



Second Symposium of the Arab Section of AOAC INTERNATIONAL

Occurrence and Risk assessment of sesame allergen in oriental-type products on the Lebanese market

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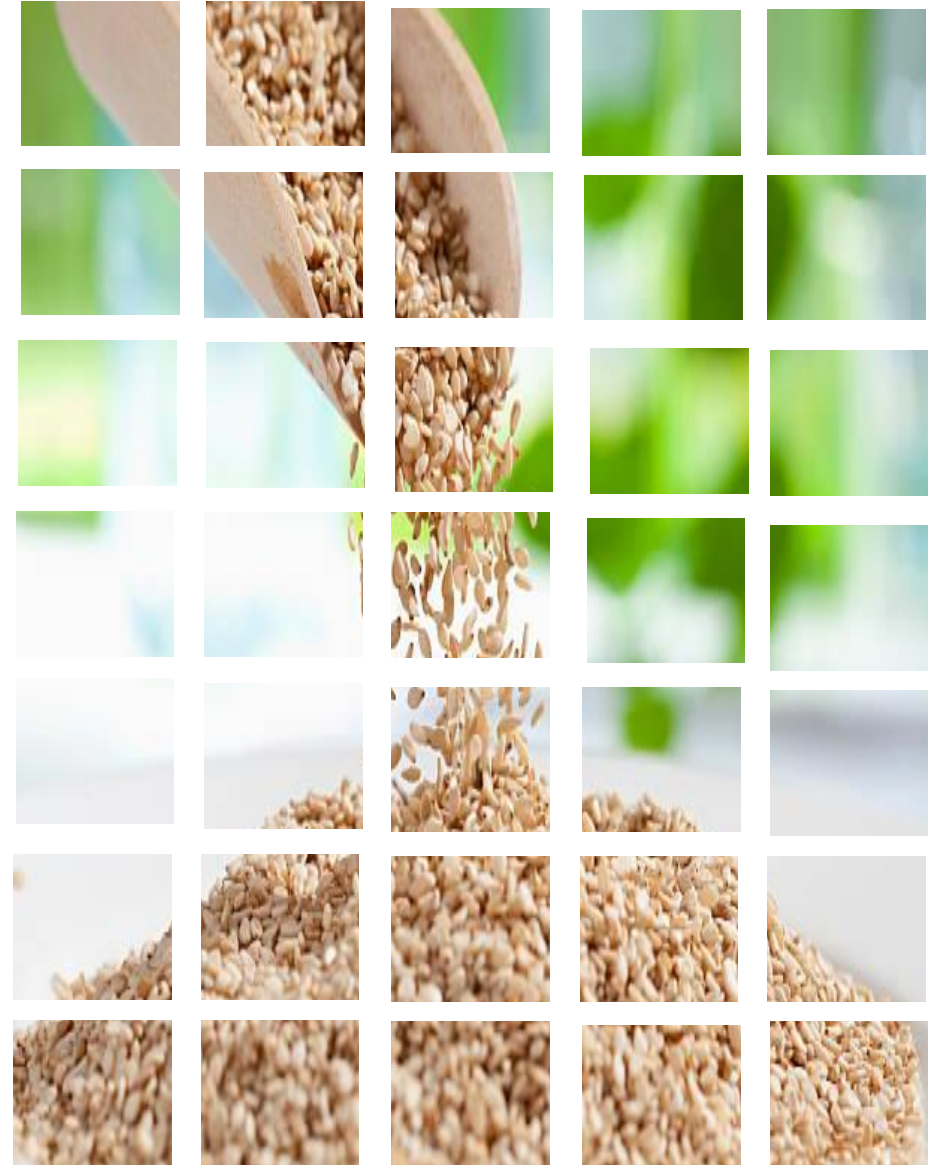
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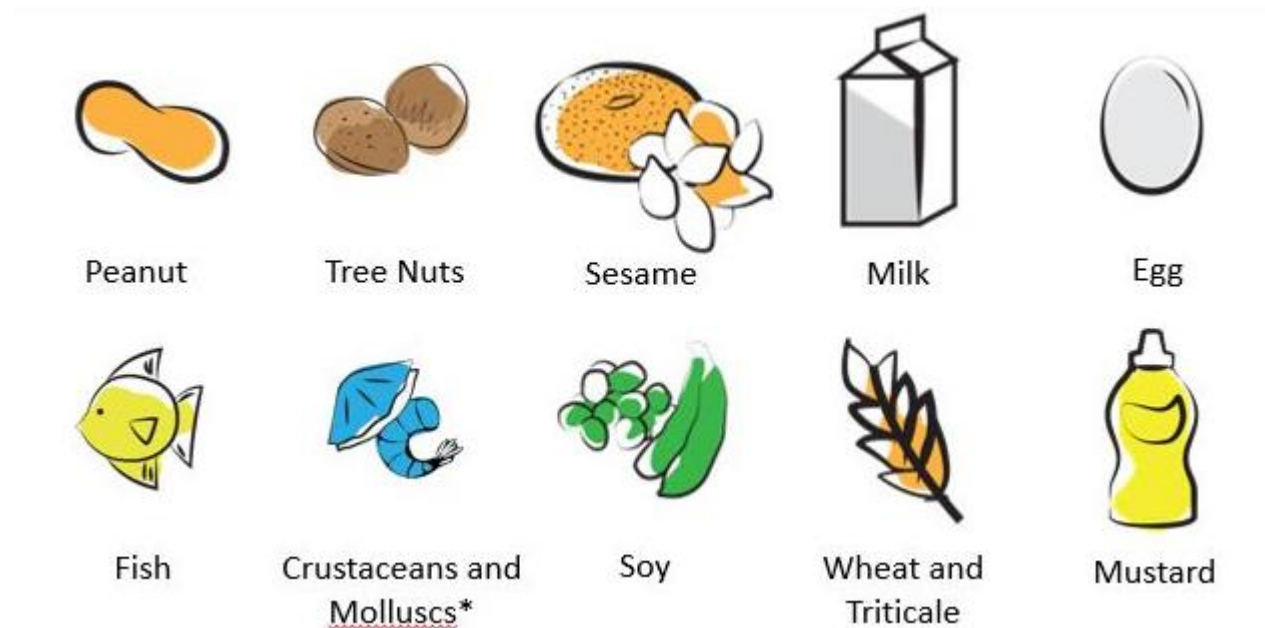


