Eerste Nederlandse congres alcohol en gezondheid

Amsterdam, 23 september 2010

Alcohol and Cancer: Are there risk factors beyond ethanol alone?

Dirk W. Lachenmeier

Chemisches und Veterinär-Untersuchungsamt Karlsruhe

Overview

- Summary of alcohol-related evaluations of the WHO International Agency for Research on Cancer (IARC)
- Mechanism for alcohol-associated carcinogenicity: ethanol, acetaldehyde and ethyl carbamate
- Quantitative data on alcohol-attributable cancer risk
- Policy implications

Alcohol-related evaluations of the WHO International Agency for Research on Cancer (IARC)

Timeline of Alcohol-Related IARC Evaluations

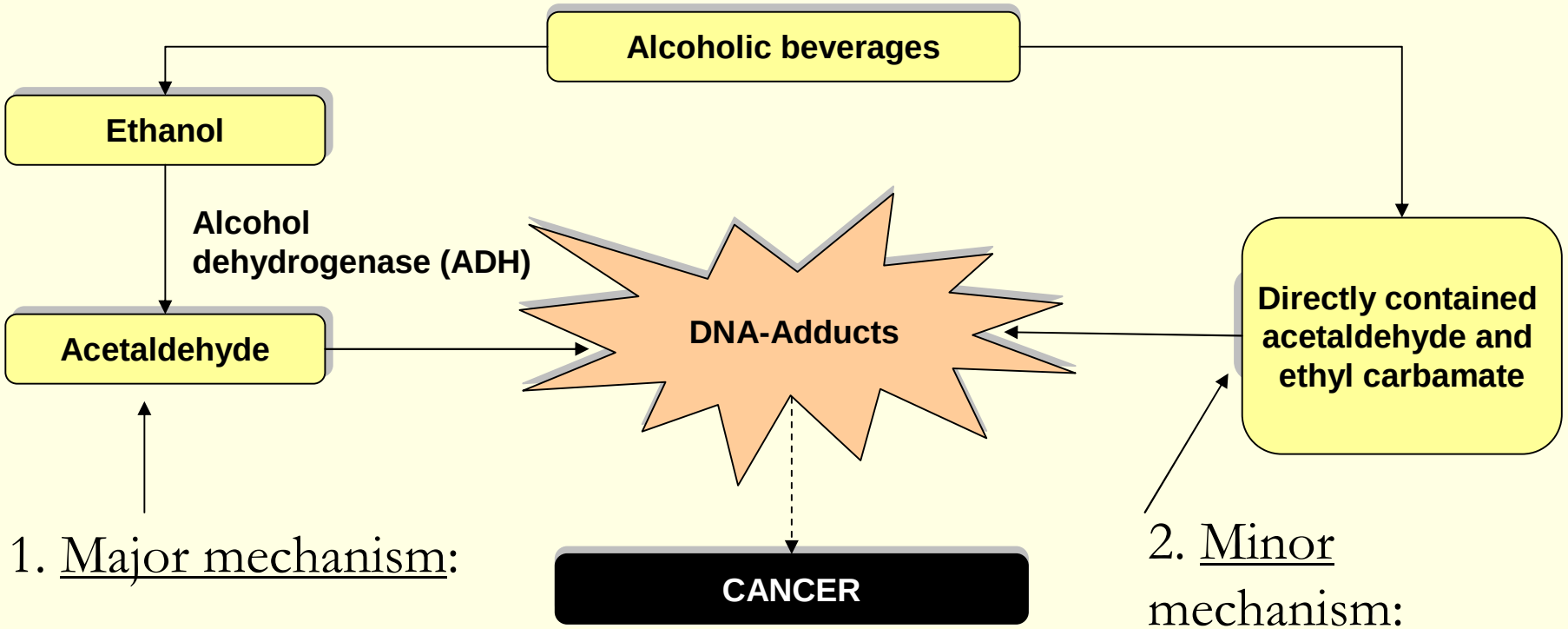
	1987 (Suppl. 7)	1988 (Vol. 44)	1999 (Vol. 71)	2007 (Vol. 96)	2009 (Vol. 100)
Alcoholic beverages		Group 1 Sites: oral cavity, pharynx, larynx, oesophagus and liver		Group 1 Plus: colo-rectum and female breast	Group 1 Plus: Pancreas (limited evidence)
Ethanol in alcoholic bevereages		(no evaluation, mechanism unclear)		Group 1	Group 1
Acetaldehyde associated with alcohol consumption	Group 2B (general evaluation)		Group 2B (general evaluation)		Group 1 Sites: Oesophagus, head and neck
Ethyl carbamate (common contaminant in alcohol)	Group 2B			Group 2A	

