

# Ad-hoc Monitoring Program to Locate Illegal Ethylene Oxide Fumigation in Food, Supplements and Additives in 2021

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## Introduction

Ethylene oxide (EO) is a highly volatile compound that is mainly used as an intermediary in the synthesis of various chemicals. Approximately 0.05% of the world's production is used, for fumigation/disinfection of various goods, such as medical instruments, fabrics, timber and dry food, such as spices, nuts and oil seeds. Being classified as a carcinogen and mutagen, EO fumigation of food has been banned in the EU since 1991, but it is still used for this purpose in other countries. Having 2-chloroethanol (2-CE) as its main distinctive residue marker, the residue definition of EO was set as the sum of EO and 2-CE expressed as EO.

## First Findings in Sesame

In autumn 2020 high levels of EO (sum) in sesame seeds from India were detected in Belgium and communicated via RASFF. Thereafter the EURL-SRM developed two quick and robust methods for analyzing 2-CE and EO simultaneously, based on QuEChERS and QuOil. Among the 14 sesame samples that were subsequently analyzed in our lab in autumn 2020, 5 samples contained levels of ethylene oxide (sum) above the legal maximum.



## Looking For More...

To quickly get an overview of the situation, a wide variety of products were analyzed over the turn of the year 2020/21. A total of 480 samples were analyzed, including, of course, sesame and sesame products, but also herbs and spices, plant powders, nuts, dried fish, nutritional supplements, additives, ice cream and dessert powders, Asian noodles and many more.

## Food Supplements

After the first 2-CE findings in moringa-containing capsules and moringa powders, we initiated a special investigatory program, expecting the plant powders to be the source. Investigations and industry feedback, however, revealed that, in some cases, 2-CE was indeed found in the dry plants whereas in other cases the empty capsules (composed of hydroxypropyl methylcellulose (HPMC)) were the source of 2-CE.

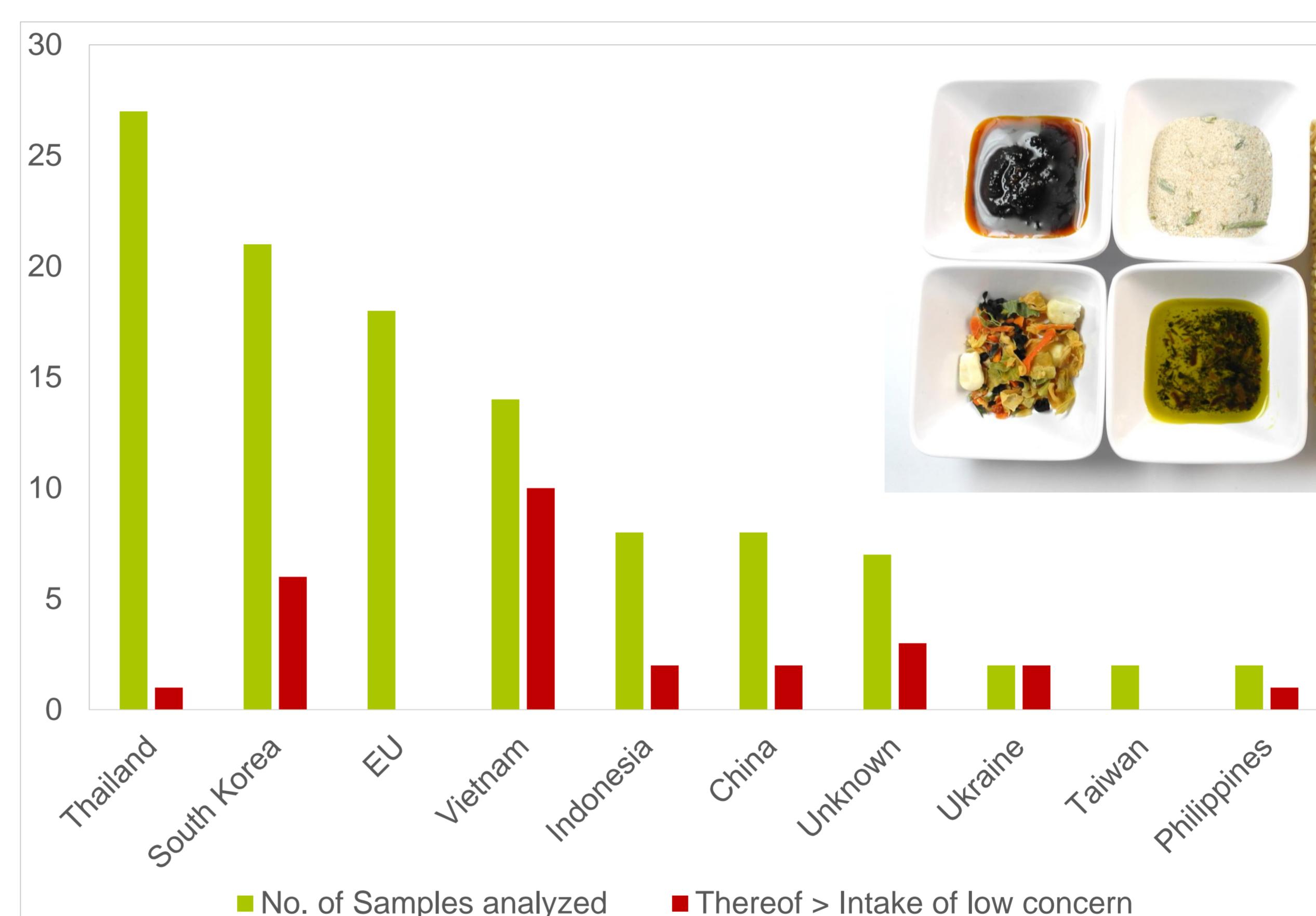
Matrix	2021		2022	
	No. of samples	EO (sum) > intake of low concern	No. of samples	EO (sum) > intake of low concern
Supplements (without Moringa)	100	10	29	1
Moringa (powder and capsules)	19	3	-	-
Vitamins and minerals	60	11	29	0
Empty capsules	20	2	-	-

The additive CaCO<sub>3</sub>, used in fitness bars, as well as thickeners such as locust gum powders were also eventually shown to be a source of 2-CE residues in processed products.

## Asian Instant Noodles

Following the detection of high 2-CE levels in a package of Asian instant noodles, several follow-up samples from various countries were analysed. The various components of these products were analysed separately and in the positive samples, it was shown that the spices and dried vegetables in these products contained the highest levels.

July/Aug 2021		Dec/Jan 2021/22		Spring 2022	
No. of samples	EO (sum) > intake of low concern	No. of samples	EO (sum) > intake of low concern	No. of samples	EO (sum) > intake of low concern
53	13	23	9	34	3



A look at the countries of origin, showed considerable differences. While none of the samples produced in the EU contained 2-CE, Vietnamese and South Korean samples showed the highest rates of 2-CE findings at levels of toxicological concern. Cross-contamination between packages was also an issue. Although the ingredients of the different instant noodle packages were contained in small, individual packets, considerable amounts of 2-CE residues were diffused over all of the contents, including the noodles. Experiments have shown that 2-CE can diffuse through various plastic foils.

## Trends

The situation concerning EO/2-CE residues in food has improved greatly in the meantime: sources of residues have been found and eliminated, and increased controls by the private and governmental sector have ensured that EO-fumigated products are no longer imported in the EU. Maximum limits for food additives have closed this entry path as well.

## Literature

- [1] EO observation on EURL-SRM website
- [2] updated BfR Opinion No. 24/2021, Health risk assessment of ethylene oxide residues in sesame seeds



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