1- Overview



1- Introduction

- ❑ Sesame is a global agricultural crop whose production has increased from 2.3 million tons in 1994 to more than 5.5 million tons in 2017 (FAO, 2020).
- ❑ Several countries follow the allergen labelling requirements of the Codex General Standard for the Labelling of Pre-Packaged Foods (Codex Stan 1–1985 [CXS-001 F])



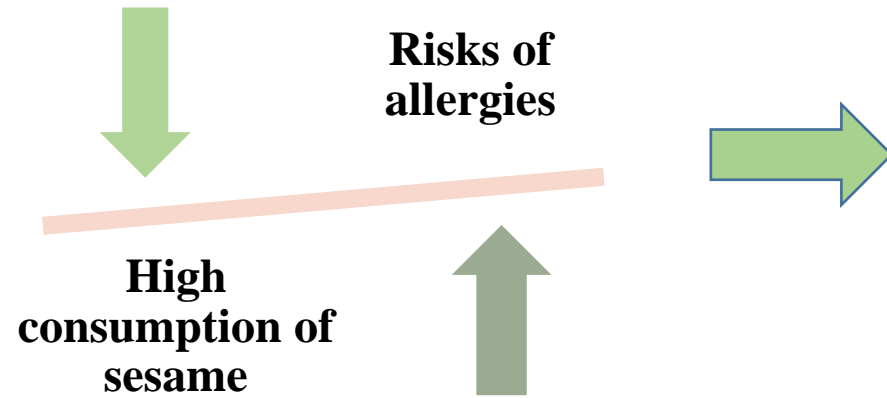
1- Introduction

- ❑ Reports of sesame allergy appear to be on the rise:
 - The increasing popularity of vegetarian dishes and cooked meals
 - The use of sesame in fast food and international baked products

- ❑ The Immunoglobulin E-induced sesame allergy begins early in life and may persist for life in 80% of patients



1- Introduction



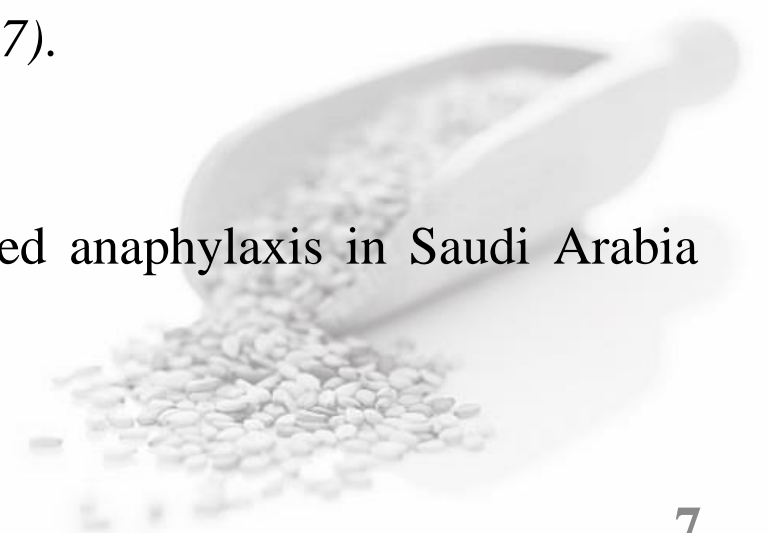
- Accidental ingestion of sesame seeds.
- Consumption of prepackaged foods that should not contain them (Cross-contact).

Sesame allergens can trigger serious reactions in people with allergies, which can lead to a life-threatening anaphylactic reaction.