Summary of IARC evaluation

- There is sufficient evidence in humans for the carcinogenicity of alcoholic beverages.
- The occurence of malignant tumours of the oral cavity, pharynx, larynx, oesophagus, liver, female breast and colorectum is causally related to the consumption of alcoholic beverages.
- There is substantial mechanistic evidence in humans with aldehyde dehydrogenase deficiency that acetaldehyde derived from the metabolism of ethanol in alcoholic beverages contributes to the causation of malignant oesophageal tumours.
- Overall evaluation: Alcoholic beverages are carcinogenic to humans (Group 1). Ethanol in alcoholic beverages is carcinogenic to humans (Group 1). Acetaldehyde associated with alcohol consumption is carcinogenic to humans (Group 1).

Mechanism for alcohol-associated carcinogenicity

Two mechanisms for alcohol-related carcinogenesis

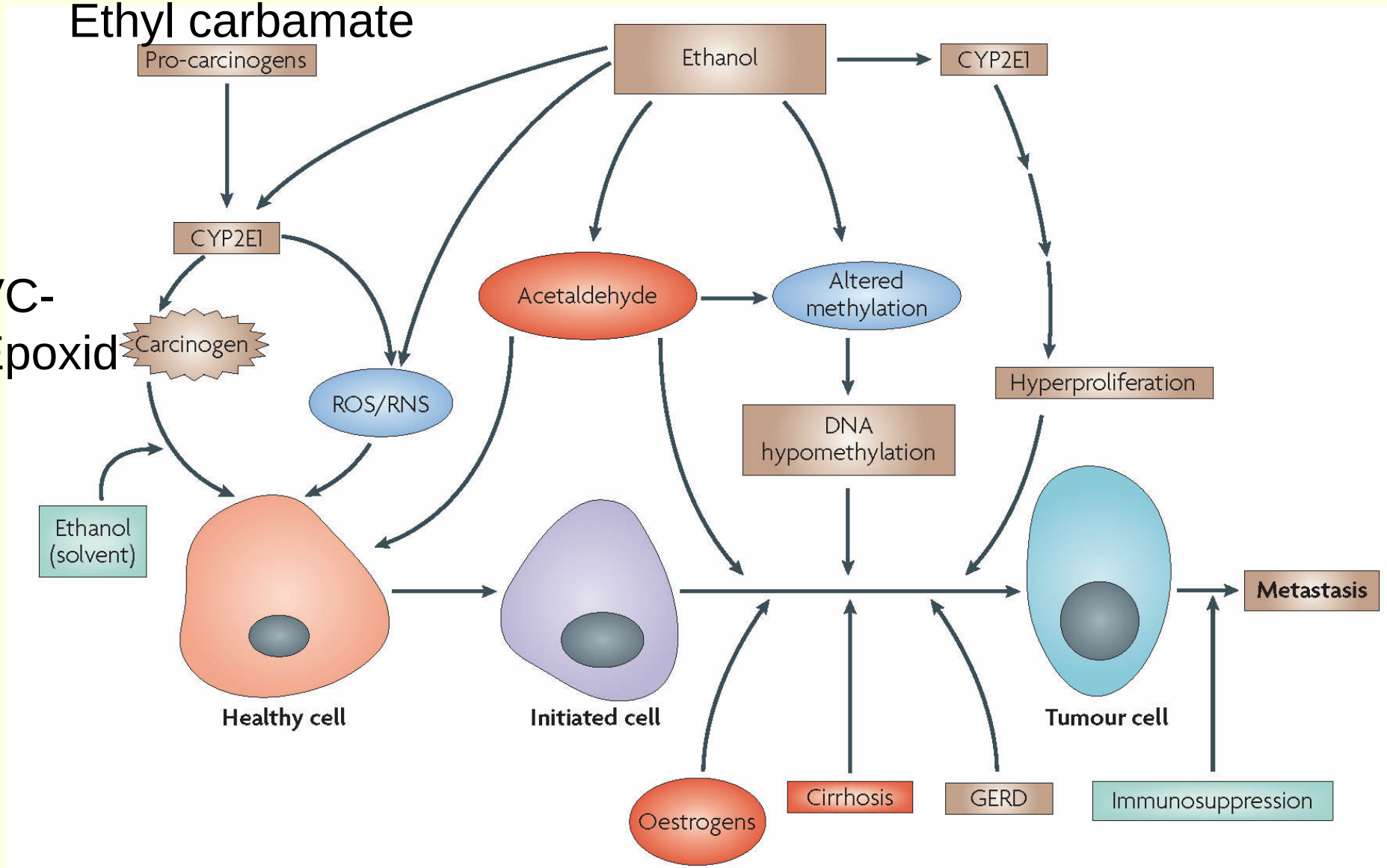


1. Major mechanism:

Ethanol and acetaldehyde from metabolism

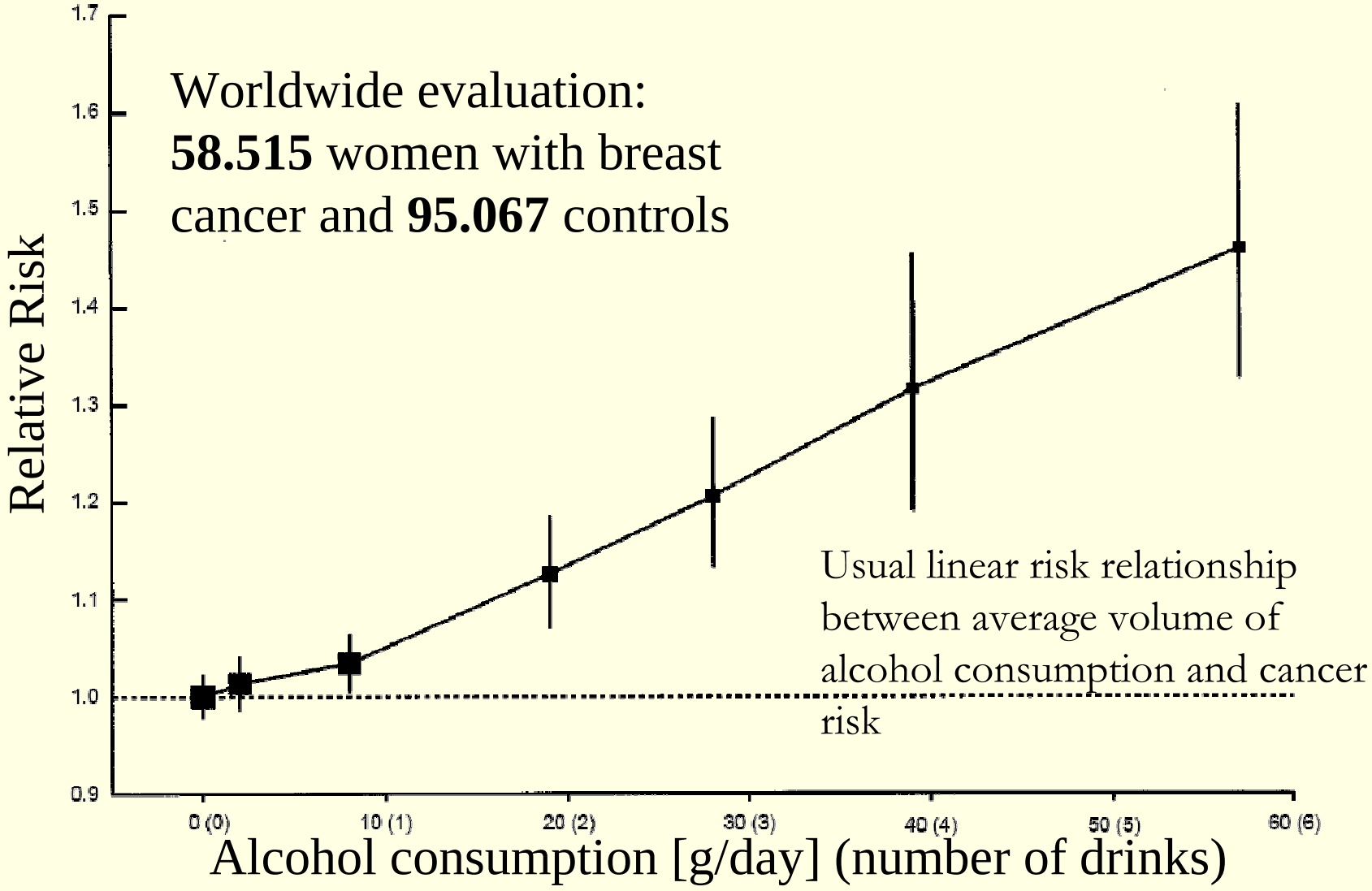
2. Minor mechanism:
Additive risk from carcinogens directly contained in the beverages

