SMP-Symposium vom 28. August 2023

Milchprodukte und das metabolische Syndrom

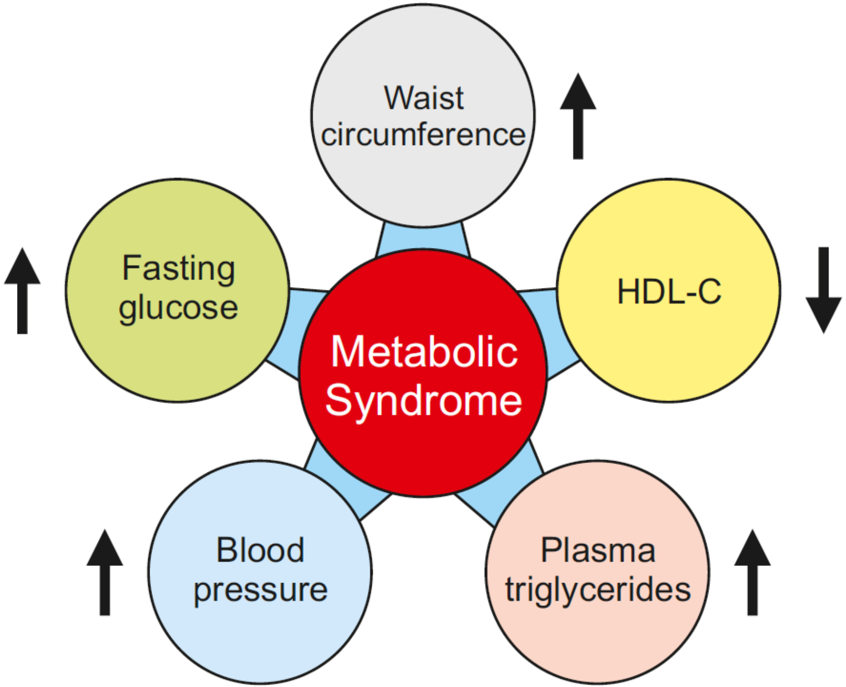
Nicolai Worm

www.nicolai-worm.de

Definition des metabolischen Syndroms (IDF)

	Europäische Männer	Europäische Frauen
Taillenumfang	≥ 94 cm	≥ 80 cm
Plus mindestens zwei der folgenden Faktoren		
Triglyceride	≥ 150 mg/dl	≥ 150 mg/dl
HDL	< 40 mg/dl (0,9 mmol/l)	< 50 mg/dl (1,1 mmol/l)
Systolischer Druck oder (diastolischer Druck)	≥ 130 mg/dl (≤ 85 mmHg)	≥ 130 mg/dl (≤ 85 mmHg)
Nüchternblutglukose	≥ 100 mg/dl	≥ 100 mg/dl

Das metabolische Syndrom



Das metabolische Syndrom: per Definition keine Krankheit, sondern eine Ansammlung einzelner metabolischer Risikofaktoren wie abdominale Adipositas, Bluthochdruck, Hyperglykämie, Hypertriglyzeridämie und niedrige HDL-Cholesterinkonzentration.

Wang HH, et al. Pediatr Gastroenterol Hepatol Nutr. 2020;23(3):189-230

Metabolic Syndrome and Its Association with Nonalcoholic Steatohepatitis

KEY POINTS

- The presence of insulin resistance is almost universal in patients with nonalcoholic fatty liver disease (NAFLD) and/or metabolic syndrome (MetS).
- Insulin resistance, and lipotoxicity, are systemic processes that can affect multiple organs, including the liver. Genetic and epigenetic factors determine which organs are affected, and thus defining the specific phenotype of the patient.
- Nonalcoholic fatty liver disease can exist in the absence of the cardiometabolic risk factors that define the metabolic syndrome.
- Targeting insulin resistance in clinical practice should be a major target, including interventions to achieve weight loss, and medications that are insulin sensitizers.