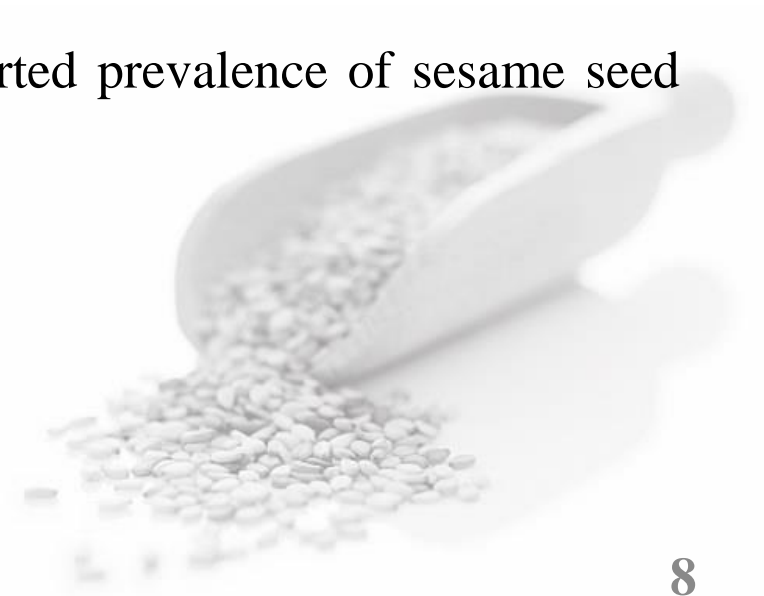
1- Introduction

- Globally, the prevalence of sesame allergy is estimated between 0.1 and 0.2% (*Pi et al. 2022*)
- In Kuwait, the prevalence of self-reported sesame allergy among young adults has been determined as 0.46 % (*Ali, 2017*).
- In Iran, the estimated proportion of sesame-induced anaphylaxis is high among all cases of anaphylaxis (1.3% of children and 9.3% of adults) (*Nabavi et al., 2017*).
- Sesame is considered the third allergen responsible for food-induced anaphylaxis in Saudi Arabia (*Sheikh et al., 2015*).



1- Introduction

- ❑ Lebanon is a major consumer of sesame seeds and its by-products.
- ❑ Sesame allergy ranked third after milk and egg in Lebanon and young children are particularly affected.
- ❑ In 2015, following a survey conducted by telephone, the self-reported prevalence of sesame seed allergy in Lebanon was estimated at 5% (*Irani and Maalouly, 2015*).



1- Introduction

□ Situation in Lebanon

- 40% of the Lebanese agri-food establishments are involved in the production of baked and confectionery products
- Lebanon is also a major exporter of sesame-containing products
- Probabilistic risk assessment of food allergens on packaged or unpackaged food products had not been carried out



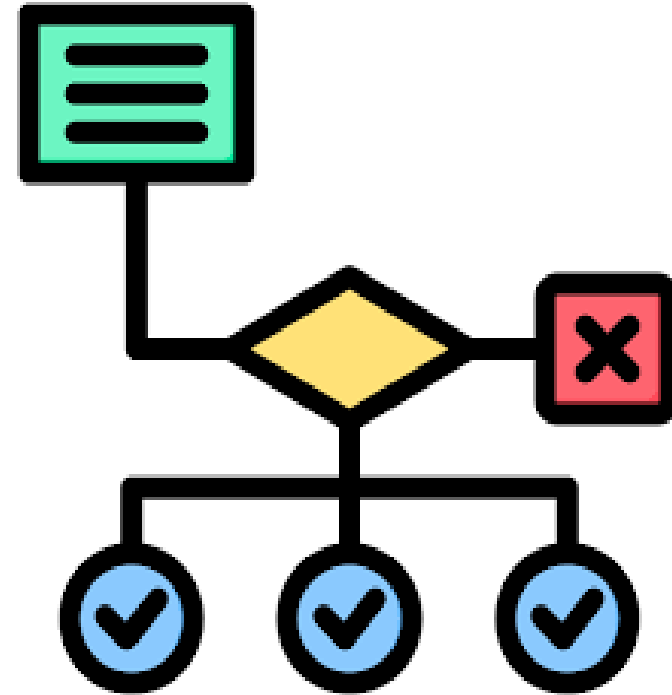
2- Objectives



- Survey on the occurrence of sesame in Lebanese food products.
- Survey on Food consumption in Beirut schools.
- Exposure and risks

