

# Systemic contact dermatitis induced by *Rhus* allergens in Korea: exercising caution in the consumption of this nutritious food

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## Abstract

Systemic contact dermatitis (SCD) develops when a person who was previously sensitized to an allergen is exposed to the same allergen via the systemic route. In East Asia, the use of lacquer for polishing furniture is common and a part of the traditional culture. Contact exposure to tableware polished with *Rhus* lacquer may lead to sensitization. In Korea, SCD is commonly observed after systemic exposure to *Rhus*, a nutritious food item consumed because of the common belief of it improving the immune system. In this study, we reviewed the medical records of 21 Korean patients with SCD caused by *Rhus* ingestion. We found that the most significant epidemiological factor for SCD was the season of the year. Furthermore, 66.67% of the patients presented with leucocytosis and 23.81% showed increased liver enzyme levels. It is important to educate people on the risks associated with the systemic ingestion of *Rhus*.

*Rhus* is a traditional medicinal plant consumed in Korea to boost immunity; however, the ingestion of boiled *Rhus* may cause systemic contact dermatitis (SCD).<sup>1</sup> Urushiol is reported to be the chief antigenic component in *Rhus*,<sup>2,3</sup> and the Korean Food and Drug Administration (KFDA) has placed controls on its consumption. Several cooking methods, including heating and boiling, have been reported to eliminate urushiol antigenicity by inducing its oxidation and polymerization. However, commercially available *Rhus* products are not completely detoxified and despite being low, *Rhus* antigenicity has not been completely eliminated. Therefore, SCD may develop when individuals previously sensitized to *Rhus* are re-exposed. Thus, the KFDA has ruled that *Rhus* cannot be used in food products, yet the incidence of *Rhus*-induced SCD has not decreased.<sup>4</sup> This study delineated the epidemiological factors of SCD through a review of medical records.

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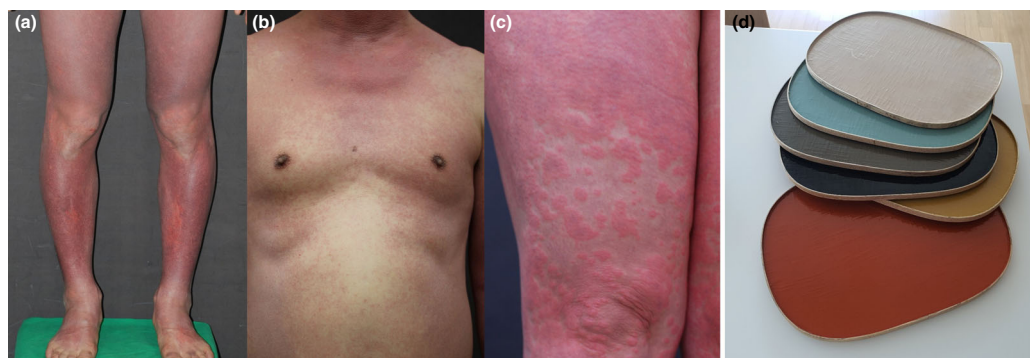
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## Report

The patients have provided written informed consent for the publication of their case details. The study was approved by the Chung Ang University Institutional Review Board (IRB no. 2031-007-413).

We retrospectively reviewed the data of 21 Korean patients (aged 24–79 years; mean age: 50 years) with *Rhus*-induced SCD previously treated at our hospital between 2009 and 2019. SCD was diagnosed based on the history of evidential *Rhus* exposure and clear temporal association between *Rhus* exposure and skin rash. The symptoms most frequently occurred during spring (52.38%), followed by summer (19.05%), autumn (19.05%) and winter (9.52%). The patients were exposed to the allergen by ingestion of chicken boiled with *Rhus* (61.9%), of *Rhus* sprouts (23.81%) and of herbal medicines containing *Rhus*.

There were various skin manifestations seen in our patients (Fig. 1a–c), with the most common type of eruption being a generalized erythematous maculopapular eruption. Of the 21 patients, 14 (66.67%) presented with leucocytosis, and of these, 10 and 6 had neutrophilia and eosinophilia, respectively. Five (23.81%) patients showed increased liver enzyme levels. All patients were treated with systemic



**Figure 1** (a) Erythroderma. (b) Generalized maculopapular eruption on the trunk. (c) Target lesions of erythema multiforme. (d) Tableware polished with *Rhus* lacquer.

corticosteroids and antihistamines. The mean treatment period was 15.9 days (range 9–25 days). Patient characteristics are shown in Table 1.