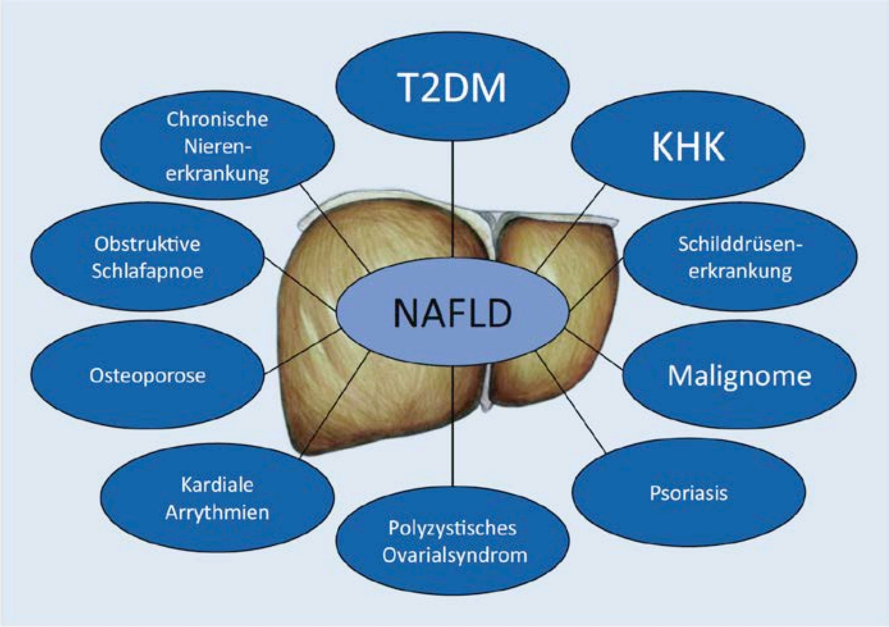
The close relationship between the metabolic syndrome (MetS) and nonalcoholic fatty liver disease (NAFLD) is well described in the literature.[1,2] Indeed, due to this strong association, NAFLD has oftentimes been referred to as the hepatic expression of the MetS, and recently suggested that NAFLD should be renamed metabolic-associated (dysfunction) fatty liver disease (MAFLD).[3] Moreover, a recently proposed

Bril F, et al. Clin Liver Dis 2023; 27:187–210

Nichtalkoholische Fettlebererkrankung

Hepatische Manifestation des metabolischen Syndroms

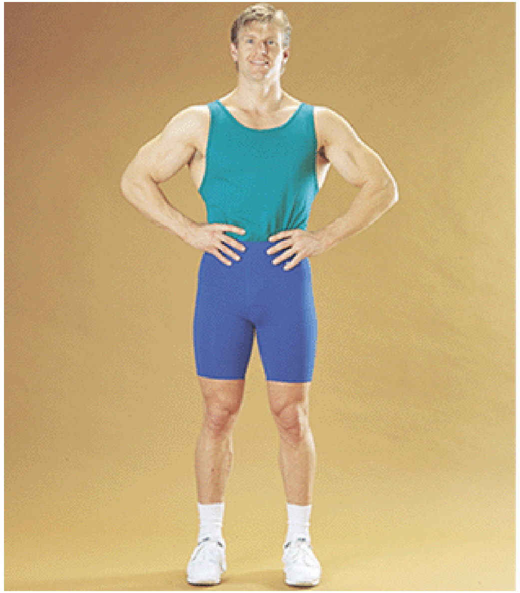
Elke Roeb
Schwerpunkt Gastroenterologie, Zentrum für Innere Medizin, Justus-Liebig-Universität & Universitätsklinikum Gießen, Gießen, Deutschland



Roeb E. Die Innere Medizin 2023;64:323–328

Warum ist der BMI kein MetS-Kriterium?

BMI = 30



BMI = 30

Metabolisch-vaskuläres Risiko durch ektopes Fett

energiedichte, hochverarbeitete Nahrung

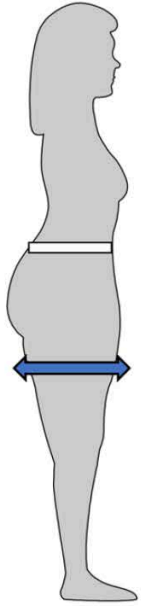
positive Energiebilanz

inaktiver Lebensstil, kaum anstrengende Muskelaktivität

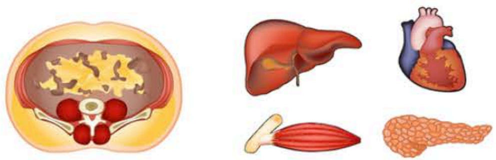
Unterhaut-Fettgewebe speichert Energieüberschuss

ja

nein



Unterhaut-Fettgewebe lagert Fett ein



↓ viszerale Adipositas

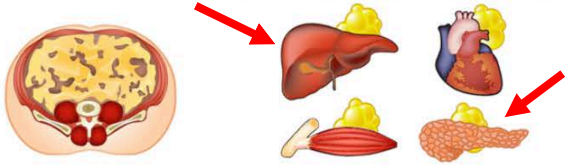
Organe ohne ektopes Fett

Favorable metabolic profile indicative of a low cardiometabolic risk

Einflussfaktoren auf viszerale Adipositas

- Age (older)
- Sex (male)
- Altered neuroendocrine and hormonal profile
- Unfavorable genotype
- Ethnicity (Caucasians, Asians)
- Smoking
- Overactivation of the endocannabinoid system
- Excessive alcohol consumption
- Maladaptive response to stress
- Etc.

