23/9/2019

View printable version &nbsp; Share this post: Published Date: 2019-09-23 14:43:31Subject: PRO/AH/EDR> E. coli EHEC, Salmonellosis - Latvia: schools  
 Archive Number: 20190923.6689539E. COLI EHEC, SALMONELLOSIS - LATVIA: SCHOOLS\*\*\*\*\*A ProMED-mail posthttp://www.promedmail.orgProMED-mail is a program of theInternational Society for Infectious Diseaseshttp://www.isid.orgDate: Sat 21 Sep...

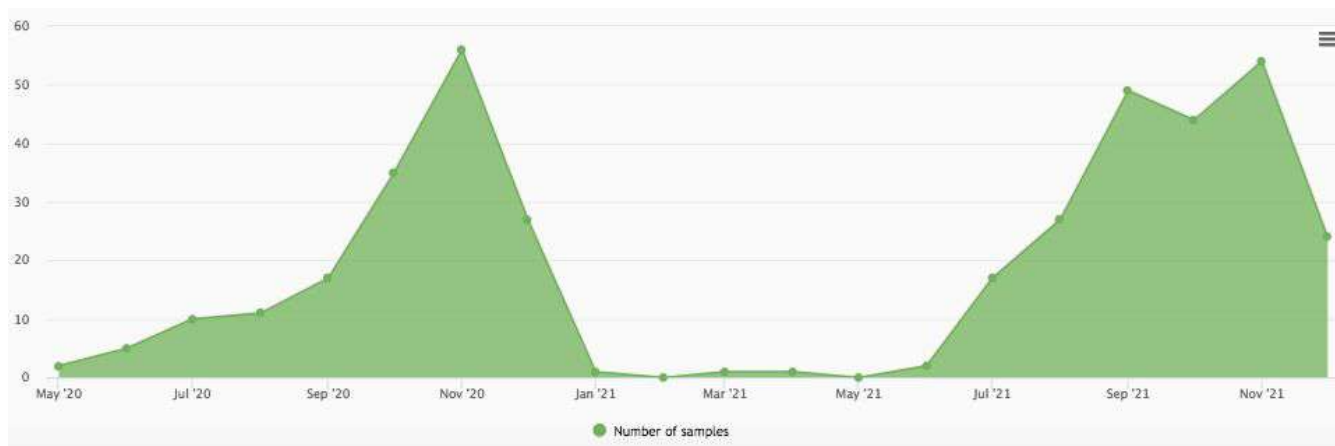
biological europe escherichia coli latvia more tags Read more

**Salmonella** in poultry from United States 5/9/2019

View printable version &nbsp; Share this post: Published Date: 2019-09-05 21:38:01Subject: PRO/AH/EDR> Salmonellosis - USA (05): live poultry, multiple serotypes, fatal  
 Archive Number: 20190905.6659617SALMONELLOSIS - USA (05): LIVE POULTRY, MULTIPLE SEROTYPES, FATAL \*\*\*\*\*A ProMED-mail posthttp://www.promedmail.orgProMED-mail is a...

biological poultry united states salmonella more tags Read more

## ANALYSE SALMONELLA TRENDS IN INCOMING INGREDIENTS AND FINISHED PRODUCTS USING LARGE LAB RESULT DATASETS



**Monitor and predict** the trend for salmonella risk using lab tests

# USE PREDICTIVE ANALYTICS TO IDENTIFY EMERGING RISKS ABOUT CHOCOLATE PRODUCTS

FOODAKAI

highlighted in Oct. 2021 that there will be an **emerging risk for salmonella** and predicted that **in 2022 there will be more incidents of salmonella in chocolate products**

