Oregon Wine Advisory Board  
Research Progress Report  
1988

The Urethane (Ethyl Carbamate) Voluntary Reduction Plan - an Update

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Urethane is a by-product of the fermentation and distillation of alcoholic beverages. In recent years, concern has been expressed over its presence in such beverages because of studies which demonstrate that urethane can cause cancer in various animal species and, as a consequence, must be regarded as a potential carcinogen in humans. The degree of risk, if any, that urethane may pose to humans is unknown because of a lack of adequate scientific and toxicological information. The U.S Food and Drug Administration and the Bureau of Alcohol, Tobacco and Firearms, which share legal jurisdiction over the regulation of alcoholic beverages, are currently seeking the scientific data necessary to determine more accurately the relationship, if any, between urethane level in foods and beverages and human cancer.

In late January 1988, Food and Drug Commissioner Dr. Frank E. Young accepted an agreement from the Wine Institute and the Association of American Vintners, to reduce voluntarily levels of urethane in table and dessert wines. The agreement was signed by John DeLuca, president of the Wine Institute, based in San Francisco, which represent 530 California wineries, and by Anthony P. Debevc, president of the Association of American Vintners, based in East Rochester, New York, which represents wine producers in 29 states. The urethane reduction plan for wines was formalized after several months of discussions between representatives of the wine industry and the U.S. Food and Drug Administration.

The basis of the agreement between the wine industry and the U.S. Food and Drug Administration is that urethane levels in wine can be reduced and possibly eliminated. Since urethane is produced in making wine, and since the levels of urethane vary considerably between different wines, viticultural and enological practices must influence urethane formation. The hope is that research over the next few years will elucidate the factors which affect urethane formation, and hence lead to practical measures which will allow reduction or elimination of urethane from wine.

The agreement explicitly states that the Wine Institute and the Association of American Vintners will voluntarily undertake the following program:

1. The associations agree to set as a goal that, for table wines (wines containing 14% or less alcohol by volume) produced from the 1988 harvest/crush, and for subsequent years, the weighted average of American table wines will not exceed 15 ppb; for dessert wines (wines over 14% alcohol by volume) produced from the 1989 harvest/crush, and for subsequent years, the weighted average will not exceed 60 ppb.

2. The associations agree to set as a goal that urethane levels, on a weighted average basis, for the volume of American table wines (wines containing 14% or less alcohol by volume) produced
from the 1988 harvest/crush and subsequent years, and for the volume of American dessert wines (wines containing over 14% alcohol by volume) produced from the 1989 harvest/crush and subsequent years, will be reduced to the extent possible.

3. The associations agree to undertake an annual survey (commencing in 1988 representing American table wine production from the 1987 harvest/crush, and in 1989 representing dessert wine production from the 1988 harvest/crush) to determine the weighted average of urethane levels in all wines, the volume of table wine that exceeds 25 ppb, and the volume of dessert wine that exceeds 90 ppb.

4. Commencing with American table and dessert wines produced in 1995 harvest/crush, the associations agree to set as a goal that their members will have no more than 1% of American dessert wine volume above 90 ppb.

5. After completion of each survey, the associations will evaluate the results of the research on urethane and will, if possible, accelerate percentage reduction goals for the volume of American table wine identified as exceeding 25 ppb and the volume of dessert wine identified as exceeding 90 ppb.

Furthermore, the Wine Institute agreed that a minimum of 200 samples would be analyzed each year, with the Wine Institute designating which wineries will be asked to draw samples from the particular types of wine produced in that year. The Wine Institute will be responsible for the testing of urethane and reporting the results to the Food and Drug Administration upon completion of the survey each year.

The Wine Institute will set as a goal a testing of a random sample of wines from each of the major wineries (approximately 20 of the largest Californian wineries) which produce at least 75% of American wine volume, and from wineries across the U.S. which produce the remaining 25% of American wine volume.

The proposal also agreed to continue the current research at Cornell University, University of California Davis and Ohio State University which includes the elucidation of the pathways and factors involved in urethane formation and practical experimentation with enological and viticultural parameters to reduce the levels of urethane.

