



The relationship between wine and cancer



Background

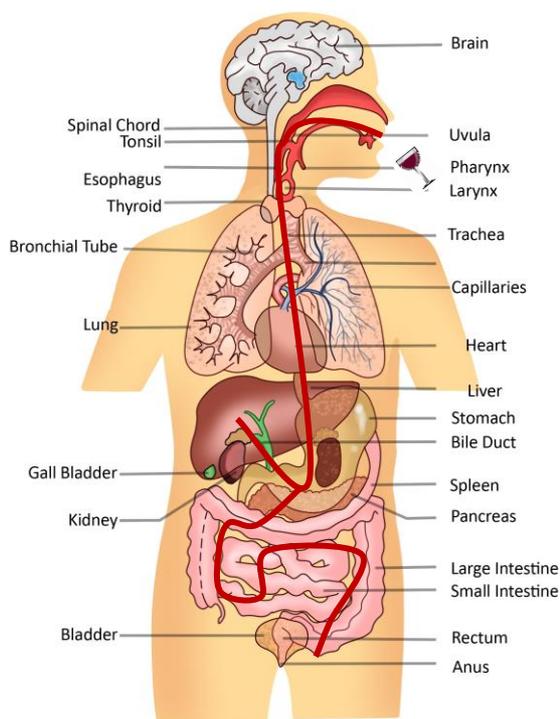
Cancer is now the primary cause of death in Australians aged 45 to 65 years and one of the primary causes of death in Australians aged over 65 years.

Did you know?

- Drinking wine does not necessarily increase your risk of developing all and any cancers.
- Drinking wine increases your risk of developing cancers of the mouth and throat, pharynx, larynx, oesophagus (collectively called the upper aero-digestive tract), liver, bowel and rectum compared to non-drinkers. These are the mucosal surfaces that come into direct contact with the alcohol contained in wine after you take a mouthful.
- For women, your risk of developing breast cancer is also increased.
- The risk of developing upper aero-digestive tract cancer is greater than for developing cancers of the bowel, rectum and breast, and liver cancer primarily develops in people with alcohol-liver cirrhosis.
- The relationship between the amount of wine you drink each day and your risk of developing certain cancers of the aero-gastrointestinal tract and breast increases in a straight line. Simply, the more wine that you drink then the more that your risk of developing certain cancers is increased. For example, when you drink a light amount of wine the risk is low while when you drink a heavy amount of wine the risk is high. This is in contrast to the relationship between the amount of wine and your risk of developing diseases of the heart which is j-shaped and where drinking



a light to moderate amount may reduce your risk. Heavy drinking increases the risk of developing these cancers by about 50%.



Alcohol's effect on the organs.

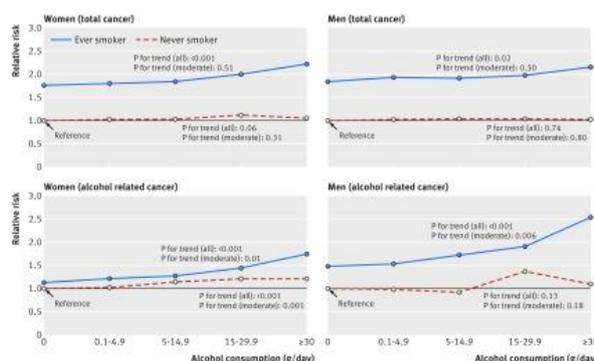
Amount and pattern of drinking alcohol and risk of developing cancer

While there is no known 'safe' amount of wine, a population study that followed patients for 34 years, showed stronger direct relationships in risk for cancers of the oral cavity and pharynx, oesophagus and larynx but less strong direct relationships for cancers of the bowel and rectum, liver and breast. For all these cancers, the risk significantly increased when more than 25-30 g alcohol or two and a half standard to three drinks were drunk per day (Bagnardi et al. 2001, Cao et al. 2015).

It has also been suggested that your risk of developing a cancer of the aero-digestive tract

is less if you drink wine with food (Dal Maso et al. 2002).

A review of more than 7,000 peer-reviewed papers on the association of lifestyle factors and cancer undertaken by the World Cancer American Institute for Cancer Research (2007), reports that there are alcohol thresholds for bowel, rectum and liver cancers. For example, the review reports that there is only an increased risk for bowel and rectum cancers for both men and women when more than 30 g alcohol per day is consumed.



Risk of total and alcohol-related cancer jointly by alcohol consumption and smoking history (Cao et al. 2015).

Mechanisms of action

Cells that are damaged can simply digest themselves (autodigest or necrose). There is also programmed cell death (apoptosis) where the damaged cell breaks apart and is broken down by other cells in the body. The body automatically replaces the cell. Cancer may occur either when the damaged cell fails to undergo programmed cell death and multiples, or when the replaced cell is also damaged and multiplies. Multiplying cells are most at risk of damage by cancer-causing compounds. Thus, cancer occurs basically when the rate of multiplication of damaged cells greatly exceeds the rate of programmed cell death.