## Hazards likely to increase for chocolate and chocolate products ⓘ

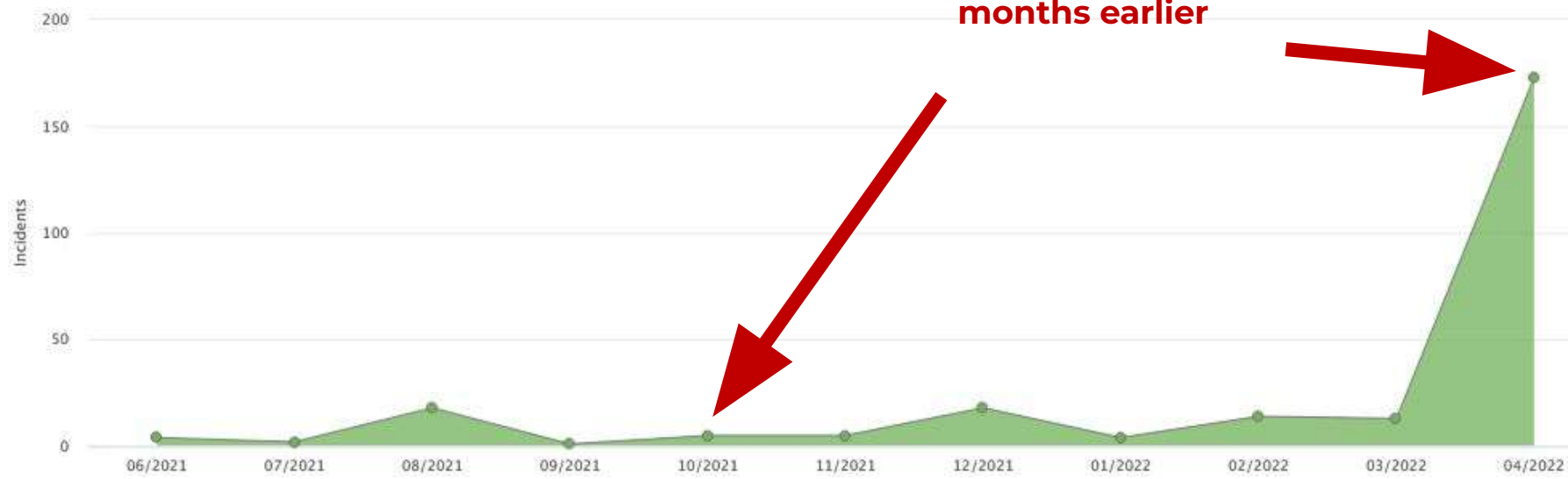
### HAZARDS LIKELY TO INCREASE

Hazard	Current year's incidents ⓘ	Next year's incidents ⓘ	Tendency
nuts ⓘ	19	21	11%
milk and products thereof ⓘ	9	20	122%
unauthorised ingredient (fraud) ⓘ	12	16	33%
almond ⓘ	9	13	44%
hazelnut ⓘ	4	6	50%
salmonella ⓘ		12	-

# A VALIDATED PREDICTION









18

Increased risk trend for salmonella was predicted **6 months earlier**



# A VALIDATED PREDICTION

# 19

Title	Product	Supplier	Date	Country
Salmonella in chocolate products by Fa. Strauss from Israel	chocolate products	Fa. Strauss	29/4/2022	
Salmonella in chocolate products from Israel	chocolate products		29/4/2022	
Salmonella in chocolates by Benedikt Imports Ptd Ltd from Israel	chocolates	Benedikt Imports Ptd Ltd	29/4/2022	
Salmonella typhimurium in chocolate products by FERRERO USA INC from United States	chocolate products	FERRERO USA INC	28/4/2022	
Salmonella typhimurium in chocolate products by FERRERO USA INC from United States	chocolate products	FERRERO USA INC	28/4/2022	
Salmonella in confectionery products and chocolate products by Strauss Israel from Israel	confectionery products	Strauss Israel	28/4/2022	
Foodborne outbreak suspected and salmonella typhimurium monophasic in chocolate products from Belgium	chocolate products		27/4/2022	
Salmonella in chocolate products by Ferrero Ardennes SA from Belgium	chocolate products	Ferrero Ardennes SA	25/4/2022	



# CONTINUOUSLY MONITOR ALL YOUR SUPPLIERS & FACILITIES

# 20

SUPPLIERS DASHBOARD  SUPPLIER CHECK  MY SUPPLIERS

Use our smart search operation to find out if any food recalls, border rejections and inspections have been previously announced by Authorities for a company. Search using the company name and the advance search option to apply specific filters.

