

# Toxic Christmas and New Year Holiday Plants...or Are They?

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## Abstract

**Background:** Poinsettia (*Euphorbia pulcherrima*), holly (*Ilex opaca*) and mistletoe (*Phoradendron flavescens*) adorn homes during the Christmas and New Year holiday season and create the potential for curious children to sample their colorful leaves and enticing berries. This study was aimed to review the American Association of Poison Control Centers National Poison Data System (AAPCC NPDS) to describe the epidemiologic profile of ingestion of these plants and to determine whether there was associated morbidity and mortality.

**Methods:** All plant ingestion exposures reported to American poison centers (PCs) from 2000-2009 were analyzed to identify all exposures to *E. pulcherrima*, *I. opaca* and *P. flavescens*. The data analysis included ingestions by age, gender, patient management site, symptoms, intention and outcome.

**Results:** The AAPCC NPDS database included 668,111 plant ingestions during 2000 to 2009. *E. pulcherrima* (19,862; 3.0%), *I. opaca* (5,432; 0.8%) and *P. flavescens* (1,138; 0.2%) exposures accounted for 26,632 (4.0%) of all plant ingestion exposures. Children younger than six years were responsible for majority of ingestions (88.0%). Ingestions were more likely to occur unintentionally ( $P < 0.001$ ). Most cases (96.1%) were asymptomatic. When clinical effects developed (1,046 cases), the most frequent reported signs were gastrointestinal in nature (59.8%) including abdominal pain, diarrhea and/or vomiting. Moreover, the development of gastrointestinal signs was higher in patients who ingested *P. flavescens* compared to the other two species. Most exposures (96.1%) were managed at home with the guidance from PC experts. When the outcome was known, the majority of exposures (89.2%) experienced no adverse effects. Moderate effects occurred in only 28 ingestions (0.1%), and one major effect was recorded in a patient who ingested poinsettia.

**Conclusion:** These holiday plants were associated with extremely low morbidity and no mortality. Home management along with expert guidance can be adequate intervention in the majority of these exposures.

**Keywords:** Euphorbia; Ilex; Mistletoe; Poinsettia; Toxicity

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## INTRODUCTION

Festive ornamental plants including poinsettia (*Euphorbia pulcherrima*), holly (*Ilex opaca*) and mistletoe (*Phoradendron flavescens*) that adorn homes during the Christmas and New Year holiday season are known as holiday plants and create the potential for curious children to sample their colorful leaves and enticing berries (1,2). The plants are often maligned in the lay press and even in the medical literature (1-5); but are they poisonous villains or merely an attractive nuisance? The objective of this study was to review the American Association of Poison Control Centers National Poison Data System (AAPCC NPDS) to describe the epidemiologic profile of ingestion of these common plants and to determine whether there was associated morbidity and mortality.

## METHODS

All human plant ingestion exposures reported to American poison centers (PCs) from 2000 to 2009 were provided to the investigators as an AAPCC data grant and were analyzed using Microsoft Office Excel (Microsoft

Corp., Redmond, WA, USA) to identify all exposures to the most common ornamental plants, *E. pulcherrima*, *I. opaca* and *P. flavescens*, that are found in homes in the United States during the Christmas and New Year holiday season. These plants were selected due to their overwhelming presence in American homes and their purported toxicity. The data analysis included ingestions by age, gender, patient management site, symptoms, intention and outcome. The outcome data as defined by the AAPCC were (6,7):

**No effect:** The patient did not develop any signs or symptoms as a result of the exposure.

**Minor effect:** The patient developed some signs or symptoms as a result of the exposure, but they were minimally bothersome and generally resolved rapidly with no residual disability or disfigurement.

**Moderate effect:** The patient exhibited signs or symptoms as a result of the exposure that were more pronounced, more prolonged, or more systemic in nature than minor symptoms.

**Major effect:** The patient exhibited signs or symptoms as a result of the exposure that were life-threatening or resulted in significant residual disability or disfigurement.

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**Death:** The patient died as a result of the exposure or as a direct complication of the exposure.

The data were exempt from the University institutional review board criteria. Descriptive statistics were used to characterize the data. Chi squared test was used to examine differences between categorical variables. P values less than 0.05 were considered statistically significant.

## RESULTS

### General statistics of plant ingestions

The AAPCC NPDS database during 2000 to 2009 included 668,111 human plant ingestions. *E. pulcherrima* (19,862; 3.0%), *I. opaca* (5,432; 0.8%) and *P. flavescens* (1,138; 0.2%) exposures accounted for 26,632 (4.0%) of all plant ingestions.