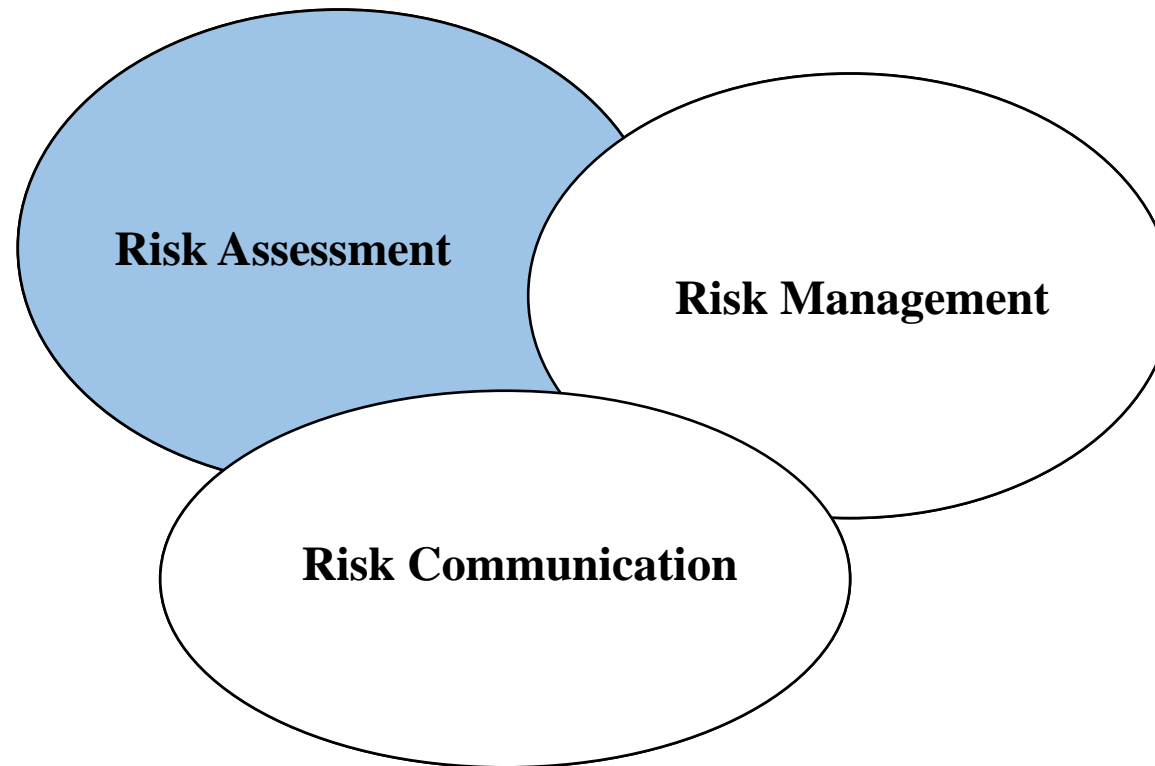


3- Methodology of the risk analysis



3- Methodology of the risk analysis

□ Risk Analysis



3- Methodology of the risk analysis

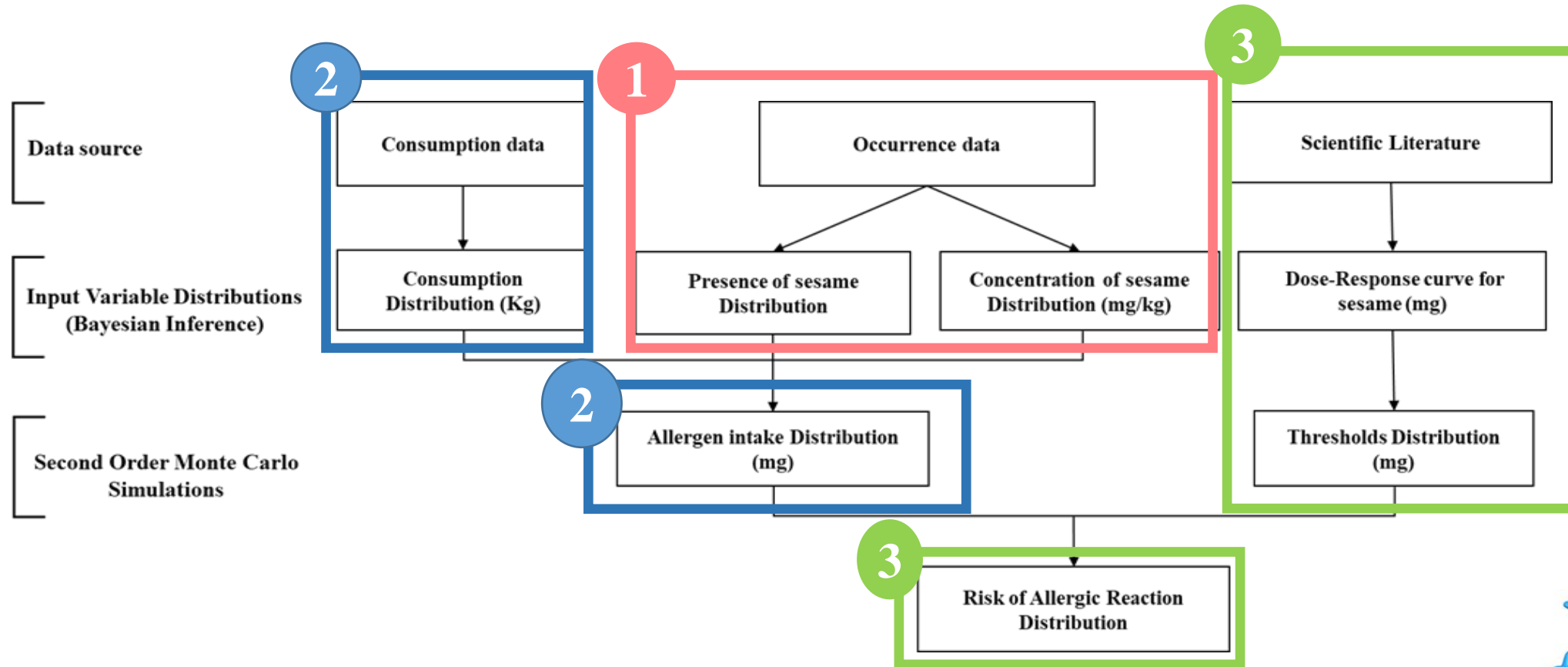


Fig 1. The concept of probabilistic food allergy risk assessment



4- Results

Objectif 1- Occurrence data



Occurrence data

Type of industries	Category	Unlabelled products	Labelled products with PAL	Labelled products without PAL	Total products per category
Bakeries	Bites	135	0	0	135
	Bread	0	0	80	80
	Cake	0	5	40	45
	Coconut Biscuits	0	5	35	40
	Croissant	105	0	0	105
	French bread	5	5	35	45
	Kaak	0	5	40	45
	Kaak with milk	0	20	55	75
	Petit four	45	0	0	45
	Round cookies	0	10	40	50
	Sfouf	40	0	0	40
Food Industries	Toast	0	10	75	85
	Abricot Jam	0	0	15	15
	Strawbery Jam	0	0	15	15
	Cans	0	0	120	120
	Spices	0	80	240	320
	Various (semolina, flour)	0	0	10	10
	Total		330	140	800