Mechanism of carcinogenesis caused by ethanol, acetaldehyde and ethyl carbamate



Seitz&Stickel, Nat. Rev. Cancer 2007, 7, 599

Dose-Response for Breast Cancer

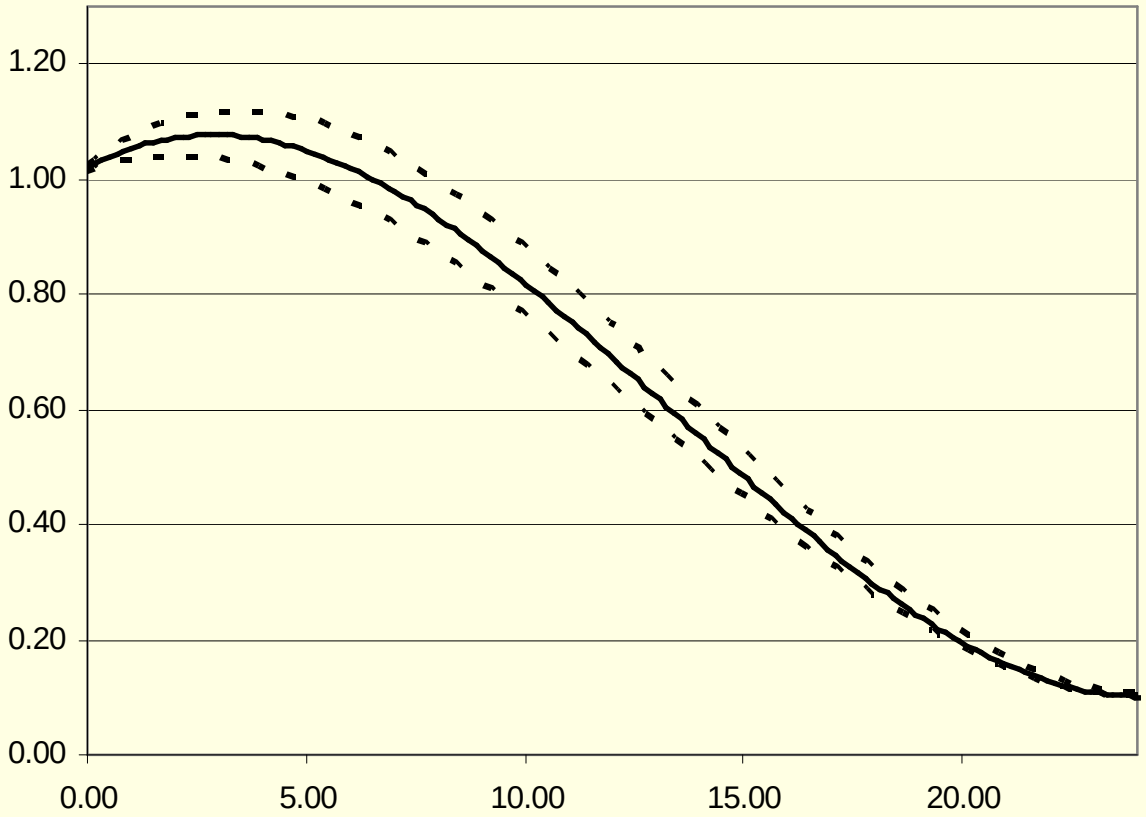


Source: Hamajima et al. (2002) BJC 87, 1234

What happens to people, if alcohol consumption is stopped or reduced?

- Meta-analysis of epidemiological literature by Rehm et al. (Int J Cancer 121, 1132-1137, 2007)
- 13 epidemiological studies including over 5,000 cases indentified about the effects of drinking cessation on the risk for head and neck and oesophagus cancers.
- Stopping drinking indeed reduced the cancer risks but it took 15-20 years, before the risks were as low as for lifetime abstainers.

Effect of drinking cessation on oesophageal cancer risk by duration



Risk of oesophageal cancer significantly increased within the first 2 years following cessation and was 2.5 times higher than that of current drinkers. Following this, the risk started decreasing rapidly and reached the risk of never drinkers after more than 15 years of abstention. In total 63% of risk reduction was observed after 15 years of quitting drinking compared to current drinkers.

Rehm et al. Int J Cancer 121, 1132-1137 (2007)

