

## Amatoxins

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## Abstract

## Amatoxins Poisonings in Korea

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**Background/Aims:** From the review of Korean literature most fatal mushroom poisonings have been due to amatoxins with high mortality. So far there have never been investigations on the amatoxins poisonings such as annual incidence, mortality, common causal species, and endemic areas. This study was carried out to develop some basic statistics as part of studies for an effective management of amatoxins intoxications. **Method:** For the year 1999 authors collected cases of mushroom poisonings which had been mainly gathered from hospitals nation-wide. All of the cases with suggestive amatoxins poisonings were screened by symptomatology and laboratory findings. The causal species of mushrooms were identified grossly and microscopically. **Results:** A total of 54 victims with mushroom poisonings were evaluated. The causal mushroom toxins were diagnosed or strongly suggested as amatoxins in 43 of 54 victims. Eleven of 54 victims did not conform to the category of amatoxins intoxication due to absent or minimal elevation of aminotransferase. Mean age of the victims was  $44.3 \pm 23.3$  (range: 7-78) with male predominance (1.2 : 1). The causal species were confirmed, or strongly suggested, as *Amanita virosa* in 25 victims, *Amanita subjunquillea* in 14, and unknown species in 4. Thirty-five out of a total of 43 were regarded as moderate to severe intoxication (AST or ALT > 1,000 IU/L) with 20% mortality. Most fatal victims showed marked thrombocytopenia ( $40,000 \pm 19,000/\text{mm}^3$ ) compared to non-fatal victims ( $109,066 \pm 42,245/\text{mm}^3$ ). A total of 88.4% of victims was developed in the Kangwon and Kyungpuk provinces. Both are west of the Taebaek Mountains (38/43). **Conclusions:** Although the common causal species for amatoxins poisonings in Korea are different from European countries and North America, the mortality is similar to that of those areas. In order to further reduce the mortality, bedside diagnostic methods using biological fluids and more effective therapy for liver failure should be established.

**Key Words :** amatoxins, mortality, *Amanita virosa*, *A. subjunquillea*.

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amatoxins, 1 (biological fluid) 가

1981 1 1985 12 .1-10 amatoxins 가

24 *Amanita* 12 amatoxins 가

12 5 .4 *Amanita* (biological fluid) 가

*(Amanita phalloides)* amatoxins

1999 amatoxins

1987 7 10 amatoxins

16 10 amatoxins

*(Amanita virosa)* .5 amatoxins

가 amtoxins .679

*(Amanita virosa)* amatoxins

1998 8 10 1) amatoxins

16 1999 1

*(A. subjunquillea)* ,8

*(A. verna)* .10 Amatoxins amato-

amatoxins xins

20-40% 11,12 70% AST ALT

Amatoxins 2 가

1,000 IU/L 가

amatoxins . amatoxins

*(intrinsic hepatotoxin)* 54 가

11 , 7 가

(latent period)가 12 (6 24 )

(target 2

organ)가 , 가

가 4 amatoxins

Amatoxins . 43 amato- 22.8% (5/22),  
 22.2% (2/9)  
 ( 1).  
 2) AST/  
 ALT가 4,354 ± 2,279/4,121 ± 2,896 IU/L  
 1,867 ± 2,006/1,949 ± 1,239 IU/L  
 가 .  
 가 6.8 ± 5.9 mg/dL 4.2 ± 3.1 mg/dL  
 43 25 99,363 ± 61,205/mm<sup>3</sup>  
 97,400 ± 17,700/mm<sup>3</sup> ( 2).  
 (40,000 ±  
 3) 19,975/mm<sup>3</sup>) (109,066 ± 45,245/mm<sup>3</sup>)  
 (p=  
 Fisher's Exact 0.001), aminotransferase  
 test 가 ( 3).  
 1  
 (hypovolemic shock)  
 1)  
 Amatoxins  
 44.3 ± 23.3 , 1.2:1 7 2)  
 78 2 25  
 14 4  
 . 43 amatoxins ( 4).  
 38 35 (7 6 )  
 AST ALT가 1,000 IU/L 가 (10 6 ) . 가  
 7 20% 가 8 9  
 37.2% (16/43)가

**Table 1.** Characteristics of Wild Mushroom Poisonings in 1999

Mushroom toxins	Causal species	No. of cases (mod. to severe)	No. of death (mortality)	Total (mod. to severe)
amatoxins	A. virosa	25(22)	5/22 (22.7%)	43(35)
	A. subjunquillea	14( 9)	2/9 (22.2%)	
	Unknown	4( 4)	0/4 (0%)	
G-I irritants and Others		11( 0)	0	11( 0)
Total		54(35)	7/35 (20%)	54(35)

**Table 2.** Moderate to Severe(ALT or AST >1,000 IU/L) Amatoxins Intoxications in 1999

Causal species	No. of patients	AST/ ALT(IU/L)*	TB(mg/dl)*	Platelets(/ul)*
<i>Amanita virosa</i>	22	4,354 ±2,279/4,121 ±2,896	6.8 ±5.9	99,363 ±61,205
<i>Amanita subjunquillea</i>	9	1,867 ±2,006/1,949 ±1,239	4.2 ±3.1	97,400 ±17,700
<i>Unknown species</i>	4	8,326 ±6,388/7,369 ±4,676	4.6 ±0.4	88,000 ±49,497
Total	35	4,266 ±3,215/4,001 ±3,143	5.8 ±4.8	97,556 ±49,338

\*, Mean ±S.D.