Presensitization to antigens is essential for SCD development.<sup>2</sup> However, our study revealed that only one patient with SCD had a history of exposure to *Rhus*. A previous report by Yun *et al.* revealed that 32% of the people who ingested boiled chicken with *Rhus* for the first time exhibited a rash.<sup>5,6</sup> This is because East Asians are often unknowingly exposed to *Rhus*-lacquered tableware and furniture. In East Asia, the use of lacquer for polishing furniture and tableware is common and part of the traditional culture.<sup>6</sup> Hence, people easily come in contact with tableware polished with *Rhus* lacquer in public places, such as cafeterias (Fig. 1d). Previous Korean studies reported that approximately 10–30% of the general population present with allergic sensitization to *Rhus* lacquer.<sup>7</sup>

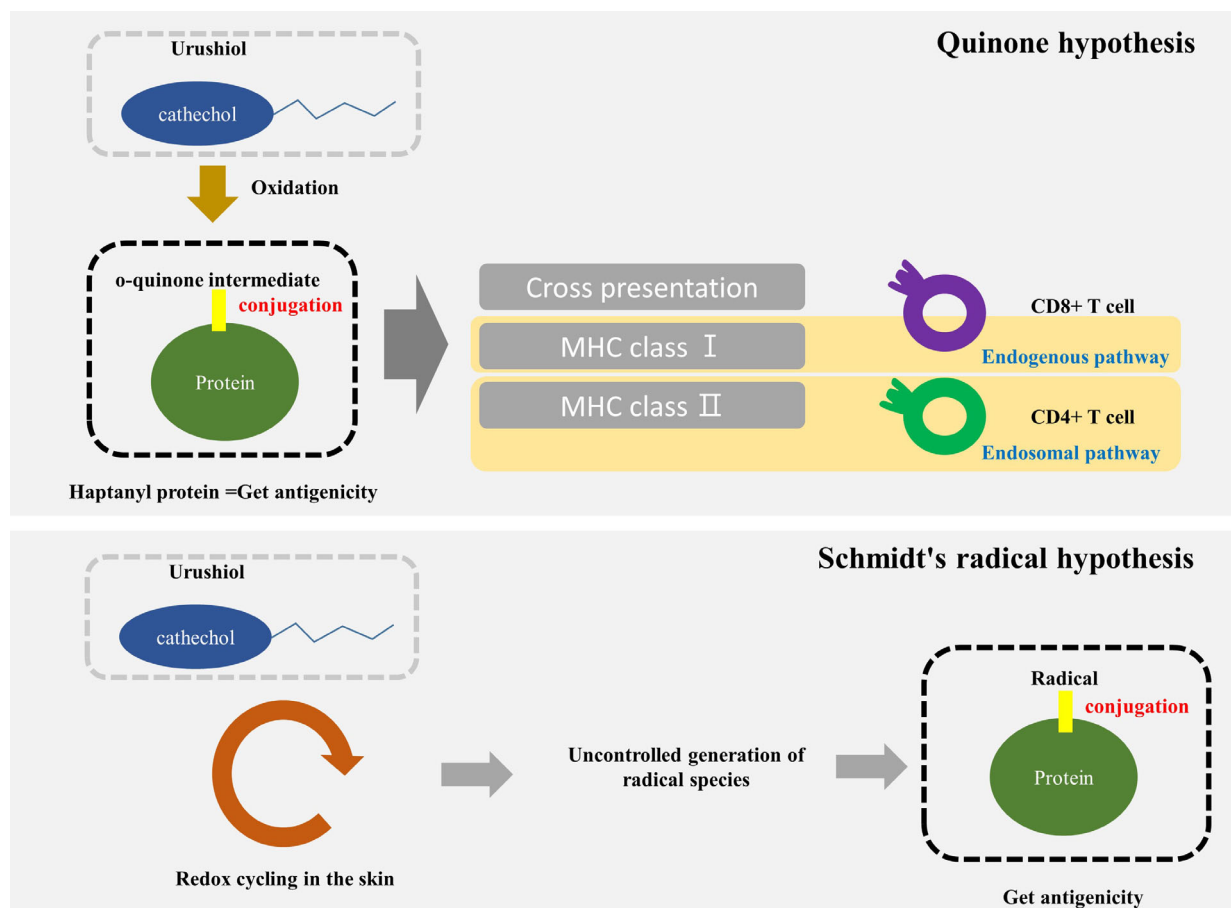
In this study, the specific epidemiological characteristic was the effect of seasons; SCD developed in most patients during spring. This is because the consumption of nutritious foods before summer is recommended by traditional folk medicine. *Rhus* is most commonly ingested via the consumption of *Rhus*-infused chicken. All patients were adults, with 76.19% aged > 40 years; the proportion of women was slightly higher than that of men, suggesting that middle-aged women are more likely to follow traditional folk medicine.