The mechanism(s) of action in causing cancer from the alcohol contained in wine is not completely understood, and differ for the different cancers.

Alcohol itself may not necessarily cause cancer but may induce or promote the actions of other cancer-causing compounds, or may produce cancer-causing compounds. For example, the first product of alcohol's breakdown in the liver is acetaldehyde, which is considered to be a cancer-causing-compound that directly damages cells and cellular constituents. It also binds to and damages DNA, interfering with its repair and production, for example, increasing the rate of production of damaged cells. When it is broken down in the liver, alcohol also produces cancer-causing compounds called free radicals, which damage cells and cellular constituents.

In addition, alcohol may induce or promote the actions of cancer-causing compounds by, for example, enabling cancer-causing-compounds to enter the mucosal surfaces of the body; the mucosa is the protective membrane that lines the body's cavities and passages. Other cancer causing mechanisms of action for alcohol include effects on chemicals and nutrients that are cancer protective, and on the immune system which may then not control cancer cell development and growth.

Breast cancer

Drinking wine also increases the risk of developing breast cancer in both pre- and post-menopausal women (Cao et al. 2015). This risk factor is additive with other risk factors for breast cancer such as: lifestyle; family history; medical history; reproductive history; sex hormones including testosterone,

estradiol and hormone replacement therapy; body mass index; and environmental exposure to cancer-causing-compounds or carcinogens.

Studies suggest that drinking wine may modify the significance of these risk factors. In particular, drinking wine actually increases the concentration of the sex hormones in your blood. An increased concentration of the sex hormones in blood, organs and tissues increases the risk of developing breast cancer (Dorgan 1994, 1996).

Studies suggest that drinking four to five drinks per session increases your risk of breast cancer by 50% compared to only one drink per session (Morch et al. 2007).

Did you know?

- When you drink heavy amounts of wine and smoke cigarettes, you significantly increase your risk of developing these cancers, especially cancers of the mouth and throat. The alcohol contained in wine may enable cancer-causing-compounds such as polycyclic aromatic hydrocarbons from cigarettes to enter the mucosal surfaces the body to damage cells and DNA (Cao et al. 2015).
- As not all heavy wine drinkers develop cancer and some light to moderate drinkers develop cancer, this suggests that your genes influence your risk of developing cancer. The rate that you break alcohol and acetaldehyde down in your liver is influenced by your genes. For example, you will breakdown the cancer-causing-compound acetaldehyde either quickly or slowly. If you break down the acetaldehyde slowly, it builds in your body for a longer time than if you break it down



quickly and has a longer time in which to damage cells and DNA.

- Recent research from animal and human studies suggest that the phenolic compounds contained in wine may protect the DNA of cells of body tissues from damage that can lead to cancer, or may stop the growth of cells with damaged DNA. In particular, population studies suggest that light to moderate wine consumption may protect against the initiation and progression of cancers of the mouth, throat, oesophagus, lung (Gronbaek et al. 1998, Prescott et al. 1999, Barstad et al. 2005, Benedetti et al. 2006, Chao 2007) and bowel (Gronbaek et al. 2000, Pedersen et al. 2003, Zell et al. 2007, Park et al. 2009) as well as non-Hodgkin's lymphoma (Briggs et al. 2002, Morton et al. 2003).

References and further reading

Baan, R., Straif, K., Grosse, Y. et al. (2007) Carcinogenicity of alcoholic beverages. *Lancet Oncol.* 8:292–293.

Bagnardi, V., Blangiardo, M., La Vecchia, C., Corrao, G. (2001) A meta-analysis of alcohol drinking and cancer risk. *Br. J. Cancer.* 85(11):1700-705.

Barstad, B., Sørensen T.I., Tjønneland, A., Johansen, D., Becker, U., Andersen, I.B., Grønbaek, M. (2005) Intake of wine, beer and spirits and risk of gastric cancer. *Eur J Cancer Prev.* 14(3):239-243

Benedetti, A., Parent, M.E., Siemiatycki J. (2006) Consumption of alcoholic beverages and risk of lung cancer: results from two case-control studies in Montreal, Canada. *Cancer Causes Control.* 17(4):469-480.

Blot, W.J. (1992) Alcohol and cancer. *Cancer Res.* 52(7 Suppl): p. 2119s-2123s.

Boffetta, P., Hashibe, M. (2006) Alcohol and cancer. *Lancet Oncol.* 7(2):149-156.

Briggs, N.C., Levine, R.S., Bobo, L.D., Haliburton, W.P., Brann, E.A., Hennekens, C.H. (2002) Wine drinking and risk of non-Hodgkin's lymphoma among men in the United States: a population-based case-control study. *Am J Epidemiol.* 156(5):454–462.

Cao, Y., Willett, W., Rimm, E.B., Stampfer, M.J., Giovannucci, E.L. (2015) light to moderate intake of alcohol, drinking patterns and risk of cancer: results from two prospective US cohort studies. *Br Med J.* 351:h4238 doi: 10.1136/bmj.h4238

Chao, C. (2007) Associations between beer, wine, and liquor consumption and lung cancer risk: a meta-analysis. *Cancer Epidemiol Biomarkers Prev.* 16(11):2436-2447.