### Demographic details of holiday plant ingestions

Among cases with *E. pulcherrima*, *I. opaca* and *P. flavescens* ingestion, children less than six years of age were responsible for 87.7%, 92.6% and 73.8%, of cases, respectively and for 88.0% of cases in total (Table 1). No significant gender difference existed, though male cases slightly outnumbered female cases (50.7% vs. 48.7%). The holiday plant ingestions were more likely to occur unintentionally ( $P < 0.001$ ) (Table 2).

### Clinical findings and outcome of holiday plant ingestions

Most cases (96.1%) were asymptomatic. When clinical effects developed (1046 cases), the most frequent reported

signs were gastrointestinal in nature (625; 59.8%) including abdominal pain, diarrhea and/or vomiting (Table 3). Moreover, the development of gastrointestinal signs was higher in patients who ingested *P. flavescens* compared to the other two species. Most exposures (96.1%) were managed at home with the guidance from PC experts (Table 3).

No follow-up could be conducted in 20,671 (77.6%) of the exposures and in 651 cases (2.4%), the symptoms were judged to be unrelated to the exposure. The final outcome was known in 5,310 exposures (19.9%). When the outcome was known, 4741 exposures (89.2%) resulted in no adverse effects. In addition, minor effects occurred in 10.2% of followed up cases (540 out of 5310). Moderate effects occurred in only 28 ingestions (0.1%), and one major effect was recorded in a patient who ingested poinsettia (Table 3).

## DISCUSSION

In this study, a 10-year compilation of Christmas and New Year holiday plant ingestions in the United States was presented. Nearly 88% of the exposures occurred in children who were less than six years of age, which is consistent with the epidemiology of plant exposures in children (8). Plant ingestion was also a common entity in children in calls to New Zealand National Poisons Center (9). This can be explained by the curiosity of children at these ages to taste unknown objects and to the attractiveness of the plants (10,11). The poinsettia has leaves that are brightly colored

**Table 1.** Demographic characteristics of cases with poinsettia, holly and mistletoe plants poisoning reported to AAPCC NPDS during 2000 to 2009

Characteristics	Holiday Plants			
	<i>E. pulcherrima</i> (n = 19,862)	<i>I. opaca</i> (n = 5,432)	<i>P. flavescens</i> (n = 1,338)	Total (n = 26,632)
Age (Years), n (%)				
≤5	17,419 (87.7)	5,030 (92.6)	987 (73.8)	23,436 (88.0)
6-12	675 (3.4)	261 (4.8)	146 (10.9)	1,082 (4.0)
12-19	298 (1.5)	92 (1.7)	118 (8.8)	508 (1.9)
20-99	1271 (6.4)	38 (0.7)	75 (5.5)	1,384 (5.3)
Unknown	199 (1.0)	11 (0.2)	12 (0.9)	222 (0.8)
Gender, n (%)				
Male	9891 (49.8)	2917 (53.7)	700 (52.3)	13508 (50.7)
Female	9871 (49.7)	2504 (46.1)	626 (46.8)	13001 (48.8)
Unknown	100 (0.5)	11 (0.2)	12 (0.9)	123 (0.5)

**Table 2.** Intention of poisoning in cases with poinsettia, holly and mistletoe plants poisoning reported to AAPCC NPDS during 2000 to 2009

Intention	Holiday Plants			
	<i>E. pulcherrima</i> (n = 19,862)	<i>I. opaca</i> (n = 5,432)	<i>P. flavescens</i> (n = 1,338)	Total (n = 26,632)
Unintentional	19,485 (98.1)	5,345 (98.4)	1,234 (92.2)	26,064 (97.9)
Intentional	318 (1.6)	71 (1.3)	100 (7.5)	489 (1.8)
Others	59 (0.3)	16 (0.3)	4 (0.3)	79 (0.3)

**Table 3.** Clinical manifestations and outcome of cases with poinsettia, holly and mistletoe plants poisoning reported to AAPCC NPDS during 2000 to 2009