Table 1. Samples analysed

Occurrence data

☐ Unlabelled products



Bites



Petit Four



Croissant



Sfouf

Occurrence data

☐ Labelled products with and without Precautionary Allergen Label (PAL)



Bread



Kaak



French Bread



Toast



Round cookies



Cake



Coconut Biscuit



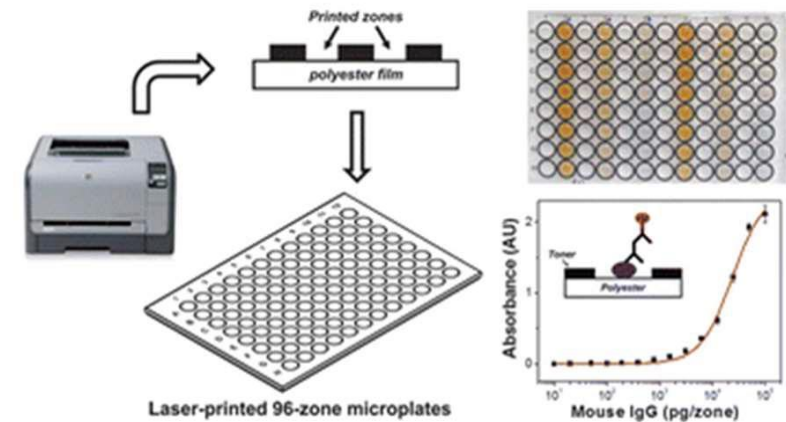
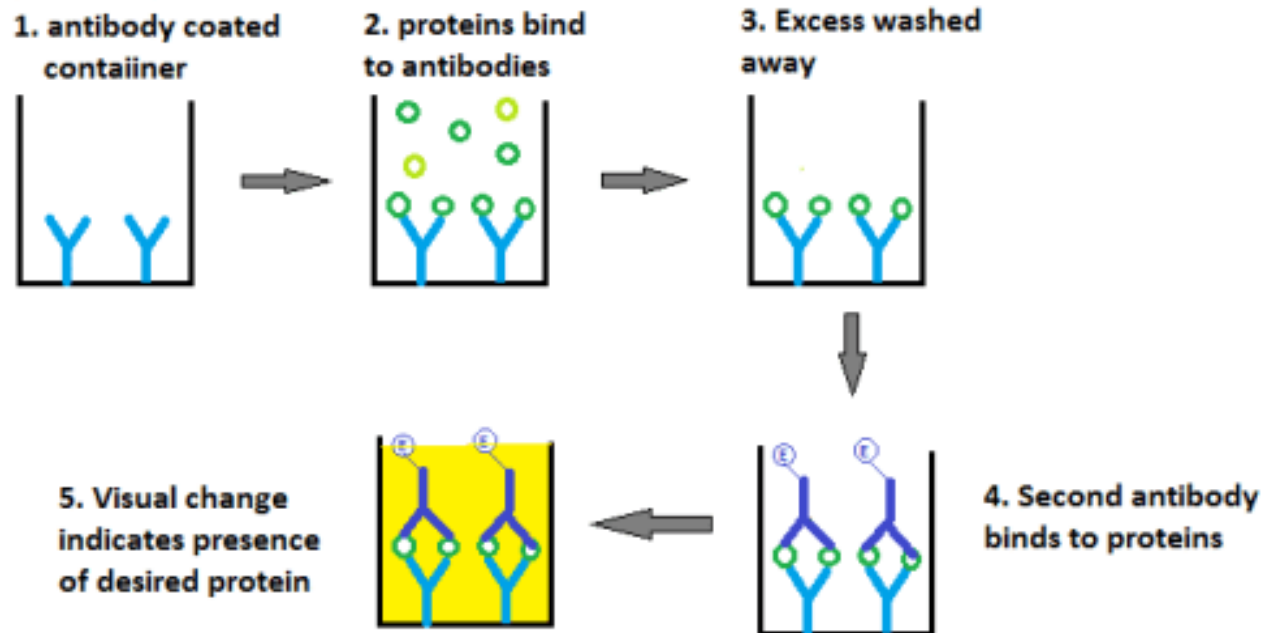
Kaak with milk



**Jam
(Abricot - Strawberry)**

Occurrence data

□ Detection method - ELISA sandwich



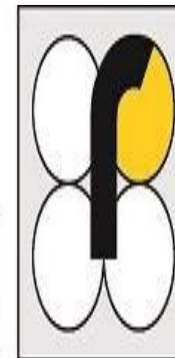
❑ Samples preparation

- Ensure good homogeneity of each sample to be analysed
- 30 g to 250 g, the whole sample was mixed or ground
- 250–500 g, half the product was sampled, mixed or ground
- For products of more than 500 g, only one-quarter was sampled, mixed or ground



