

Hypersensitivity pneumonitis in a worker exposed to tiger nut dust

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Hypersensitivity pneumonitis (HP) is a major cause of morbidity and mortality in certain occupational environments.¹⁻⁴ The diagnosis must be based on clinical, radiologic, histopathologic, and immunologic findings; pulmonary function tests; and sometimes specific inhalation challenge.⁴

Tiger nut (*Junia avellaneda*) is a variety of the *Cyperus esculentus* species (Cyperaceae family). Horchata is a cold drink widely used in Spain. It is made by macerating tiger nuts in water with sugar. Tiger nuts are also

Abbreviations used

BAL: Bronchoalveolar lavage

HP: Hypersensitivity pneumonitis

PIPT: Pulmonary inhalation provocation test

eaten dried in the same way as almonds. Because of these uses, its cultivation is common in the Valencia region (Mediterranean Spain). Despite wide use in Spain, allergic diseases caused by tiger nuts are not commonly reported.

We report a case of HP caused by inhalation of dust derived from tiger nuts in a worker of this industry.

CASE REPORT

A 60-year-old man without an allergic background had a 1-month history of progressive dyspnea, asthenia, and nonproductive cough. Symptoms began 2 months after the patient changed jobs to

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a department in which horchata was made. In his new job he manipulated 6000 kg of tiger nuts per day, without any isolation system. He carried sacks and was near the place where tiger nuts were macerated. His symptoms increased during the day, reaching a maximum in the evening, and he felt better on weekends and holidays.

In the emergency department, complete and differential blood counts were normal. Room air arterial blood gases on admission showed a pH of 7.34, PaO₂ of 53 mm Hg, and PaCO₂ of 32 mm Hg. Chest radiographic findings showed bilateral alveolar infiltrates. Two days after admission, the patient was asymptomatic without treatment.

Pulmonary function testing, performed when symptoms had improved, showed a total lung capacity of 80% of predicted value, a forced vital capacity of 79% of predicted value (2.528 L), and an FEV₁ of 85% of predicted value (2.166 L). Because functional respiratory tests (eg, plethysmography and carbon monoxide diffusion in the lungs) were performed several days after admission to the hospital, these tests were within the normal range; however, an exercise-induced desaturation test showed an important decrease in capillary O₂.

Results of bronchoalveolar lavage (BAL) fluid cultures for bacteria, molds, and mycobacteria were negative. BAL fluid cell count showed 60% macrophages, 15% neutrophils, 5% eosinophils, and 20% lymphocytes, with a CD4/CD8 ratio of less than 1, as measured by flow cytometry. Transbronchial biopsy samples revealed the presence of giant cells within the interstitium and few lymphocytes in the alveolar walls. Symptoms corresponded to a subacute form of HP.

Random samples of freshly harvested tiger nuts were crushed to obtain a very thin dusty material. Two grams of this material was diluted in 20 mL of PBS. The solution was shaken for 24 hours, passed through filter paper, dialyzed against PBS for 24 hours, passed through a 0.22-μm Millipore filter (Millipore Corp, Bedford, Mass) for sterilization, and lyophilized. The total protein content of the final powder, determined by use of the Bio-Rad protein assay (Bio-Rad Laboratories, Richmond, Calif), was 22.4% (wt/vol).

All cultures of the extract and of the previous dusty material used to look for fungi, bacteria, and mycobacteria were negative.

Skin prick test responses to common allergens, molds, and tiger nut extract (10 mg/mL) were negative. An intradermal skin test with tiger nut extract (1 mg/mL) resulted in an induration of 10 × 12 mm in diameter at 24 hours in the patient, and responses were negative in 11 healthy control subjects. Open oral challenges with 10 tiger nuts and 200 mL of horchata were negative.

Specific IgG antibodies against tiger nut extract were investigated in the patient and in control sera by use of the colorimetric double-antibody ELISA method, which showed an absorbance of 2.69 in the patient's serum, whereas in the control serum absorbance was 0.219. Titer of specific IgG antibodies in patient serum against *Aspergillus fumigatus*, as determined by use of the CAP system (Pharmacia & Upjohn, Sweden), was 88.5 mg/mL (control value, <25 mg/mL).

Pulmonary inhalation provocation tests (PIPTs) were performed during asymptomatic periods. The nebulizer was a De Vilbiss 646 nebulizer (De Vilbiss Co, Somerset, Pa) with an output of 0.30 mL/min. The patient inhaled by tidal breathing for 20 minutes and was monitored as shown in Table I. These parameters were assessed at 10, 20, 30, and 60 minutes; every 2 hours after PIPT for the next 12 hours; and finally at 24 hours. PIPT response to *A fumigatus* (1% wt/vol; ALK-Abelló, Madrid Spain) was negative. PIPTs with tiger nut extract were conducted on different days in stepwise concentrations of 0.01, 0.1, 1, and 5 mg/mL until a positive reaction was obtained at 5 mg/mL (Table I). One healthy control subject underwent inhalation challenge with 5 mg/mL tiger nut extract with a negative result, and we considered it sufficient to rule out a toxic

TABLE I. PIPT with tiger nut extract in the patient

	Basal values	6-hour values
Temperature	36.5°C	38.5°C
Respiratory symptoms	No	Dyspnea and cough
Heart auscultation	Normal	Normal
Pulmonary auscultation	Normal	Crackles, hypoventilation
Heart rate	75	80
Respiratory rate	20	28
Peak flow	380	380
FVC	2940	2450 (−17%)
FEV ₁	2490	2128 (−14%)
Arterial blood gas	PO ₂ 84/PCO ₂ 34	PO ₂ 67/PCO ₂ 36
Capillary O ₂ Saturation (%)	94	89

FVC, Forced vital capacity.

reaction. Despite the positive challenge, there was no blood leukocytosis or recurrence of alveolar infiltrates. A second BAL was not performed.

Informed written consent was obtained from the patient and control subjects before any inhalation test was performed.

DISCUSSION

Our case meets sufficient criteria to be considered as HP caused by the dust derived from tiger nuts. We were able to detect IgG antibodies against tiger nuts, and within 6 hours after PIPT with tiger nut extract (5 mg/mL), the patient had a systemic picture closely resembling the acute condition at his admission to the emergency department.

Several molds and thermophilic actinomycetes have been associated with some types of HP.¹⁻⁴ In this case we were able to detect IgG antibodies to *A fumigatus*, but the result of specific inhalation challenge was negative, and this mold was not isolated in tiger nut dust samples.

Tiger nuts are used extensively in our country and are manipulated commonly in Spanish industry; however, we found only one abstract⁵ in which any allergic pathology (anaphylaxis) caused by tiger nuts has been reported.

Tiger nut dust was able to produce HP in an exposed worker, whereas no molds have demonstrated to be involved in the etiology of the disease in this case.

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