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Research article/Araştırma makalesi

Mushroom poisoning of death cap (*Amanita phalloides*) from Denizli (Turkey)

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Abstract

In this study, two mushroom poisoning cases caused by death cap (*Amanita phalloides*), distributed naturally in Denizli Province are reported. A short discussion is made by giving the poisoning cases with the general features of the taxon which causes the poisoning.

Key words: mushroom poisoning, death cap, Denizli, Turkey

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Denizli'den (Türkiye) köygöçüren mantarı (*Amanita phalloides*) zehirlenmesi

Özet

Bu çalışmada, Denizli İlinde doğal olarak yayılış gösteren köygöçüren mantarından (*Amanita phalloides*) kaynaklanan iki zehirlenme vakası rapor edilmektedir. Zehirlenmeye neden olan türün genel özellikleri ile beraber zehirlenme vakaları da verilerek kısa tartışması yapılmıştır.

Anahtar kelimeler: Mantar zehirlenmesi, Köygöçüren mantarı, Denizli, Türkiye

1. Introduction

Mushrooms belonging to *Amanita*, *Galerina*, *Lepiota* and *Conocybe* genera which contain amatoxins cause important mushroom poisonings worldwide. *Amanita phalloides* (death cap) heads a list of species containing amatoxin (Hall et al., 2003; Ammirati et al., 1985). *A. phalloides* which causes deaths resulted from mushroom poisonings in Turkey and around the world is generally confused with *Volvariella gloiocephala* (DC.) Boekhout & Enderle, *Tricholoma magnivelare* (Peck) Redhead, *Tricholoma portentosum* (Fr.) Quél., *Russula virescens* (Schaeff.) Fr. and *Agaricus silvicola* (Vittad.) Peck. This fungus which is extremely toxic and dangerous is very often encountered in generally woodland and oak forest areas in early summer and fall (Duffy and Wood, 2008; Polese, 2005).

The severity of mushroom poisoning depends on the type of species eaten, early diagnosis and right treatment. *A. phalloides* contains 3 groups of cyclopeptides that are amatoxins, phallotoxins, and virotoxins which contain aminoacids and occur in cyclic structure. Only amatoxins among these compounds are absorbed by gastrointestinal system and cause poisoning in humans (Mat, 2000). The structure of amatoxins does not disintegrate with cooking (Wieland and Faulstich, 1991). First symptoms occur in eight–twelve hours later after amatoxins are absorbed and destroy liver and renal metabolism in 3-4 days.

The consumption of less than 50 g or a medium sized mushroom of *A. phalloides* is enough to kill a person. Consumption of lesser amounts can lead to deaths in children while it causes poisonings in adults. As well as fruiting body of *A. phalloides*, its spores are also toxic. Even *A. phalloides* to be stored in the same basket with edible ones is dangerous (Hall et al., 2003).

Turkey is one of the leading countries in the world in terms of macrofungal biodiversity (Gezer et al., 2011). According to the current literature on Turkish macrofungi, the first report of mushroom poisoning in Turkey is by Karamanoğlu and Öder (1973). Besides, more recent studies were published by Öder (1977), Aytuğ et al. (1989),

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Işıloğlu and Watling (1991), Işıloğlu (1992), Işıloğlu et al. (1995), Işıloğlu et al. (2007), Işıloğlu et al. (2009), Işıloğlu et al. (2011) and Gücin et al. (1996). All known poisonous mushrooms of Turkey were documented recently by Gücin et al. (2000).

1.1. *Amanita phalloides* (Vaill. ex Fr.) Link

1.1.1 *Macroscopic features*

Pileus 60-120 mm across, ovoid and completely enclosed in the white universal veil when young, the veil soon breaking and the pileus soon conic-convex to plane, also uplifted in age, surface satiny when dry, somewhat viscid when finely radially fibrillose, color ranging from pale yellow-green to deep olive-green or brown-olive, without or only rarely with white veil remnants, margin smooth, acute (Figure 1). Flesh white, yellowish under the cuticle, thick in the center of the pileus and thin toward the margin, odor sweetish, unpleasant when old, taste mild, nutty. Lamellae are white when young, yellowish in age, broad, free, edge smooth. Stipe is 80-150 x 10-20 mm, cylindrical, base bulbous, solid when young, pithy to hollow when old, elastic, surface with faint to distinct greenish to brownish bands on a whitish background especially toward the base, annulus membranous, whitish, more rarely pale greenish, pendent, upper surface striate, base with a whitish, +/- well defined, membranous-lobed volva (Breitenbach and Kranzlin, 1995).

Figure 1. Mature basidiocarp of *Amanita phalloides* (a) and the egg-like stage of primordial basidiocarp (b)
Şekil 1. *Amanita phalloides'*in olgun basidiokarpı (a) ve primordiyal basidiokarpın yumurta görünümlü dönemi (b)

1.1.2. *Microscopic features*

Spores subglobose to broadly elliptical, smooth, hyaline, 7.7-10.1 x 6.7-8.5 µm, spore print white (Figure 2a). Basidia clavate are 50-62 x 12-15 µm, with 4 sterigmata, without basal clamp (Figure 2b). Marginal cells pyriform to vesicular, 29-45 x 13-25 µm, abundant, pleurocystidia not seen. Pileipellis composed of periclinal hyphae 1.5-6 µm across, hyphae in the uppermost layer gelatinized, deeper hyphae brownish-pigmented, septa without clamps (Figure 2c).

