

### Alcohol

Absorption	Ethanol is absorbed in small intestine and metabolised in liver
Metabolisation factors	Gender, body fat, liver size, amount of metabolic enzymes
Metabolism slide	

### Beer composition

Water	Beer is 93% water, which counters dehydration
	Also helps with uric acid -> kidney stones
	Helps mineral balance
	Better water to calories ratio
	Low alcohol (free) beer is isotonic (have same tension)
Water numbers	1 g of alcohol -> 10ml urine excretion
	Alcohol makes you pee more by suppression of vasopressin, which is hormone that reuptakes water
	Dehydration -> hangovers
Net water intake	330ml beer -> 191 ml
	125ml wine -> -11
Health benefits	Less kidney stones (40% risk reduction)
	Beer after exercise does not decrease water uptake

### Major nutrients

	per 100 ml	per 330 ml
Energy	156kJ / 37kcal	515kJ / 122kcal
Water	93 g	307 g
Alcohol	3,6 g	12 g
Protein	0,3 g	1 g
Carbohydrate	2,7 g	9 g
Fat	0 g	0 g

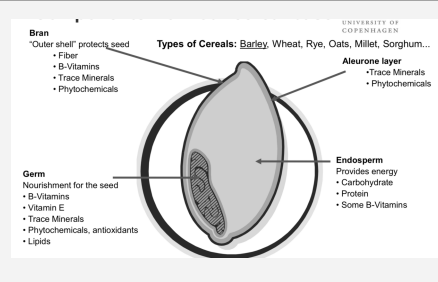
Table 4  
Energiegehalt von und  
Ernährungsbedeutung

1 g protein:	17 kJ oder 4 kcal
1 g Fett:	37 kJ oder 9 kcal
1 g Kohlenhydrat:	17 kJ oder 4 kcal
1 g Alkohol:	29 kJ oder 7 kcal
1 kJ = 0,239 kcal	
1 kcal = 4,184 kJ	

### Calorie counts and exercise

Beer	12 oz = 150 kcal, alc free 100 kcal
Red wine	125 kcal (anti-inflammatory)
Pina Colada	6 oz = 460 kcal
Margarita	280 kcal
100 kcal is	Casual biking: 23 min
	Lifting weights: 15 mins
	Pilates: 24 mins
	Swimming: 15 mins moderate intensity

### Nutrients



### Nutrients II

Major nutrients	readily available carbohydrates: 10 - 60 g/litre as dextrins
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### Nutrients II (cont)

	little free sugars: < 5 g/litre – typical lager = 1 g/litre
	Fibre: 1 beer contains 3-6% of the daily requirement for fibre
	no fat
	protein as small peptides – 2 - 6 g/litre
Trace nutrients	vitamins, minerals, antioxidants, other hop compounds
Vitamins	Cereals good for B vitamins, malting increases B9 and B6 (spouting), B2 from yeast
	Beer is more vitamin rich than beer
	Too high levels of homocysteine = heart disease, increase in level of homocysteine after wine and spirits consumption, but not for beer
	Lots of potassium and magnesium in beer
	lots of silicon in beer, which is not readily available anymore in water
	antioxidants in beer help against free radicals that can start cancers
Polyphenols	positive: beer taste and aging stability, health

## Nutrients II (cont)

negatives: haze (together with proteins),  
astringent bitterness

beer < white wine < red wine, beer has way  
less

shown to protect LDLs from oxidation

## Health

Harmful effects Accidents, brain degeneration,  
hepatitis, cancer, stroke

Amount pr week 7 for women, 14 for men, stop  
before 5 on one occasion

Most consumed alcohol Wine, then beer

Habits Beer drinkers were generally  
more unhealthy compared to  
wine drinkers

Beer vs wine Higher drinking frequency,  
shorter education, lower  
income, more men, more  
smoking, lower exercise, less  
healthy diet

## Calculation of BAC

Formula  $C = A / (p \cdot r)$

C BAC

A Alcohol intake in grams

p body weight in kg

r distribution or reduction factor

## Calculation of decrease in BAC

Formula  $C_t = C_0 - k \cdot t$

$C_t$  current BAC in promille

$C_0$  legal BAC in promille

k individual factor, ca 1/400

t time in minutes

rule of thumb bac decreases 0.15 bac/hr

Exercise slides for examples

## Exercise 1

### Exercise No. 1

#### Case

Mr. Olsen (75 kg, average constitution) drinks one liter of beer (5% abv.) after a football match in Copenhagen.

