

“Pine Mouth” Syndrome: Cacogeusia Following Ingestion of Pine Nuts (Genus: *Pinus*). An Emerging Problem?

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Published online: 5 January 2010
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Abstract We report a case of cacogeusia, specifically metallogeusia (a perceived metallic or bitter taste) following pine nut ingestion. A 36-year-old male presented with cacogeusia one day following ingestion of 10–15 roasted pine nuts (genus: *Pinus*). Symptoms became worst on post-exposure day 2 and progressively improved without treatment over 5 days. There were no other symptoms and physical examination was unrevealing. All symptoms resolved without sequelae. We contemporaneously report a rise in pine nut-associated cacogeusia reported online during the first quarter of 2009, and a significant rise in online searches related to pine nut-associated cacogeusia (or what the online public has termed “pine mouth”) during this time. Most online contributors note a similar cacogeusia 1–3 days following pine nut ingestion lasting for up to 2 weeks. All cases seem self-limited. Patients occasionally describe abdominal cramping and nausea after eating the nuts. Raw, cooked, and processed nuts (in pesto, for example) are implicated. While there appears to be an association between pine nut ingestion and cacogeusia, little is known about this condition, nor can any specific mechanism of specific cause be identified. It is not known if a specific species of pine nut can be implicated. “Pine mouth” appears to be an emerging problem.

Keywords Cacogeusia · Dysgeusia · Metallogeusia · *Pinus*

Introduction

Cacogeusia may have various causes. These include metal toxicity, seafood toxins, nutritional disorders (especially zinc deficiency), and neurologic disorders [1]. Medications, particularly angiotensin-converting enzyme inhibitors, disulfiram, calcium channel blockers, and diuretics can cause cacogeusia by interfering with taste receptors, or with receptor mechanisms [2–4]. Dental conditions and infections such as sinusitis may also cause symptoms. We report a case of cacogeusia, specifically metallogeusia (a perceived metallic or bitter taste) following pine nut ingestion and suggest a possible association between pine nut ingestion and subsequent prolonged cacogeusia.

Case Report

A 36-year-old, previously well male physician, presented to colleagues with pronounced bitter and metallic taste, exacerbated by ingestion of sweet foods and drinks. Symptoms began 24 h following a large meal containing well-cooked meat, vegetables, salad, red wine, and pine nuts that had been lightly roasted. Approximately 10–15 pine nuts were ingested. No fish or shellfish had been ingested during the previous 2 weeks. There were no other complaints, including abdominal discomfort, nausea, vomiting or diarrhea, and no rash was noted. No other neurologic complaints were noted including cacosmia. Social history was unrevealing: the patient was a non-smoker, drank three to four alcoholic beverages weekly and denied any history of illicit substance use. An otherwise healthy physician, he denied any use of either prescribed or over-the-counter medications, or nutritional supplements/herbal preparations, during the 2 weeks prior to symptom onset. Physical examination was unrevealing: the patient was

No funding was received

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afebrile and vital signs were normal for age. Neurologic testing (including cranial nerves II–XII; motor, sensory, and reflex testing; gait and coordination) was normal. Dermatologic examination showed no lesions. A normal complete dental examination had been performed 1 week prior to symptoms, and examination of the oropharynx after symptoms began revealed no observable pathology. Ineffective therapies attempted during this episode included mouthwash gargles and saline gargles. Cacogeusia was worst on post-exposure day 2, progressively improving without treatment over 5 days. No laboratory testing was performed, and symptoms resolved without sequelae.

Discussion

Cacogeusia following pine nut ingestion appears to have been first described at a European medical conference in 2001 [5]. Authors hypothesized that oxidized pine nuts were responsible for eight cases of bitter taste disturbance, six which had been reported to a European poison control center. They were able to elicit cacogeusia in a healthy physician volunteer who ingested implicated pine nuts. Chromatographic examination of the suspicious pine nuts revealed novel triglycerides, potentially created by oxidative stresses, as a possible cause. A specific receptor or mechanism was not offered.

There were few reported subsequent cases of pine nut-associated cacogeusia between 2001 and 2009. In the second quarter of 2009, following our index case, we noted a spike in cases of pine nut-associated cacogeusia reported online [6–9] and in the mainstream media [10]. Termed “Pine Mouth” by the public, cases present in a roughly similar fashion: a persistent metallic or bitter taste beginning 1–3 days following ingestion of pine nuts lasting for up to 2 weeks. All cases seem self-limited. Patients occasionally describe abdominal cramping and nausea after eating the nuts. Raw, cooked, and processed nuts (in pesto, for example) have been implicated. Online reports implicated pine nuts purchased in supermarkets, restaurants, and bulk food warehouses in the US and in the UK.

To quantify this increase in interest in pine nut-associated cacogeusia, we searched Google Trends (which reports search word volume indices over time) for the terms “Pine Mouth” or “Pine Bitter” or “Pine Taste.” This technique of using Google search volume as a barometer of disease prevalence has been previously used in influenza epidemiology. In that setting, search volume was found to correlate well with physician visits for flu-like symptoms within defined geographic areas and searches were found to estimate flu activity in near real-time [11, 12]. We surmised that this informal surrogate search method would provide a rough measure of public interest in “pine mouth.” We found, for all three search-terms, a rapid spike (search volume indices 100–150 times

baseline) in search popularity abruptly beginning in the second quarter of 2009 [13]. Whether this reflects a surge in cases, or public interest due to media reports, is not known.

This case report raises an intriguing hypothesis, but by no means proves causality. Little is known about the cacogeusia termed “pine mouth”. Initial reports suggested that affected nuts came from China, although consumer reports online show that symptom-causing pine nuts originated from other areas as well. It is unclear if a specific species of *Pinus* is to blame. If a link between pine nut ingestion and cacogeusia is real, an exact mechanism is unclear: symptoms may be related to decomposing lipids, as pinus oils are known to be unstable and degrade quickly [14]. The role of toxins and other contaminants has not been fully evaluated. “Pine Mouth” appears to be an emerging problem—bothersome, but apparently self-limited and relatively benign.

Conflicts of Interest None declared.

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