More than one type of immunological reaction (Types I, III and IV) is involved in SCD; thus, it presents with various clinical manifestations. The clinical features include flares of previous dermatitis, along with new onset of widespread dermatitis, vesicular palmar erythema multiforme, purpura and vasculitis.<sup>6</sup>

**Table 1** Characteristics of the patients with systemic contact dermatitis induced by *Rhus*.

Characteristic	No. of patients (%)
Sex	
Female	13 (61.90)
Male	8 (38.10)
Age, years <sup>a</sup>	
20–29	2 (9.52)
30–39	3 (14.29)
40–49	4 (19.05)
50–59	5 (23.81)
≥ 60	7 (33.33)
Season	
Spring	11 (52.38)
Summer	4 (19.05)
Autumn	4 (19.05)
Winter	2 (9.52)
Method of ingestion	
Boiled chicken with <i>Rhus</i>	13 (61.90)
<i>Rhus</i> sprouts	5 (23.81)
<i>Rhus</i> in a herbal medicine	1 (4.76)
Inhalation of lacquer fumes	1 (4.76)
Soup with <i>Rhus</i>	1 (4.76)
Skin manifestation	
GEME	18 (85.71)
Erythroderma	2 (9.52)
Other	1 (4.76)
Systemic symptoms	
Neutrophilia	14 (66.67)
Leucocytosis	10 (47.61)
Neutrophilia	6 (28.57)
Eosinophilia	0 (0)
Fever	8 (38.10)
Increased serum IgE level	0 (0.00)
Gastrointestinal discomfort	5 (23.81)
Increased liver enzymes	
Treatment	
Admitted	17 (80.95)
Outpatient	4 (19.05)

GEME, generalized erythematous maculopapular eruption; IgE, immunoglobulin E. <sup>a</sup>Mean age was 50 years.



**Figure 2** Two hypotheses delineating the mechanism of development of systemic contact dermatitis on exposure to urushiol. MHC, major histocompatibility complex.

Urticarial and anaphylactic types of reaction are also possible but are rare.<sup>6</sup>

There are two hypotheses for the mechanism of SCD development due to urushiol (Fig. 2). Urushiol acts as a hapten and acquires antigenicity by combining with proteins. Following urushiol re-exposure, memory cells rapidly multiply and induce the secretion of various cytokines, causing contact dermatitis. Alternatively, according to Schmidt *et al.*'s<sup>8</sup> radical hypothesis, radicals derived from urushiol induce polymerization reactions with proteins to form conjugated intermediates, thereby causing contact allergies. However, the precise mechanism underlying *Rhus*-induced SCD remains unclear.<sup>9</sup>

A patch test is often necessary to differentiate between SCD and other skin diseases.<sup>9</sup> However, it was not performed in this study; the SCD diagnosis was solely based on the history of systemic exposure

to *Rhus* and consequent rash development. There are several obstacles to performing a patch test in *Rhus*-induced SCD. First, no commercial patch test is currently available for urushiol. Second, a patch test should be performed after steroid therapy discontinuation because systemic steroids diminish patch test reactions.<sup>10</sup> Third, it must be performed in a disease-free state to prevent false-positive reactions.<sup>9</sup> In addition, the patients admitted to our centre were in the acute phase; hence, it was difficult to confirm the diagnosis using a patch test. Further, most patients were lost to follow-up following treatment. A provocation test, another diagnostic tool, is not safe and may lead to aggravation of the previous status because it re-challenges the patient with the suspected allergen via the systemic route.<sup>5</sup> Therefore, patients were diagnosed considering the clinical presentation, history of exposure to *Rhus* and specific temporal association.

Although the harmful effects of *Rhus*-infused chicken are relatively well known, SCD continues to occur quite commonly in South Korea. To reduce the incidence of *Rhus*-induced SCD, the probability of contact with *Rhus* or its systemic ingestion should be reduced. Moreover, because of the cultural heritage, people are likely to come in contact with lacquered furniture or ornaments. Therefore, it is important to educate people on the risks associated with the systemic ingestion of *Rhus*.

### Learning points

- Ingestion of boiled *Rhus* as a nutritious food item may cause SCD.
- Despite controls of *Rhus* in food, the incidence of *Rhus*-induced SCD has not decreased in Korea.
- In East Asia, the use of lacquer for polishing furniture is common and a part of the traditional culture, and contact exposure to tableware polished with *Rhus* lacquer may lead to sensitization.
- The specific epidemiological characteristic was the effect of seasons; SCD developed in most patients during spring.
- Overall, 66.67% of the patients presented with leucocytosis and 23.81% showed increased liver enzyme levels.
- To reduce the incidence of SCD induced by *Rhus*, the probability of contact with *Rhus* or systemic ingestion of *Rhus* should be reduced.

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