

Consumption of pine nuts: report any lingering bitterness!

Although pine nuts are highly nutritious oil seeds rich in fatty acids, vitamins and minerals and are commonly used in cooking, certain species are not edible.

Some pine nuts can cause a taste disturbance called "dysgeusia", which occurs 24 to 48 hours after consumption and can last for several days. While the reported symptoms are mild and without known sequelae, they are particularly unpleasant, with poisoned individuals describing a metallic and/or bitter taste exacerbated by the consumption of food.

In France, the first case was reported to the poison control centre (PCC) in Strasbourg in 2008. A retrospective study conducted from March 2008 to January 2010 then found more than 3,000 similar cases reported to the PCC network [1], with an epidemic peak of around 700 cases in August 2009.

This outbreak, widely reported on internet forums, was global, being observed at the same time in Europe, the United States and Australia.

Investigations have shown that it was due to the consumption of newly marketed species of pine nuts from China: *Pinus armandii* and to a lesser extent *Pinus massoniana*.

These species, not listed as edible by the Food and Agriculture Organization of the United Nations (FAO), were exported in 2009 by traders wishing to take advantage of the large increase in the price of edible pine nuts (*Pinus pinea*, *Pinus koraiensis*, etc.). This led the Chinese authorities to put in place strict measures for the export of their pine nuts (approval of exporters by the authorities, mandatory listing of the botanical and common names – in English – of the pine nut species on the bags, etc.), and European import controls on pine nuts were reinforced.

In order to distinguish edible from inedible pine nuts, ANSES published an opinion in 2010 [2] recommending the use of morphological (1) and chemical (2) criteria: (1) visual sorting and sieving of pine nuts, as the inedible ones are smaller, less angular and duller than the edible ones (see photograph); (2) analysis of the fatty acid composition, as the profiles for certain types of unsaturated fatty acids vary according to the pine nut species (Destailats index). However, no genetic criterion for differentiating pine nut species is currently available.



Photo: Examples of pine nut varieties (samples from France, Switzerland and the Netherlands) [4]. According to the FAO, the species *Pinus pinea*, *Pinus koraiensis* and *Pinus gerardiana* are edible, while the species *Pinus armandii* is not.

Then in late July 2017, following a new case reported by a doctor, the Directorate General for Competition, Consumer Affairs and Fraud Control (DGCCRF) asked ANSES to find out whether cases of dysgeusia were persisting. ANSES and the PCC network therefore produced a new list of cases of exposure to pine nuts reported to the PCCs between 1 January 2010 and 31 September 2017.

This new study [3] showed that while the number of pine nut exposure cases reported to the PCC network had fallen sharply between 2010 and 2012, from about 200 to five cases per month, cases were still being regularly observed several years after the alert: about 10 to 15 per month in 2014, and 5 to 10 cases per month since then.

A total of 1,960 cases of symptomatic exposure to pine nuts were registered in the French PCC national database (SICAP) from 2010 to September 2017, of which 1,949 involved dysgeusia, alone or associated with minor digestive symptoms; the remaining 11 cases presented only a few digestive signs (nausea, vomiting, etc.).

The individuals concerned by the cases were predominantly female (sex ratio 0.60) and 39 years of age on average. While only 0.6% were under 5 years of age, the minimum age was 2 years, which in practice corresponded to reports by parents who had themselves presented with dysgeusia following a family meal. They had also observed a loss of appetite in their children and so assumed that they had experienced the same unpleasant taste.

All the symptomatic cases were mild. An 8-year-old child suffered an anaphylactic shock (allergic reaction that is life-threatening if untreated) due to an allergy to pine nuts. The symptoms regressed after the child was immediately taken to a hospital emergency department. It should be noted that allergy to pine nuts can occur with both edible and inedible species.

The dossiers on the most recent cases were reviewed to search specifically for information on the purchase of pine nuts. Among the 156 cases reported from January 2015 to September 2017, this information was mostly only partial: trade names were identified for only 29 cases (19%), and the origin of the pine nuts for only 26 cases (17%). It should be noted that the place of purchase, the brand name and the batch number were all known in only five cases (3%). Most of the time, the people questioned could not remember exactly where they had bought the products, had not kept the packaging, and could not give details, even for cases where the people were contacted afterwards by telephone or post (some PCCs conducted follow-up).

Considering the cases where the necessary information for an investigation was available, the PCCs issued five alerts to the regional health agencies (ARS) during this period (2015-2017).

References:

[1] Flesch F, Daoudi J. Pignons de pin et dysgueusie retardée [Pine nuts and delayed dysgeusia]. Internal request by the Toxicovigilance Coordination Committee, October 2010, 19 p.

http://www.centres-antipoison.net/cctv/Rapport_CCTV_Pignons_de_pin_2010.pdf

[2] ANSES Opinion of 26 July 2010 concerning the implementation of an experimental protocol for the analysis of pine nuts <https://www.anses.fr/fr/system/files/RCCP2009sa0289EN.pdf>

[3] Sinno-Tellier S, Tournoud C. Dysgueusie associée à la consommation de pignons de pin : note d'actualisation des cas rapportés au réseau des Centres antipoison entre le 1er janvier 2010 et le 30 septembre 2017 [Dysgeusia associated with pine nut consumption: update note on cases reported to the network of poison control centres between 1 January 2010 and 30 September 2017]. Internal request by the Toxicovigilance Coordination Committee, December 2017, 19 p.

http://www.centres-antipoison.net/CCTV/Pignons_de_pin_Rapport_CCTV_Vf.pdf

[4] Zonneveld, B.J.M. Pine nut syndrome: a simple test for genome size of 12 pine nut-producing trees links the bitter aftertaste to nuts of *P. armandii* Zucc. ex Endl. *Plant Syst Evol* (2011) 297: 201-206.

An investigation was carried out in April 2015, but no inedible pine nuts were found in samples taken from an unopened bag of the same brand from the same shop, but with a different batch number from the one that caused the poisoning.

At present, although the occurrence of dysgeusia seems to be related to the consumption of certain Asian varieties of pine nuts, the precise cause and mechanism of the taste disturbance have still not been determined. Genetic variations ("genetic polymorphisms") are thought to lie behind the "sensation" of bitterness, which varies among individuals. This could explain why only some consumers experienced dysgeusia. Research into the neurotoxic mechanisms that may be responsible for the protracted nature of these taste disorders should be encouraged.

Some time after the initial alert, it therefore remains important to collect any information useful for investigating each case of dysgeusia reported following pine nut consumption (source, trade name and batch number, place and date of purchase, expiry date, etc.).

This is why ANSES and the PCC network are continuing their surveillance and developed a specific questionnaire to collect all relevant data when disorders related to pine nut consumption are reported to a PCC [3].

So, if you notice a bitterness that lingers after consuming pine nuts, do the right thing... report it to a poison control centre, making sure to keep and specify any useful information on the purchase of these pine nuts!

Sandra SINNO-TELLIER (Anses)