❑ Samples analysis

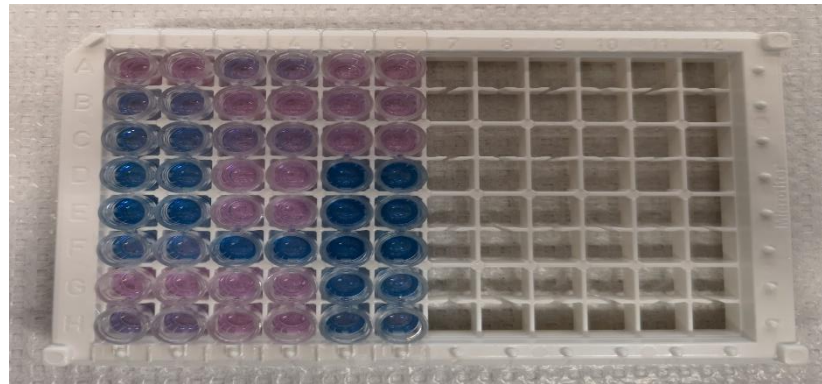
- Food samples were analysed using the RIDASCREEN® FAST Sesame enzyme immunoassay
- The limit of detection (LOD) of the kit is established as 0.14 mg kg⁻¹ sesame
- The range of quantification as 2.5–20 mg kg⁻¹ sesame
- The doses obtained were converted from mg kg⁻¹ sesame to mg kg⁻¹ sesame protein by multiplying the amount of sesame by 0.17



Occurrence data

□ Samples analysis

- Samples with a concentration of sesame proteins above $LOQ = 0.43 \text{ kg}^{-1}$ (sesame proteins) were considered positive.
- The intensity of the coloring is proportional to the concentration of the protein present



- The absorbance of the analyzed samples is determined at 450 nm in a spectrophotometer reader and the resulting concentration is compared to a standard curve

Occurrence data

Product category	Unlabeled Products
Croissant	44/105 [0.44-515]
Petit Four	7/45 [0.5-3.4]
Bites	65/135 [0.44-4.3]
Sfouf	40/40 [24.8-3392]
French bread	0/5
Total (%)	156 (47%)

Table 2. Occurrence and sesame protein concentration (ppm) in unlabeled (bulk) products on the Lebanese markets

Occurrence data

Product category	Labeled Products with PAL(*)
French bread	1/5 [0.44]
Cake	0/5
Coconut biscuits	2/5 [0.5-0.8]
Kaak	5/5 [0.8-300]
Kaak with milk	4/20 [0.6-1]
Round cookies	2/10 [0.5-1.3]
Spices	42/80 [0.44-44]
Toast	4/10 [1.1-115]
Total (%)	60 (43%)

Table 3. Occurrence and sesame protein concentration (ppm) in labelled (with precautionary allergen labelling (PAL)) on the Lebanese markets

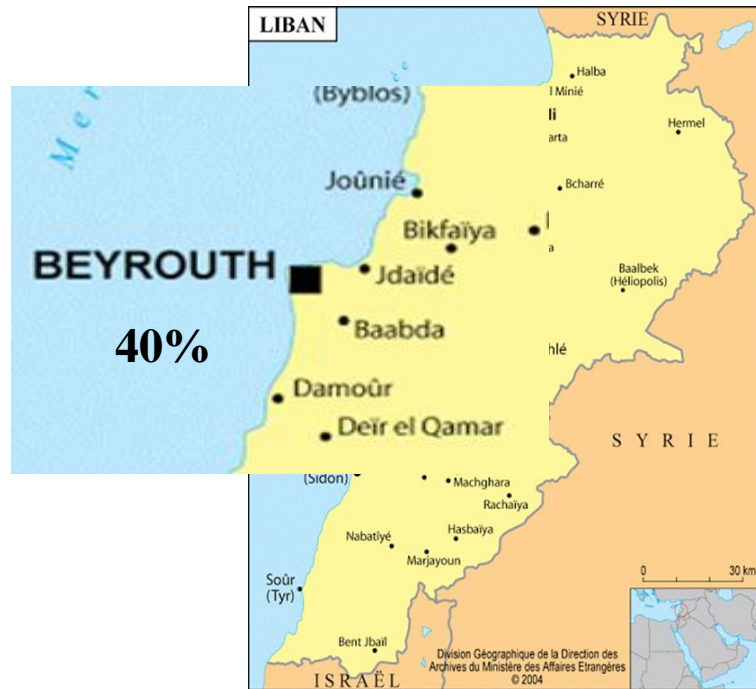
Occurrence data

Product category	Labeled Products without PAL
French bread	9/35 [0.44-28.5]
Cake	6/40 [0.44-5.8]
Coconut biscuits	9/35 [0.5-290]
Kaak	38/40 [0.5-908]
Kaak with milk	22/55 [0.5-61.6]
Round cookies	30/40 [0.5-616]
Spices	65/240 [0.44-227]
Toast	26/75 [0.44-835]
Apricot jam	1/15 [0.9]
Bread	3/80 [0.44-1.4]
Canned foods	0/120
Strawberry jam	3/15 [0.44-2.5]
Various (Semolina, flour)	0/10
Total (%)	212 (26%)