Quantitative data on alcohol-attributable cancer

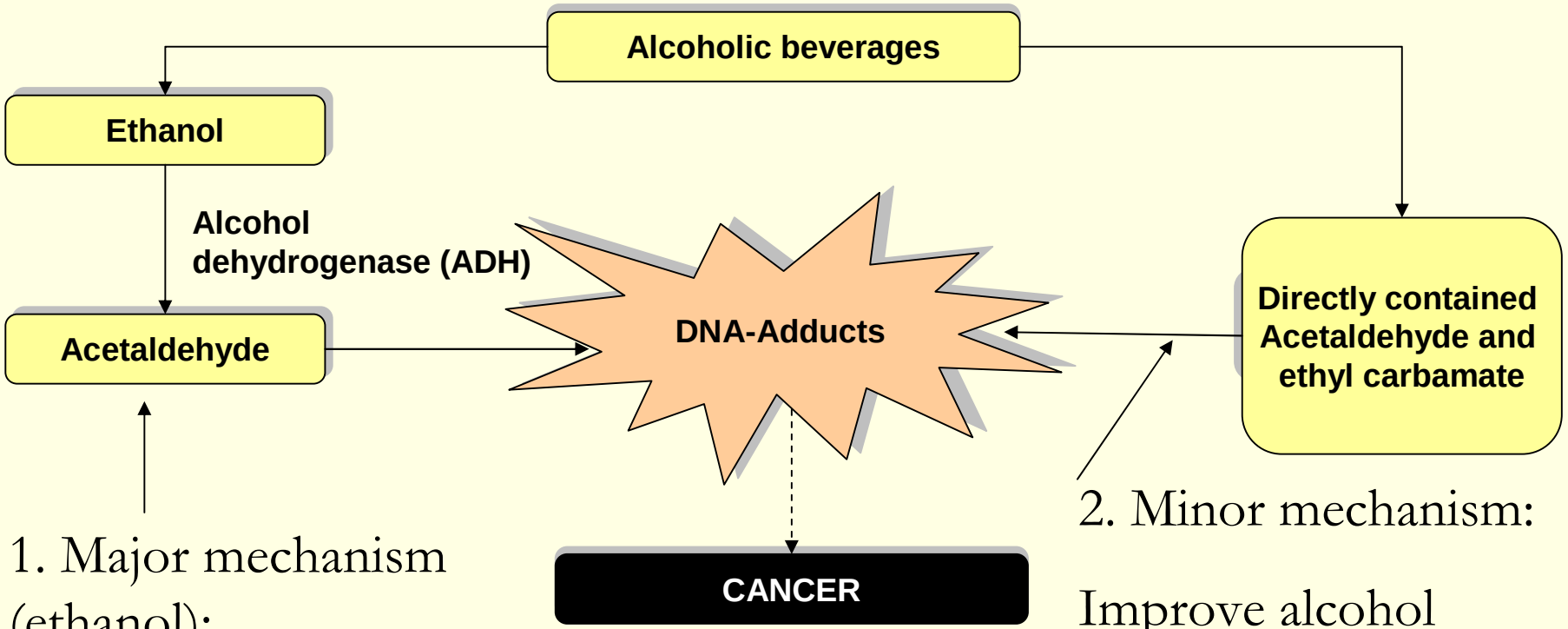
Alcohol-attributable DALYs

DALY					
Disease Category	**EUR A**				
	M	**W**	**T**	**M%**	**W%**
Maternal and perinatal conditions (low birth weight)	2.394	1.878	4.272	0,1%	0,2%
Cancer	375.454	236.704	612.158	12,0%	23,4%
Diabetes mellitus	0	0	0	0,0%	0,0%
Neuropsychiatric disorders	1.469.490	403.034	1.872.524	46,8%	39,8%
Cardiovascular diseases	109.274	22.175	131.450	3,5%	2,2%
Cirrhosis of the liver	473.422	191.462	664.883	15,1%	18,9%
Unintentional injuries	553.495	115.108	668.604	17,6%	11,4%
Intentional injuries	156.634	41.550	198.184	5,0%	4,1%
Total 'detrimental effects' attributable to alcohol	3.140.164	1.011.911	4.152.074	100,0%	100,0%
Diabetes mellitus	-109.545	-42.530	-152.076	24,3%	9,8%
Cardiovascular diseases	-341.394	-390.435	-731.829	75,7%	90,2%
Total 'beneficial effects' attributable to alcohol	-450.940	-432.965	-883.905	100,0%	100,0%
All alcohol-attributable net DALY	**2.689.224**	**578.946**	**3.268.170**		
All DALYs	26.813.110	24.625.031	51.438.141		
Percentage of all net DALYs attributable to alcohol	**10,0%**	**2,4%**	**6,4%**		

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., Patra, J. (2009): Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. Lancet 373: 2223-2233.