- Calculate his blood alcohol concentration (BAC) (‰)
- Is Mr. Olsen able to drive his Fiat home?
- How long time will Olsen have to wait before being able to drive his car again?

## Exercise 1 answers

### Answer to Exercise No. 1

- $5.0 \text{ ABV\%} \times 1000 \text{ ml beer} = 50 \text{ ml alcohol}$   
 $50 \text{ ml alcohol} \times 0.789 \text{ g/ml} = 39.5 \text{ g alcohol}$   
 $39.5 \text{ g alcohol} / (75 \text{ kg} \times 0.7 \text{ factor}) = 0.75 \text{ (‰)}$   
BAC = 0.75
- Olsen can't drive home as legal limit is 0.5 in Denmark
- Calculation of time to  $C_t = 0.5\text{‰}$   
 $t = (C_0 - C_t) \cdot 400 = (0.75 - 0.5) \cdot 400 = 100 \text{ minutes}$   
Rule of thumb: the blood alcohol conc. falls about 0.15‰ / hour

## Exercise 2.1

### Exercise No. 2

Compare the energy content (kJ) in:

Beer – Red wine – White wine – and Whisky

- per 100 ml
- per drink (12 g alcohol)
- Carbohydrate + protein pr. 100 ml is 3.0 g for beer, 1.7 g for red wine, 2.6 g for white wine and 0 g for whisky

Note: energy from alcohol = 29 Kilo Joule / g alcohol

## Exercise 2.1 answers

### Calculation

Find amount of alcohol in 100 ml:  
 $(4.6 / 100) \text{ ml/ml} \times 100 \text{ ml} \times 0.789 \text{ g/ml} = 3.63 \text{ g alcohol}$

Find energy from alcohol in 100 ml:  
 $3.63 \text{ g alcohol} \times 29 \text{ kJ/g} = 105 \text{ kJ}$

Find energy from other macro nutrients:  
 $2.7 \text{ g carbohydrate} \times 17 \text{ kJ} = 46 \text{ kJ}$

$0.3 \text{ g protein} \times 17 \text{ kJ} = 5.1 \text{ kJ}$

Total energy content in 100 ml beer: 156 kJ

## Exercise 2.2

### Energy content in alcoholic beverages

Note: Alcohol density = 0.789 g/ml. Energy from alcohol = 29 kJ/g

	Beer 4.6% vol. (330 ml)	Red wine 12% vol. (125 ml)	White wine 12.5% vol. (125 ml)	Whisky 46% vol. (33 ml)
Energy content per 100 ml				
Energy content per drink				

## Effects of alcohol consumption

2-4 drinks mortality protection of 18%  
(men) 1-2  
(women)

Jshaped curve Risk goes down with  
moderation, goes up with  
excessive use

HDL and LDL High density lipoprotein up  
with alcohol (good cholesterol)

LDL down with alcohol (bad  
cholesterol)

diabetes in moderate drinkers 30% reduced risk of  
diabetes

alcohol is anti-inflammatory

### Effects of alcohol consumption (cont)

enhanced insulin sensitivity with lower plasma insulin concentrations (risk factor for diabetes)

partly due to lower average weight of drinkers (obesity is a risk factor for diabetes)

#### Cognitive function

Alcohol decreases arteriosclerosis in brain vessels, Protective antioxidative effects of polyphenols on cerebral cells (both good)

“regular consumers of alcohol had a significantly lower risk of Alzheimer’s compared to non-drinkers”, protection was 50% for moderate drinkers

1-6 drinks/week associated with lower risk of dementia in ≥ 65year adults, 20% reduction in dementia risk for moderates

### Effects of alcohol consumption (cont)

Alcohol triggers release of dopamine, a hormone, which plays a major role in reward-motivated behavior

#### Osteoporosis

“a positive association between alcohol intake and bone mineral density in older women has been reported in the original Framingham Osteoporosis Study”

Suppression of gradual bone loss that increases with age, called resorption, Positive effect of silicon on bone formation

Moderate consumption of alcohol may be beneficial to bone mineral density in men and postmenopausal women. The tendency toward stronger associations between BMD and beer or wine, relative to liquor, suggests that constituents other than ethanol may contribute to bone health.

### Exercise 2.2 answers

#### Energy content in alcoholic beverages

	Beer 4,6% vol. (330 ml)	Red wine 12% vol. (125 ml)	White wine 12,5% vol. (125 ml)	Whisky 46% vol. (33 ml)
Energy content per 100 ml	156 kJ	303 kJ	330 kJ	1053 kJ
Energy content per drink	515 kJ	379 kJ	413 kJ	347 kJ



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