Technical notes

Adverse reactions to wine – which compounds are responsible?

Consumers sometimes report adverse reactions after consuming wine. The most commonly reported symptoms are redness of facial skin, headache, itching and bronchial or nasal congestion. These types of symptoms tend to be associated with an intolerance to components of wine rather than being due to an immune system response (allergy). Compounds in wine that can cause intolerance reactions include the preservative sulfur dioxide (SO_2) and the naturally occurring wine components salicylates and biogenic amines.

A very small number of cases of immune responses (allergies) to wine are reported in the literature. These have been shown to be due to responses to grape proteins present in wine. Consumers sometimes also have concerns about the use of protein fining agents in winemaking and whether there is potential for residues to cause allergic reactions. A recent literature search found no published reports of allergic reactions following the consumption of wine in individuals with allergies to egg, fish, milk or nuts. The risk of an allergic reaction from wine fined with proteins is considered to be very low if not negligible, based on the concentrations of protein found in fined wine and the threshold concentrations for an allergic reaction.

More information about the components in wine most commonly linked with intolerances is provided below.

Sulfur dioxide (SO_2)

Sulfur dioxide is an extremely common preservative used in winemaking and is known to cause adverse reactions in a small proportion of consumers. The most common symptom from the ingestion of sulfites is asthma (bronchospasms and wheezing), although adverse reactions in non-asthmatic individuals also occur occasionally.

It has been clinically demonstrated that sulfur dioxide will generally trigger an adverse reaction in sulfite-sensitive asthmatics, which comprise approximately 1.7% of all asthmatics. Ten percent of the Australian population currently has asthma. Steroid-dependent asthmatics are most at risk of an adverse reaction because they have more severe asthma due to compromised pulmonary function.

The threshold for sulfite-sensitive individuals to experience an adverse reaction varies between 5 and 200 mg/L sulfur dioxide. Usually the minimum threshold is considered to be 10 mg/L, which reflects existing Australian and international legislation stipulating that 'added sulfites in concentrations of 10 mg/kg or more' must be stated on the label of a food product such as wine. The median concentration of total sulfur dioxide in Australian wines is 73 mg/L for red wine and 123 mg/L for white wine (AWRI unpublished data). Approximately 20–200 mg/L of sulfur dioxide may be added during winemaking and approximately 10–50 mg/L can be produced by yeast during fermentation, a portion of which is usually bound to acetaldehyde.

The AWRI website provides the following advice regarding SO_2 and asthma:

> If your asthma is not triggered by sulfur dioxide, then any kind of wine can be consumed with minimal risk of inducing asthma-related symptoms. If you are 'sulfite-sensitive', however, wines that contain a lower concentration of sulfur dioxide are recommended. Wines labelled as 'organic' normally contain less sulfur dioxide; cask wines contain higher levels of sulfur dioxide. No wine is truly 'sulfur dioxide free', as 10–50 mg/L of sulfur dioxide is produced naturally during fermentation.
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> In addition, if you are a sulfite-sensitive asthmatic, one standard serve of 100 mL of wine, containing approximately 45 to 120 mg/L of sulfur dioxide, may trigger an allergic reaction. Data from research undertaken by the Department of Medicine of The University of Western Australia indicates that the low concentration of sulfur dioxide observed generally in Australian wine is not problematic for a significant proportion of sulfite-sensitive individuals.

Salicylates

Salicylates are a group of naturally occurring compounds, found in many plants and fruits and used widely in pharmaceuticals and perfumes. In the UK, salicylates in wine account for 22% of their daily dietary intake. Salicylates and associated derivatives contained in foods can cause adverse food reactions such breathing difficulties, rashes, headaches and very occasionally anaphylaxis. Intolerance to salicylates is particularly common in individuals with asthma who also have chronic rhinitis and/or nasal polyps. The relatively short duration of asthmatic responses among the majority of wine-sensitive asthmatic subjects, however, argues against a major role for salicylates in wine-induced asthma, because asthmatic responses to salicylates are generally longer in duration.

Histamine

Histamine, a biogenic amine, is present in cheese, fish, meat, yeast extracts, vegetables and wine. While histamine has been observed to 'modulate' heart rate and blood pressure, physiological responses generally occur when large amounts exceeding normal dietary intake are ingested, for example, greater than 32 to 250 mg. Generally an upper limit of 100 mg histamine/kg in foods has been suggested. These amounts are far in excess of those observed in wine. Indeed, the amount of histamine observed in wine is generally tenfold less than that measured in other foodstuffs associated with physiological responses.

It is now widely accepted that bacterial growth at some stage during the winemaking process is responsible for the formation of histamine. Red wine generally contains a concentration of histamine higher than that of white wine, which is partly attributed to the greater use of malolactic fermentation. The results of one study found that there was no correlation between the histamine concentration of wine and allergic adverse reactions.

More information about the health effects of wine consumption can be found on the AWRI website (http://www.awri.com.au/industry_support/wine_and_health/). For additional references, please contact the author.

Further reading

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Stockley, C. O'Hehir, R. Rolland, J. (2006) Is allergen labelling necessary for Australian wine? Aust. N.Z. Wine Ind. J. 21(3): 17–21.

Stockley, C. (2005) Sulfur dioxide and the wine consumer. Aust. N.Z. Grapegrower Winemaker 501: 73–76.

Stockley, C. (2004) Can histamine in wine cause adverse reactions for consumers? Aust. N.Z. Grapegrower Winemaker 485a: 77, 79–82.

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