SUPPLIER A

ALL (1517)

Sort by Relevance

Citation citation sup

Hi John,

within the last 3 days there are 7 incidents that match your FOODAKAI supplier alerts list with title: **My Suppliers**.  
Please check the below list:

Title	Supplier	Date	Foodakai link
<b>Salmonella in chocolate products and peanut butter by Supplier A from United States</b>	Supplier A	23-05-2022	<a href="#">Details</a>

*You have received this email because there are new incidents that match your FOODAKAI supplier alerts.*

Thank you.

FOODAKAI Customer Success Team

## IDENTIFY WHICH FACILITY WILL BE AFFECTED USING PREDICTIONS

PRODUCTS & FACILITIES LIKELY TO BE AFFECTED		
Product/Facility	Hazard	Risk
Honey sesame bar	ethylene oxide	3.14
FACILITY A	salmonella	6.26
Milk Chocolate	salmonella	5.27

# STUDY THE LIVE FOOD SAFETY PROFILE OF FACILITY



Risk based on **sourced & processed ingredients**

## REAL-TIME RISK SCORING & RANKING IN FACILITIES' DASHBOARD

Overall facilities risk incorporating all risk parameters

FOODAKAI risk data sources

Client's Internal data sources

Supplier	Incidents Risk	Sourced Ingredients Risk	Foodakai Ingredients Risk	Recalls	Border Rejections	Inspections	Warning Letters	Predicted risk	Audit Score	GFS	Compliance Parameter 1	Compliance Parameter 2	Compliance Parameter 3	Overall Risk Score
FACILITY A	8	9	9	2	131	47	-	54	47	96	4	138	51	418
FACILITY B	10	8	6	-	230	-	-	100	15	42	10	145	66	387
FACILITY C	8	8	8	-	3	-	-	100	Suppliers Sourced Ingredients Risk ⓘ					335
FACILITY D	6	8	12	45	1186	17	1	13	<div style="display: flex; justify-content: space-between;"> <div style="background-color: #f4a460; padding: 10px; border: 1px solid #ccc;"> <p>Medium</p> <p>FACILITY C</p> </div> <div style="background-color: #c00000; padding: 10px; border: 1px solid #ccc;"> <p>High</p> <p>FACILITY A</p> </div> </div>					282
FACILITY E	8	8	10	5	5	10	-	20						246
FACILITY F	-	9	6	-	-	-	-	42						189
FACILITY G	8	10	8	-	4	-	-	55						152

## WITHOUT DATA YOU'RE JUST ANOTHER PERSON WITH AN OPINION

### North American Data Sources

- FDA Recalls
- FDA Inspections Citations
- FDA Enforcement Reports
- FDA Import Alerts
- ProMED
- USDA Food Composition Database
- FSIS USDA
- Canadian Food Inspection Agency
- FreshDirect U.S.
- California Dep. Of Public Health

### European Data Sources

- RASFF
- German Authority
- Food Standard Agency UK
- Greek Authority
- Italian Authority
- Austrian Authority
- French Authority
- Czech Authority
- Irish Authority
- Danish Authority
- Spanish Authority