WHO. (2009): Global Health Risks. Mortality and burden of disease attributable to selected major risks. Geneva, Switzerland: WHO.

Policy implications

Policy implications to reduce alcohol-related cancers



1. Major mechanism (ethanol):

General policy measures to reduce alcohol consumption

2. Minor mechanism:

Improve alcohol quality, introduce maximum limits for contaminants into EU law

Warning Labels?

Conclusions

- Alcoholic beverages are carcinogenic to humans (IARC Group 1).
- Linear dose-response relationship between volume of alcohol consumption and cancer risk
- No clear-cut threshold for drinking without cancer risk
- The development of cancer lags behind for 2-15 years, even after cessation of drinking
- Research is needed about the contribution of the different mechanisms (ethanol, acetaldehyde, ethyl carbamate) to cancer risk
- Contamination of alcoholic beverages with carcinogens is avoidable and should be subjected to improved regulatory control (EU-wide maximum limits needed)
- Policy measures should also include unrecorded alcohol, which might be especially prone to contamination with carcinogens

Thanks for your attention

**Chemisches und Veterinär-
Untersuchungsamt Karlsruhe**

E-Mail: Lachenmeier@web.de

Thanks to:
Jürgen Rehm, CAMH, Toronto, for quantitative data on cancer burden and slides about drinking cessation