1.1.3. *Habitat*

Solitary to grouped in hardwood (*Quercus*, *Fagus*) forests, rarely in coniferous forests or outside of forests. Summer-fall (Breitenbach and Kranzlin, 1995).

Turkey, Denizli: in the pine forests, 22.10.2011.

Specimens of *A. phalloides* are deposited in Pamukkale University Mushroom Research and Application Center Fungarium.

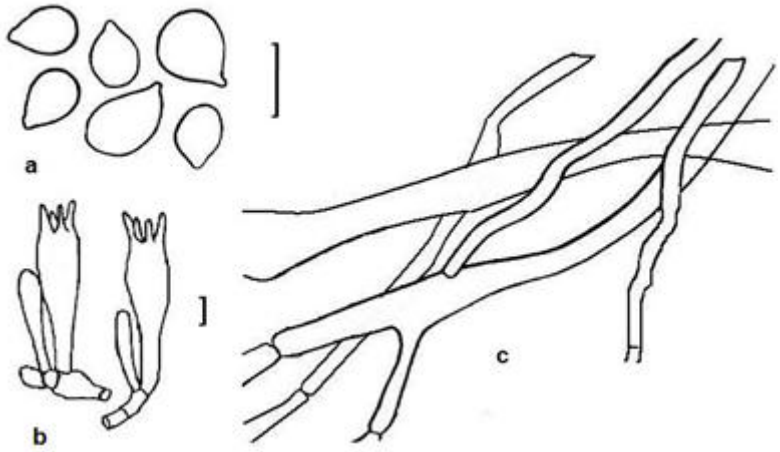

Figure 2. Micromorphology of *Amanita phalloides*. Spores (a), basidia (b) and hyphae (c). Scale bar 10 µm
Şekil 2. *Amanita phalloides*'in mikromorfolojisi. Sporlar (a), basidia (b) ve hifler (c). Ölçek çubuğu 10 µm

2. Cases

On 1st October 2011, a middle aged male and a middle aged female applied to nephrology clinic of Pamukkale University Medicine Faculty Hospital with complaints of vomiting, nausea and sweating approximately 1 hour after eating mushrooms collected from the forest. According to the information received from the relatives of the poisoned people, mycologists went to the site where the poisonous mushrooms had been collected, found the mushroom samples and took their pictures. Macroscopic and microscopic examinations were made on the collected samples in Pamukkale University Mushroom Research and Application Center Laboratory. In the end of the studies, mushrooms which had caused poisoning were identified as *A. phalloides*. Patients poisoned by death cap had not variable features except for the moderate common impairment. ECG and chest radiographs were normal. As a result of biochemical examinations, the high serum creatinine and BUN values were identified. Kidney ultrasonography demonstrated increased kidney parenchymal echogenicity. Diagnosis of acute kidney failure was made and the patients received acute hemodialysis treatment for 5 days. During the follow-up, renal function returned back to normal. Patients were discharged after their general condition was improved and dialysis catheters were withdrawn.

4. Conclusions

In literature *A. phalloides* is found as a poisonous species causing poisoning in both people and animals. According to Ammirati et al. (1985), McKnight and McKnight (1987), Bresinsky and Besl (1990), Fischer and Bessette (1992), Breitenbach and Kranzlin (1995), Hall et al. (2003), Fergus and Fergus (2003), Polese (2005), Roux (2006), Russell (2006) and Knudsen and Vesterholt (2008), death cap is indicated in toxic species. In studies made by researchers such as Bernard (1979), Kirwan (1990), Cole (1993), Yam et al. (1993), Tegzes and Puschner (2002) and Cope (2007), *A. phalloides* is indicated to cause mushroom poisoning in animals as humans.

A. phalloides which contains lethal poison is generally confused with *V. gloiocephala*, *T. magnivelare*, *T. portentosum*, *R. virescens* and *A. silvicola* species because they show similar morphological properties. In button stage, death cap is almost white and has a smooth surface turning rapidly from light green to light brown. In this stage, they cause the fatal poisonings since they resemble to puffball. Besides, they show a great similarity with *V. gloiocephala* and *A. silvicola* in young stage. In young stage, *V. gloiocephala* has a slippery odoriferous cap being brownish gray. *A. silvicola* has properly smooth surface and a white cap in its young stage. During maturation, death cap turns to its typical color of yellowish green, while it can turn to such various colors as brownish yellow and greenish brown. Its gills are whitish cream. *R. virescens* has a brown, dark yellow or rust cap. It has many gills and they are creamy white. There are red spots towards the stem base. *A. silvicola* has a creamy white cap and yellow spots occur when touched. Gills are dense and turn to pale gray, pink and dark brown when older. *T. portentosum* is mouse gray, bright and sometimes has violet-colored bright yellow spots. Gills are broad, white or slightly yellowish. *T. magnivelare* cap is smooth and plain white. Gills are dense and white. *V. gloiocephala* has a rusty brown cap. Gills are crowded, broad, pink or pinkish white (Fergus and Fergus, 2003; Knudsen and Vesterholt, 2008).

As a result, people should be acquainted with mushroom poisonings and told that it is not possible to distinguish the mushrooms with their morphologic appearance. Only those which are safe as edible mushrooms should be consumed. People who do not have any knowledge of mushrooms to be edible or not should be directed to the reliable culture mushroom. Both society and people in health departments should be given information by the expert mycologists in such months as October, November and April, May when these types of cases are experienced densely.

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