Case Reports

Atrioventricular Block Induced by Mad-Honey Intoxication

Confirmation of Diagnosis by Pollen Analysis

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An unusual type of food poisoning, mad-honey intoxication, can be observed in the Black Sea region of Turkey and various other parts of the world. It can occur after ingestion of grayanotoxin-contaminated honey produced from the nectar of Rhododendron ponticum *and other plant species, chiefly of the Ericaceae and Sapindaceae families. Mad-honey intoxication can result in severe cardiac complications, such as complete atrioventricular block. The diagnosis is generally reached on the basis of the patient's history of honey intake. In this report, we describe the case of a patient who had mad-honey–related complete atrioventricular block; in this instance, the diagnosis was confirmed by a pollen analysis of the suspect honey.* ***(Tex Heart Inst J 2009;36(4):342-4)***

Key words: *Atropine/therapeutic use; bradycardia/chemically induced; diterpenes/poisoning; food poisoning/complications/diagnosis/therapy; heart block/chemically induced; honey/poisoning; hypotension/chemically induced; ion channels/drug effects; muscarinic antagonists/therapeutic use; pollen analysis; plants, toxic/poisoning; rhododendron; syncope/chemically induced; toxins, biological*

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Mad-honey intoxication may occur after ingestion of grayanotoxin-contaminated honey produced from the nectar of *Rhododendron ponticum* and other species, chiefly of the Ericaceae and Sapindaceae botanical families,[1] growing on the mountains of the Black Sea region of Turkey and also in Japan, Nepal, Brazil, and parts of North America and Europe.[2] In cases of severe intoxication, bradycardia and rhythm disturbances, including complete atrioventricular block, can be seen.[3,4] The diagnosis is generally reached upon learning of a patient's history of honey intake. In this report, we describe a case of a patient who presented with mad-honey–related complete atrioventricular block, which diagnosis was confirmed by analysis of pollen in the honey sample.

Case Report

In March 2007, a 48-year-old man with no history of heart disease or drug use was admitted to our emergency department after an episode of syncope that had occurred in his office 20 minutes earlier. His syncope had resolved after the injection of 1 mg atropine sulfate by paramedics, who had noticed severe bradycardia upon initial evaluation. On admission, the patient displayed symptoms of general weakness and dizziness. Upon history-taking, we learned that the patient's breakfast had included nearly 100 mL of honey brought from Zonguldak, a city in the western Black Sea region of Turkey, 8 hours before. Physical examination showed bradycardia (heart rate, 33 beats/min) and hypotension (blood pressure, 80/60 mmHg). Surface electrocardiography revealed complete atrioventricular block, with a ventricular rate of 31 beats/min (Fig. 1). Because vital signs improved rapidly after saline

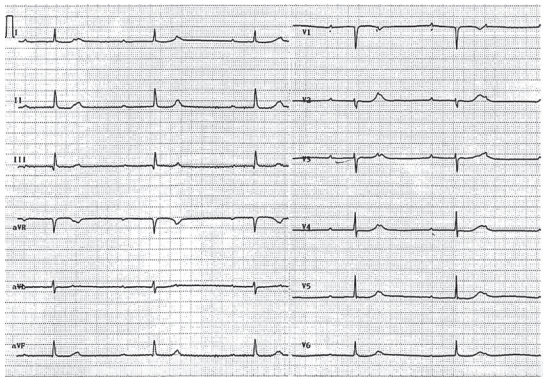

Fig. 1 *Complete atrioventricular block is evident in the patient's electrocardiogram, taken upon admission.*