**Table 3.** Laboratory Finding of Fatal versus Non-fatal Cases in Moderate to Severe Intoxications(ALT or AST >1,000 IU/L)

	AST/ALT(IU/L)*	Total bilirubin(mg/dl)*	Platelets(/ul)*
Non-fatal	4,336 ±3,293/5,670 ±3,202	4.6 ±2.7	109,066 ±45,245
Fatal	2,174 ±1,764/2,639 ±2,025	9.8 ±8.8	40,000 ±19,975 ‡

\*, Mean ±S.D.; ‡ *p*=0.001

**Table 4.** Some Edible Species Being Confused with the Causal Species

Endemic areas	<i>A. virosa</i>	<i>A. subjunquillea</i>
Kangwon province	<i>Lepiota</i> spp, <i>Agaricus</i> spp.	<i>Catharellus</i> spp.
Kyungpuk province	<i>Tricholoma</i> spp, <i>Lepiota</i> spp.	<i>Amanita hemibapha</i> , <i>Cantharellus</i> spp.
Other areas	<i>Lepiota</i> spp, <i>Agaricus</i> spp	<i>Cantharellus</i> spp.

가 , 3  
 88.4%  
 (38/43)가 10 가  
 5 , 4 , 3 , 3 , 3 , KOH  
 가 2 , 2 , 2 , 가  
 , , , , , , ,  
 1 .  
 amatoxins 10  
 13-16  
 amatoxins  
 2  
*Amanita bisphorigera* 가

(*Cantharellus cibarius*)  
 ,8 1999  
*nita hemibapha*  
 (*Amanita hemibapha var javanica*)  
 xins  
 가  
 amatoxins  
 (olive green)  
 " (green death cap)"  
 (young mushroom)  
 가  
 amatoxins  
 (*A. abrupta*), (*A. volvata*),  
 (*Russula subnigricans*)  
 .13-15  
 (*A. phalloides*), (*A. virosa*),  
 (*A. verna*) 3, *Amanita bisporigera*, *Conocybe filaris*, *Lepiota helveola*, *L. hetieri*, *L. castanea*, *L. subincarnata*,  
*Galerina unicolor* amatoxins  
 .16,17 amatoxins  
 가 4  
 ( 2).  
 amatoxins 가  
 amatoxins  
 virotoxins  
 phallotoxins  
 phalloidins  
 , thio-ether bridge L- cysteine  
 D- serine  
 cyclopeptides  
 phallotoxins  
 LD50가 2mg/kg  
 cyanide 10  
 cyclopeptides  
 amatoxins  
 . Amatoxins LD50 0.1mg/kg phallotoxins  
 .17 Amatoxins  
 Amatoxins 1941 Wieland  
 amanitin  
 ( , , , - amanitin  
 and amanin) amanullin  
 .18 Alpha- amanitin - amanitin  
 90% amatoxins  
 DNA m- RNA RNA  
 polymerase II 가 m-  
 RNA  
 .19,20 Phallotoxins 가  
 가 phalloidin  
 phallotoxins  
 ,  
 actin polymer  
 excretory tubule actin polymer  
 21  
 .  
 ptides cyclodecapeptide  
 cyclopeptides

phallotoxin 가 antamanide ,22  
 0.5mg/kg 5mg/ 가 25  
 kg phalloidin phalloto- 가  
 xins 가 . Amatoxins  
 phallotoxins 가 가 .  
 가 가  
 .  
 Amatoxins . K, corticosteroids, penicillin G  
 4 , 1 acid $\alpha$  thioctic  
 12 2 , 2 Silymarin (milk thi-  
 12- 24 , 3 stle) 가 flavo-  
 . 4 noids silybinin 60-  
 가 90%  
 .16 .27 amatoxins 가  
 2 3 amatoxins 28  
 7 (free-radical scavenger)  
 1 , , xins N- acetylcysteine  
 3 . 29 가  
 (biological fluids)  
 amatoxins .30  
 가 , Dr. Bastien 31  
 가 .  
 (RIA) high pressure liquid chr-  
 omatography(HPLC) 가 가  
 .23 .  
 Meixner test .24  
 가 20  
 . Amatoxins 1-2  
 가 가  
 가 .  
 Amatoxins 가  
 ,  
 (Charcoal hemo-

perfusion)32

amatoxins

가

ALT 가

2,000 IU/L

가

37

(hemodialysis)

,33

amatoxins

1

300 Da

amatoxins

900 Da

가

amatoxins

:

amatoxins

가

1998

34

1

가

amatoxins

가

amatoxins

20- 40%

가

가

가

AST ALT가 1,000 IU/L

가

60,000/mm3

amatoxins

가

1

prothrombin time

amatoxins

1999 1

amatoxins

. Amatoxins

가 가

Molecular Adsorbent Recirculating System(MARS)35 Bio- Artificial Liver(BAL)36 가

가 가

: 54

43

amatoxins 35

7 20%

4

가 , , .  
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amatoxins

, 1997  
70%

20%

가 ,

amatoxins

가 ,  
가

amatoxins

1999

amatoxins

가

가

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