Dal Maso, L., La Vecchia, C., Polesel, J., Talamini, R., Levi, F., Conti, E., Zambon, P., Negri, E., Franceschi, S. (2002) Alcohol drinking outside meals and cancers of the upper aerodigestive tract. *Int. J. Cancer.* 102(4):435-437.

Dorgan, J.F., Longcope, C., Stephenson, H.E. Jr., Falk, R.T., Miller, R., Franz, C., Kahle, L., Campbell, W.S., Tangrea, J.A., Schatzkin, A. (1996) Relation of prediagnostic serum estrogen and androgen levels to breast cancer risk. *Cancer Epidemiol. Biomarkers Prev.* 5(7):533-539.

Dorgan, J.F., Brown, C., Barrett, M., Splansky, G.L., Kreger, B.E., D'Agostino, R.B., Albanes, D., Schatzkin, A. (1994) Physical activity and risk of breast cancer in the Framingham Heart Study. *Am. J. Epidemiol.* 139(7):662-669.

Grønbaek, M., Becker, U., Johansen, D. et al. (2000) Type of alcohol consumed and



mortality from all causes, coronary heart disease and cancer. *Ann Intern Med.* 133:411–419.

Gronbaek, M., Becker, U., Johansen, D., Tonnesen, H., Jensen, G., Sorensen, T.I. (1998) Population based cohort study of the association between alcohol intake and cancer of the upper digestive tract. *Br Med J.* 317(7162):844-847.

International Agency for Research on Cancer (2007). Volume 96 Alcoholic Beverage Consumption and Ethyl Carbamate (Urethane). Meeting Summary. (accessed 1 June 2007) <http://monographs.fr/ENG/Meetings/index1.php>.

Key, J., Hodgson, S., Omar, R.Z., Jensen, T.K., Thompson, S.G., Boobis, A.R., Davies, D.S., Elliott, P. (2006) Meta-analysis of studies of alcohol and breast cancer with consideration of the methodological issues. *Cancer Causes Control.* 17(6):759-770.

Longnecker, M.P. (1995) Alcohol consumption and risk of cancer in humans: an overview. *Alcohol.* 12(2):87–96.

Longnecker, M.P. (1994) Alcoholic beverage consumption in relation to risk of breast cancer: meta-analysis and review. *Cancer Causes Control.* 5:73–82.

Mørch, L.S., Johansen, D., Thygesen, L.C., Tjønneland, A., Løkkegaard, E., Stahlberg, C., Grønbaek, M. (2007) Alcohol drinking, consumption patterns and breast cancer among Danish nurses: a cohort study. *Eur. J. Public Health.* 17(6):624-629.

Morton, L.M., Holford, T.R., Leaderer, B., Zhang, Y., Zahm, S.H., Boyle, P., Flynn, S., Tallini, G., Owens, P.H., Zhang, B., Zheng, T. (2003) Alcohol use and risk of non-Hodgkin's lymphoma among Connecticut women

(United States). *Cancer Causes Control.* 14(7):687-94.

Park, J.Y., Mitrou, P.N., Dahm, C.C., Luben, R.N., Wareham, N.J., Khaw, K.T., Rodwell, S.A. (2009) Baseline alcohol consumption, type of alcoholic beverage and risk of colorectal cancer in the European Prospective Investigation into Cancer and Nutrition-Norfolk study. *Cancer Epidemiol.* 33(5):347-354.

Pedersen, A., Johansen, C., Grønbaek, M. (2003) Relations between amount and type of alcohol and colon and rectal cancer in a Danish population based cohort study. *Gut.* 52(6):861-7.

Pöschl, G., Seitz, H.K. (2004) Alcohol and cancer. *Alcohol Alcohol.* 39(3):155-165.

Prescott, E., Gronbaek, M., Becker, U., Sorensen, T.I. (1999) Alcohol intake and the risk of lung cancer: influence of type of alcoholic beverage. *Am J Epidemiol.* 149(5):463-470.

World Cancer Research Fund (1997) American Institute for Cancer Research. Food, Nutrition and the Prevention of Cancer: A Global Perspective. Washington: American Institute for Cancer Research.

World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) (2007) Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective. Washington DC: World Cancer Research Fund.

Zell, J.A., McEligot, A.J., Ziogas, A., Holcombe, R.F., Anton-Culver, H. (2007) Differential effects of wine consumption on colorectal cancer outcomes based on family history of the disease. *Nutr Cancer.* 59(1):36-45.



The Australian Wine
Research Institute

Fact Sheet

Contact

For further information, please contact:

Dr Creina Stockley

This information sheet on the relationship between wine and cancer forms part of an Information Series on wine and health.

Phone 08 8313 6600 **Fax** 08 8313 6601

Email helpdesk@awri.com.au

Website <http://www.awri.com.au/>

Address Wine Innovation Central Building,
Corner of Hartley Grove & Paratoo Rd,
Urrbrae (Adelaide), SA 5064