Variable	Holiday Plants			
	<i>E. pulcherrima</i> (n = 19,862)	<i>I. opaca</i> (n = 5,432)	<i>P. flavescens</i> (n = 1,338)	Total (n = 26,632)
<b>Clinical manifestations</b>				
Asymptomatic	19,158 (96.4)	5,217 (96.0)	1,211 (90.5)	25,586 (96.1)
Gastrointestinal	376 (1.9)	169 (3.1)	80 (6.0)	625 (2.3)
Cough/Choke	101 (0.5)	10 (0.2)	3 (0.2)	114 (0.4)
Dermal Irritation	171 (0.9)	5 (0.1)	3 (0.2)	179 (0.7)
Lethargy	2 (0.01)	6 (0.1)	3 (0.2)	11 (0.04)
Others	54 (0.3)	25 (0.5)	38 (2.9)	117 (0.4)
<b>Management Site</b>				
Non HCF*	19246 (96.9)	5166 (95.1)	1191 (89.0)	25603 (96.1)
HCF	139 (0.7)	87 (1.6)	49 (3.7)	275 (1.0)
PC** Referral to HCF	60 (0.3)	141 (2.6)	74 (5.5)	275 (1.0)
Other/Unknown	417 (2.1)	38 (0.7)	24 (1.8)	479 (1.9)
<b>Outcome</b>				
No effect	2,811 (14.1)	1483 (27.3)	447 (33.4)	4741 (17.8)
Minor effect	360 (1.8)	119 (2.2)	61 (4.6)	540 (2.0)
Moderate effect	15 (0.1)	10 (0.2)	3 (0.2)	28 (0.1)
Major effect	1 (0.005)	0 (0.0)	0 (0.0)	1 (0.004)
Unknown/Unrelated	16,675 (84.0)	3820 (70.3)	827 (61.8)	21,322 (80.1)

\* HCF = Health Care Facility

\*\* PC = Poison Center

(red, white or pink), holly berries are crimson red, and mistletoe berries are found in white clumps.

In the present study, the outcome data showed low morbidity and no mortality that are consistent with studies that were published previously (1,2,5,6). Krenzelok and Mrvos (8) and Hoppe-Roberts et al (12) also found a very low mortality rate in plant ingestions overall. This may be due to: (a) the fact that an insufficient quantity of the plant was ingested, (b) these plants may probably not contain highly toxic substances, (c) in most cases, little amount of the plants are taken by the children because of their unpleasant taste, (d) the plants contain some nauseous components that cause vomiting and so the chance of absorption of poison to blood circulation decreases, (e) these plants are not commonly used by adults for suicidal purposes.

In this study, the frequency of exposure by male and female subjects was relatively equal which is similar to the gender distribution of poisoning exposures in previous studies (8,13). A mean of only 3.3% of all patients developed symptoms. The data do not depict the total number of patients who developed symptoms because a single patient may have developed multiple symptoms. Not surprisingly, gastrointestinal symptoms mimicking gastroenteritis were most prominent due to the presence of irritating alkaloids that are found in all three species (1,2,14). Since almost all of the exposures occurred in

children less than six years of age, it is to be expected that the majority (97.8%) of the exposures were unintentional (accidental). A national awareness about the potential risks of holiday plants should be raised during the holiday season to reduce this kind of exposure, especially in children.

### LIMITATIONS

The interpretation of these data is subject to the inherent limitations of all data in the AAPCC NPDS. The American Association of Poison Control Centers (AAPCC) (<http://www.aapcc.org>) maintains a national database (National Poison Data System) of information logged by the 57 poison information centers in the United States. Case records in this database are from self-reported calls; they reflect only information provided when the public or healthcare professionals report an actual or potential exposure to a substance (e.g. ingestion, inhalation, dermal exposure). Exposures do not necessarily represent a poisoning or an overdose and are not necessarily confirmed by laboratory analysis. The AAPCC is not able to completely verify the accuracy of every report made to member centers. For example, the accurate identification of every plant cited in this manuscript cannot be confirmed. In these exposure reports, some caller information may be incomplete or recorded inaccurately, despite quality control measures taken by individual poison information centers. In this study, in 77.6% of the exposures, no follow-up was

conducted; therefore, the conclusions reflect only the subset of exposures where a known outcome was determined. Additional exposures may go unreported to poison centers and the data presented in this article should not be construed to represent the complete incidence of national exposures to botanicals, and so the true frequency of plant exposures is likely underestimated. The data presented in the manuscript, the interpretation of the data and the conclusions do not represent the opinions of the AAPCC.

## CONCLUSION

These Christmas and New Year holiday plants were associated with extremely low morbidity and there were no fatalities related to these ingestions. Despite the fact that no follow-up was conducted in the majority of the exposures, there were no toxicity signals that suggested the need for medical management. Therefore, home observation and management can be adequate interventions in the majority of these exposures.

**Conflict of interest:** None to be declared.

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