Table 4. Occurrence and sesame protein concentration (ppm) in labelled (without precautionary allergen labelling (PAL)) on the Lebanese markets

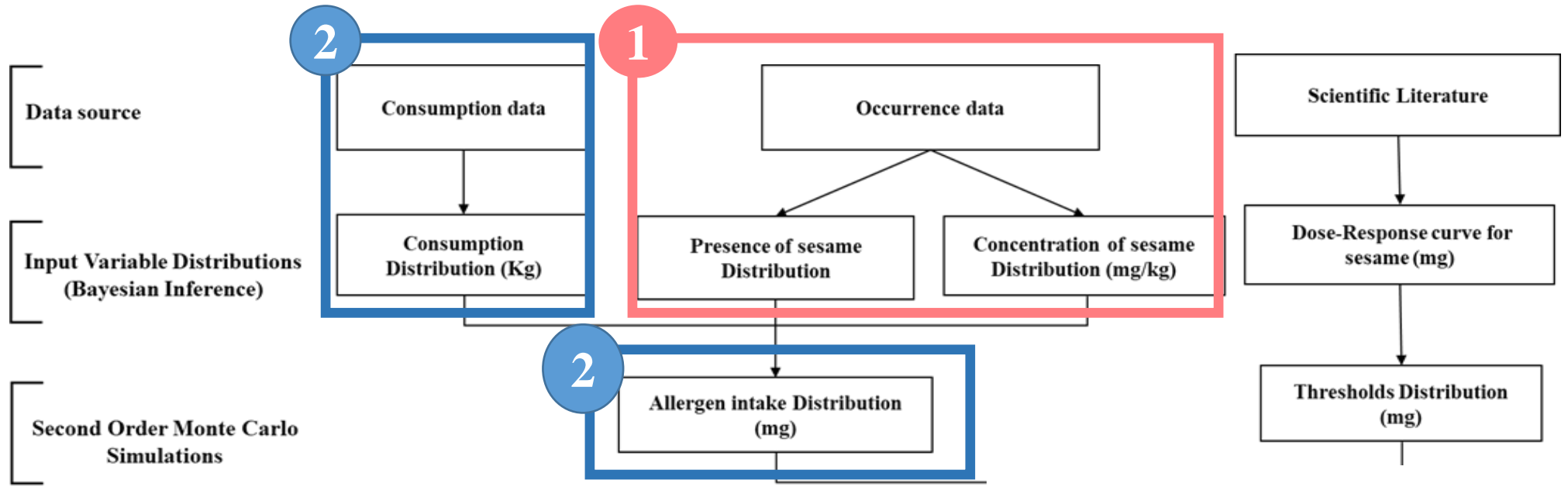
Consumption data

- A semi-quantitative survey of the frequency of food consumption.