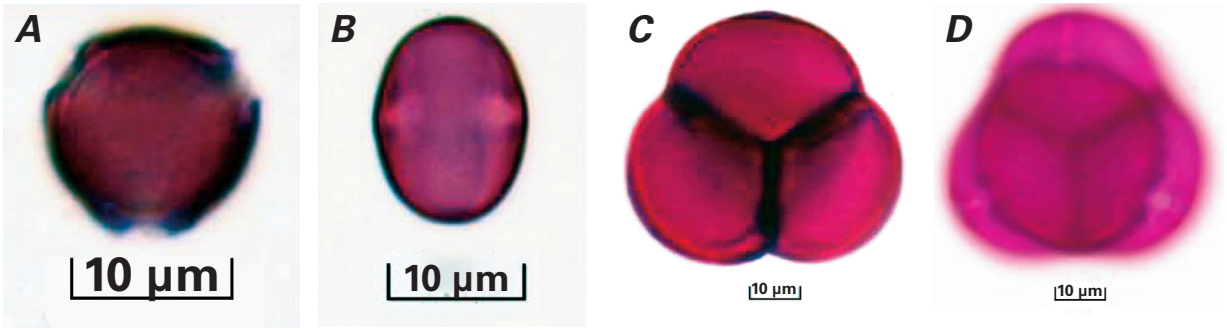

Fig. 2 A, B*) Photomicrographs of pollen from* Castanea sativa *(European chestnut) in different views. This is the most abundant type of pollen type found in this sample of honey.* ***C, D****) Photomicrographs of pollen from* Rhododendron *species, in different views. The rhododendron pollen was responsible for the toxicity.*

The scale under each photomicrograph represents 10 µm.

infusion and sinus rhythm was restored within the following 2 hours, no more atropine was needed. He was monitored for 24 hours, during which time he manifested no type of block or bradycardia. No pathologic finding was noted on subsequent 24-hour Holter monitoring and transthoracic echocardiography. The results of treadmill stress-testing performed before discharge were negative for ischemia and chronotropic incompetence. Because these findings suggested a diagnosis of "mad-honey intoxication," the suspect honey was sent for melissopalynology (pollen analysis). This showed a pollen-rich honey: 83% of the pollen came from *Castanea sativa* (European chestnut, Figs. 2A and 2B), 10% from *Rhododendron* species (Figs. 2C and 2D), and the remainder from several other taxa, such as Fabaceae, Rosaceae, and Lamiaceae. The rhododendron pollen was the culprit.

Discussion

Rhododendron (from the Greek rhodos, "rose," and dendron, "tree") is a genus of flowering plants in the family Ericaceae. Rhododendrons and certain other plants produce grayanotoxin in their pollen and nectar. Honey made from this nectar can cause grayanotoxin poisoning, or "mad-honey intoxication," as it is known by the rural populace.

Grayanotoxin binds to sodium channels in the cell membrane, which are involved in voltage-dependent activation and inactivation, and it prevents inactivation. This maintains excitable cells in a depolarized state,[5,6] a state in which they behave like cholinergic agents and cause dose-dependent hypotension, bradycardia, and respiratory-rate depression. Atropine improves both bradycardia and respiratory-rate depression, but selective M2-muscarinic receptor antagonists only restore heart rate, which suggests that M2-muscarinic receptors are involved in the cardiotoxicity. In addition, oscillatory afterpotentials triggered by grayanotoxin can result in cardiac tachyarrhythmias.[2,7]

Symptoms of mad-honey intoxication usually appear within 1 to 2 hours of ingestion. This latent period, however, is dose dependent, so the delay can last several hours, as it did in our patient.[8] In mild intoxication, the manifestations are dizziness, weakness, nausea, vomiting, excessive perspiration, hypersalivation, and paresthesias; in such a case, close follow-up is enough. In severe form, such life-threatening complications as syncopy, seizures,[9] complete atrioventricular block,[3] and acute myocardial infarction[10] can be seen. The toxic effects of mad honey are rarely fatal and generally last for no more than 24 hours. In the event of atrioventricular block, intravenous atropine sulfate can usually restore sinus rhythm, but in some refractory cases vasopressor agents or a temporary pacemaker may be needed.[11]

A clinical evaluation that includes a detailed history is generally sufficient to establish the diagnosis of mad-honey intoxication, but in difficult cases pollen analysis can be helpful.

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