In addition, the Wine Institute agreed to remain in close contact with Food and Drug Administration representatives on all matters relating to the voluntary urethane reduction program. The Wine Institute will act as a clearing house for the dissemination of technical information it develops and which may be supplied by other associations and wineries on factors that appear to correlate with urethane formation and practices that might reduce urethane levels in wine.

A similar agreement between the U.S. Food and Drug Administration and the Distilled Spirits Council of the United States to reduce levels of urethane to 125 ppb in whiskey products by January 1, 1989, was arrived at in early January 1988.

It is important to recognize that the urethane levels (i.e. 15 ppb in table wines, 60 ppb in dessert wines, 125 ppb in whiskey products) in these agreements are voluntary goals or target levels. They are not action levels or regulatory levels. In contrast, however, the Canadian Ministry of Health and Welfare this past year established action levels for urethane as follows: table wines, 30 ppb; fortified wines, 100 ppb; distilled spirits, 150 ppb; and fruit spirits (liqueurs), 400 ppb.
The Center for Science in the Public Interest, a Washington, D.C.-based consumer protection group is critical of the voluntary plan to reduce urethane levels in alcoholic beverages. They have charged the U.S. Food and Drug Administration with "shirking its responsibility" in protecting the public health. Over the past year the Center for Science in the Public Interest has been urging the Food and Drug Administration to set action levels for urethane in alcoholic beverages rather than accept voluntary limits on urethane by the distilled spirits and wine industries. In addition, the Center for Science in the Public Interest has released a publication entitled "Tainted Booze" which contains urethane levels of approximately 1000 beverages including many U.S. produced wines. The information contained in "Tainted Booze" includes urethane levels in specific name-brand products, was obtained from the U.S. Food and Drug Administration and Bureau of Alcohol, Tobacco and Firearms through the Freedom of Information Act.

During the past several weeks, Barney Watson and Dick Scanlan at the Department of Food Science and Technology, O.S.U. have been gathering information relating to formation of urethane in wine. Dr. C.S. Ough, Department of Viticulture and Enology at U.C. Davis, Dr. Art Caputi from Gallo, and Richard Gahaghan from the Bureau of Alcohol, Tobacco and Firearms have been particularly helpful in supplying information. Although some of the "facts" may change as new information develops, the following points appear to be important to urethane formation in wines.

Urea is the most significant precursor to urethane formation, but it may not be the only source. Urea is produced during fermentation from the amino acid arginine. Urea can react chemically with ethanol to form ethyl carbamate, commonly known as urethane. The formation appears to be time and temperature dependent and can be expected to increase with aging of wine and with exposure to heat.

Urea and urea-containing formulations should not be used as yeast nutrients during fermentation. If nutrients are necessary, diammonium phosphate should be used instead. Urethane levels appear to be higher in certain wines, including Chardonnay, Sauvignon blanc and Chenin blanc, and is probably due to higher nitrogen levels in these varieties.

Fertilization is known to cause higher nitrogen levels in juice including amino acids such as arginine which lead to higher urethane levels in wine. Fertilization should therefore be kept to a minimum.

Other enology practices may influence urethane production and warrant further investigation, including choice of yeast strain and fermentation management. Different yeast may utilize nitrogen sources differently and produce different levels of urethane. The efficiency of nitrogen utilization can change with fermentation temperature and aeration and may effect urethane production.

Analytical methodology, reliable down to 1-5 ppb, exists for determining urethane in wine. A number of commercial laboratories in California will analyze wines for urethane; one which has been recommended is ETS Labs, 1204 Church St, St. Helena, CA 94574 (707-963-4806). The cost is approximately $100 per sample.

During the past several weeks we have had a number of conversations with people on WAB and other people in the Oregon winegrape industry in an attempt to stay informed. It is our understanding that the OWA and WAB are currently determining the best ways in which the Oregon winegrape industry can participate in the solution to this problem. It seems prudent to us that our industry aligns itself with the voluntary agreement reached between the Wine Institute and the U.S. Food and Drug Administration for the monitoring and reducing urethane in wine.