### Asian Data Sources

- Chinese Authority
- Singapore
- Hong Kong
- Japanese Authority
- Israel

### Oceania Data Sources

- New Zealand
- Australia

### Latin American Data Sources

- Brazil

### African Data Sources

- Nigeria



**>155 million**

Records from official trusted sources

**15**

Data types

**>880**

Data sources

**196**

Countries covered

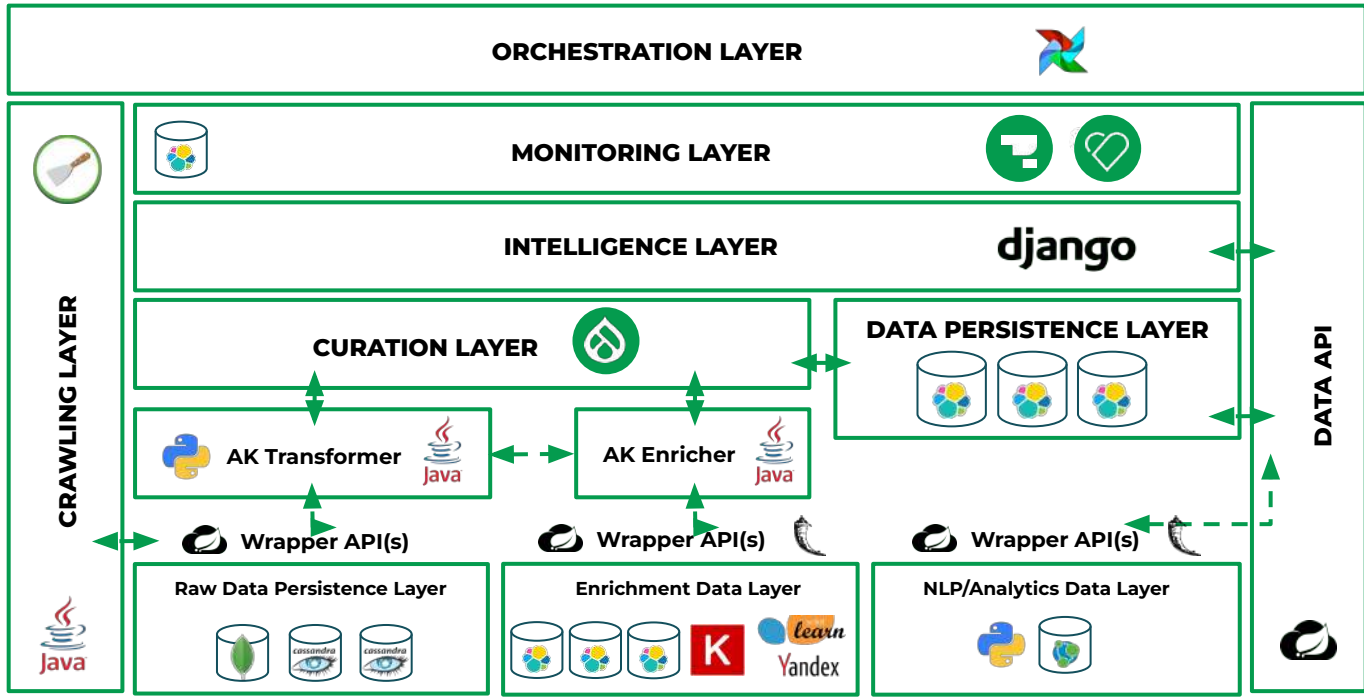
**>1 billion**

Records from social media

**>9,000**

Social media data sources

# UNDERLYING DATA PLATFORM

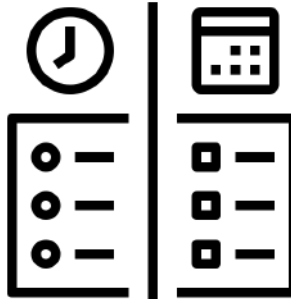




## LESSONS LEARNED ABOUT INGREDIENTS' & FINISHED PRODUCTS' RISK

### Short-term:

daily **monitoring & investigation of hazards** affecting key ingredients, customized per role/team/region



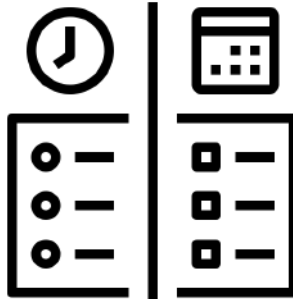
### Mid-term:

using **large historical data sets** (such as lab testing programs, food fraud trends) & **global incident predictions** to identify emerging issues and their trends

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## LESSONS LEARNED ABOUT FACILITIES' & SUPPLIERS' RISK

**Short-term:**  
**Supplier/facility check  
& monitoring** to  
consider alternative  
suppliers or facilities



**Mid-term:**  
combining heterogeneous data  
sources for real-time **existing  
supplier and facility risk ranking** to  
monitor particular suppliers/facilities  
& increase lab test sampling  
frequency & change audit plan

# Thank You!

**Do you have any  
questions?**

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to help inform  
preventive measures**