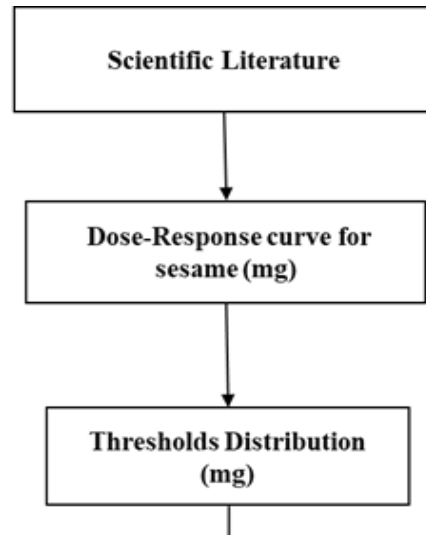


Sexe	Age		Total
	[4-11]	[12-18]	
Mâle	246	324	570
Femelle	253	333	586
			1156

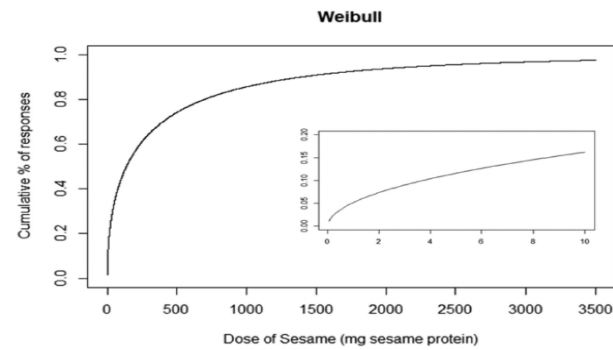
Exposure and risks



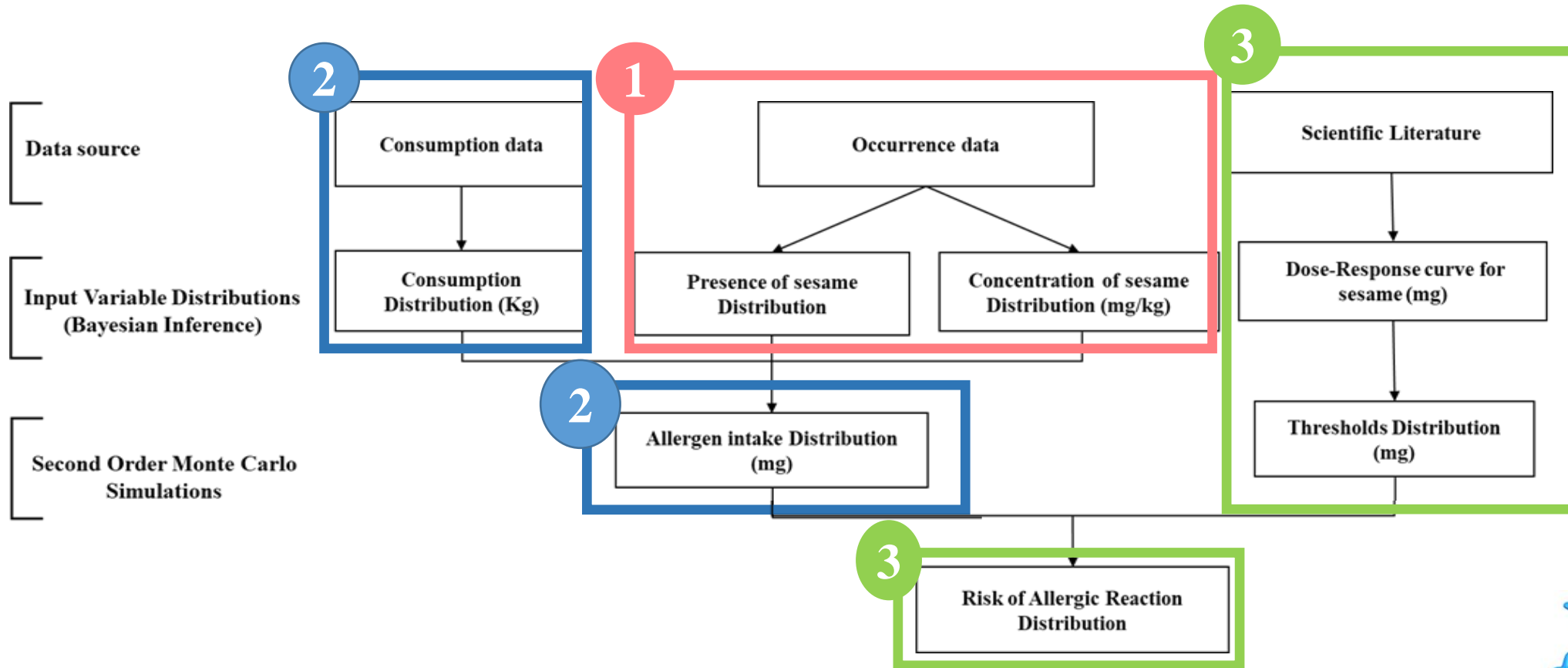
Exposure and risks



☐ 40 Allergic individuals



Exposure and risks



□ Probabilistic risk assessment

✓ Variability and uncertainty are taken into account

→ Variability represents heterogeneity over time

→ Uncertainty is a lack of knowledge about the exact value of the quantity



✓ It allows better use of existing information



❑ R statistical software (version 3.6.2)

- ✓ The two-dimensional Monte-Carlo simulation method allow to estimate the risk per eating occasion for 1000 scenarios, each including 1000 eating occasions, in order to characterize uncertainty and variability.
- ✓ This risk assessment assumes that all individuals in the simulations are allergic to sesame.

Product category	Age	Predicted reactions in allergic user population per eating occasion (1000 users)	
		Mean	
<i>Bakeries</i>			
Bites	A	6	
	B	7	
Croissant	A	19	
	B	21	
Petit four	A	1	
	B	2	
Sfouf	A	203	
	B	231	

Table 6. Mean of predicted reactions in allergic consumer population per eating occasion (1000 consumers) upon the ingestion of these products and for each age category (A = 4-11 years, B = 12-18 years).

“Sfouf”, on average, 203 out of 1000 eating occasions (95% CI 64–387), and 231 out of 1000 eating occasions (95% CI 75–423) would lead to a reaction in sesame-allergic children and adolescents, respectively.



Exposure and risks

Product category	Age	Predicted reactions in allergic user population
		per eating occasion (1000 users)
<i>Bakeries</i>		Mean
Cake	A	<1
	B	1
Coconut biscuits	A	6
	B	7
French bread	A	2
	B	3
Kaak	A	42
	B	50
Kaak with milk	A	4
	B	5
Round cookies	A	20
	B	23
Toast	A	14
	B	16
<i>Jams</i>		
Apricot	A	<1
	B	<1
Strawberry	A	<1
	B	<1

Table 7. Mean of predicted reactions in allergic consumer population per eating occasion (1000 consumers) upon the ingestion of these products and for each age category (A = 4-11 years, B = 12-18 years).

Recommendations

- ✓ Better risk management in food industries and bakeries, limiting economic losses
- ✓ The food industry and regulators should adopt a transparent and risk-based approach
- ✓ Need for regulatory (e.g., EU Food Information Regulation 1169/2011) and/ or voluntary risk management measures (e.g., retail employees training, voluntary alert messages at the point of sale) targeting unlabeled products.
- ✓ Strengthen risk management measures, including regulatory measures related to allergen labeling in Lebanon, not only for the use of PAL but overall to enhance compliance with the requirements of declaration of ingredients on food labels.

