



Maisons-Alfort, 8 September 2009

Information regarding reports of bitter taste following consumption of pine nuts

DIRECTOR-GENERAL

Following several complaints from consumers who reported alteration and/or temporary loss of taste after consuming pine nuts, the Directorate General for Competition, Consumer Affairs and Fraud Control (DGCCRF) requested that AFSSA issue an opinion regarding a risk assessment for pine nut consumption.

On 21 July 2009, a concerted meeting was held between experts from the Scientific Panel on 'Residues and physical and chemical contaminants', a representative from the Poison Control and Monitoring Centre (CAPTV) in Strasbourg and a representative from the DGCCRF, and the following information was elucidated.

Background

In the past few months, the DGCCRF and CAPTVs have recorded a series of complaints from consumers who report a temporary bitter taste in the mouth following consumption of pine nuts.

Based on information provided by the DGCCRF, two varieties of pine nuts are sold in France: pine nuts from the (Italian) stone pine (*Pinus pinea*) that grows in the Mediterranean region and pine nuts from the Korean pine (*Pinus koraiensis*) originating from China and Pakistan. Only the latter variety seems to be the object of consumer complaints (there are more than a hundred *Pinus* species, not including varieties and chemotypes).

Investigations into the growing, harvesting and processing conditions and procedures for pine nuts were undertaken by the DGCCRF.

The French National Union for Dried Fruits and Nuts indicates that these symptoms, reported since 2001, remain unexplained to date. Consumers who eat pine nuts from the same batch may or may not experience the bitter taste.

This bitter taste has been widely discussed on Internet forums. Consultation with other European health agencies shows that reports of pine nut-related taste alteration vary in frequency among EU countries and that tests have not thus far detected any particular contaminants or physico-chemical residues.

Information collected by the CAPTV in Strasbourg

In France, a standardised questionnaire to collect data on the matter was distributed to all CAPTVs in mid June 2009. According to the data collected by the CAPTV in Strasbourg in mid August 2009, more than 800 cases have been reported in the National Database of Intoxication Cases (BNCI) of the Poison Control Centres' Information System (SICAP).

Analysis (still in progress) of the questionnaire has not made it possible to identify a particular complainant profile or a specific mode of consumption. High inter-individual variability has been observed. The lapse of time between consumption and the onset of the symptoms varies from one to three days and ingesting food or drink often aggravates the bitter taste. Some people report dysgeusia symptoms as of the first consumption and some only after repeated consumption. Moreover, as the manifestation of symptoms is mainly qualitative, it has not been possible thus far

to define a minimal dose that induces these effects. However, in some cases, consuming just two pine nuts can trigger the bitter taste.

The symptoms last an estimated two to fifteen days, according to individuals.

General information on 'bitter' substances

Many natural and synthetic substances have a bitter taste. These include some medicines, chemical contaminants such as pesticides (organophosphates), heavy metals (lead, chrome) or solvents (Reiter *et al.* 2006).

A large number of bitter substances are naturally present in food. These substances have highly varied chemical structures and can be amino acids, peptides, amides, aliphatic amines, carbamides, fatty acids, etc. Plant-based foods in particular contain many bitter substances (terpenes, phenolic compounds, glucosinolates, lactones, etc.). Bitter compounds from foods can also result from heating (e.g. Maillard reaction) or fermentation. Others arise from rancidification (lipid oxidation, peptide hydrolysis) (Maga, 1990; Meyerhof, 2005).

Various bitter compounds, such as amino acids, ascorbic acid, caffeine, beta-carotene or epicatechin have also been identified in the Pinaceae family.

However, no delayed effect has ever been demonstrated with these bitter substances.

Analytical Investigations

The results from analyses carried out on these pine nut products during official tests in France and Europe and/or communicated by the affected food companies have not revealed any contaminants or chemical residues (pesticides, heavy metals, mycotoxins, etc.) in the implicated batches. Bacteriological analyses were also normal.

Differences in lipid profiles have been observed in several EU countries, but thus far none have been shown to be correlated with the onset of the symptoms.

A more detailed analysis of the composition of and/or the potential substances found in the great number of botanical varieties of pine species would require carrying out more complex, high-resolution screening analyses.

Conclusions

Regarding the few data currently available and in particular:

- the multitude of 'bitter' compounds present in the environment and in food,
- the complex mechanisms (primary and secondary) involved in the manifestation of the bitter taste,
- the absence of exogenous contamination in analysed samples using the employed methods,
- the qualitative nature of the reported symptoms,
- the high inter-individual variability observed and the difficulty to define a particular complainant profile,
- the chronology of the symptoms that can arise several days after having ingested pine nuts,

no scientifically based hypothesis can explain the reported bitter taste or ascertain any health risk.

The DGCCRF is currently further investigating the possible link between the perception of the bitter taste and the presence of variable quantities of a particular species of pine nut in the implicated batches (Armand pine, *Pinus armandii*).

References

- Maga J.A., 1990. Compound structure versus bitter taste. In: Bitterness in foods and beverages. Ed : Rouseff R.L. Elsevier, pp 35-48.
- Meyerhof W., 2005. Elucidation of mammalian bitter taste. Reviews of Physiology Biochemistry and Pharmacology, 154, 37-72.
- Reiter E.R., DiNardo L.J. and Costanzo R.M., 2006. Toxic effects on gustatory function. In: Taste and Smell. An update. Ed: Hummel T. and Welge-Lüssen T. Karger, pp 265-277.

The Director General

Marc MORTUREUX