Bauchhöhle lagert Fett ein



↑ viszerale Adipositas

ektope Fetteinlagerung in Organen

Altered metabolic profile indicative of an increased cardiometabolic risk

Insulin resistance
- Hyperinsulinemia
- Impaired glucose tolerance
- Metabolic syndrome
- Type 2 diabetes

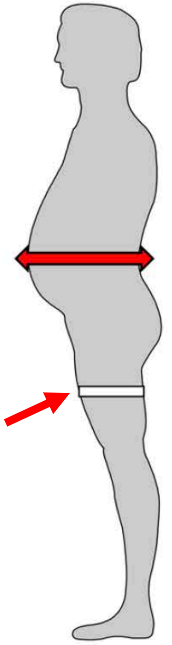
Dyslipidemia
- ↑ Triglycerides
- ↑ Apolipoprotein B
- Small, dense LDL particles
- ↓ HDL-cholesterol

Low-grade systemic inflammation
- Increased proinflammatory adipo/cytokines

Neurohormonal disturbances
- Activation of the sympathetic nervous system and of the renin-angiotensin-aldosterone system
- ↓ Atrial and brain natriuretic peptide levels

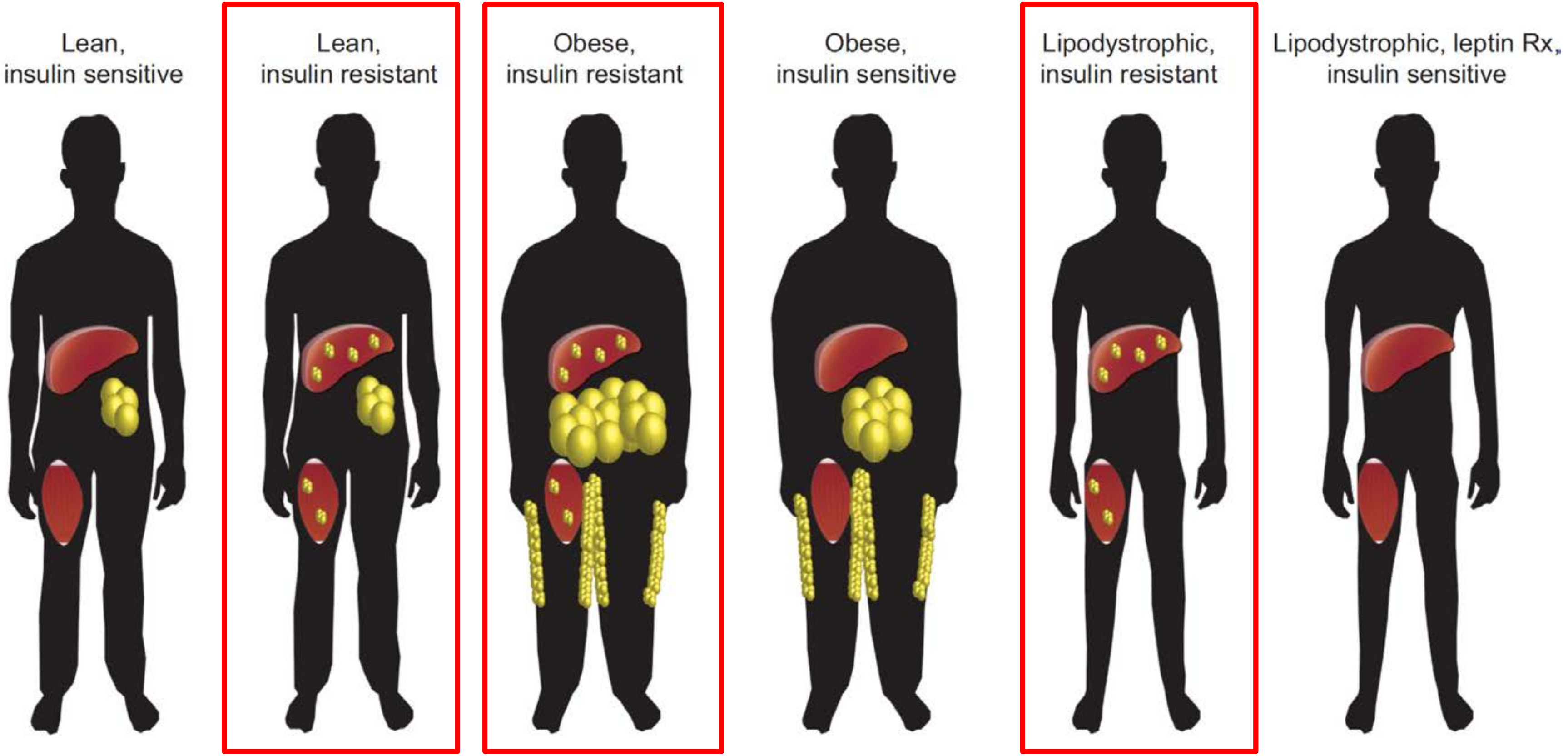
Metabolic dysregulation
- Accumulation of toxic lipid metabolites
- Mitochondrial dysfunction
- ↓ Metabolic flexibility
- Impaired myocardial metabolism

Endothelial dysfunction



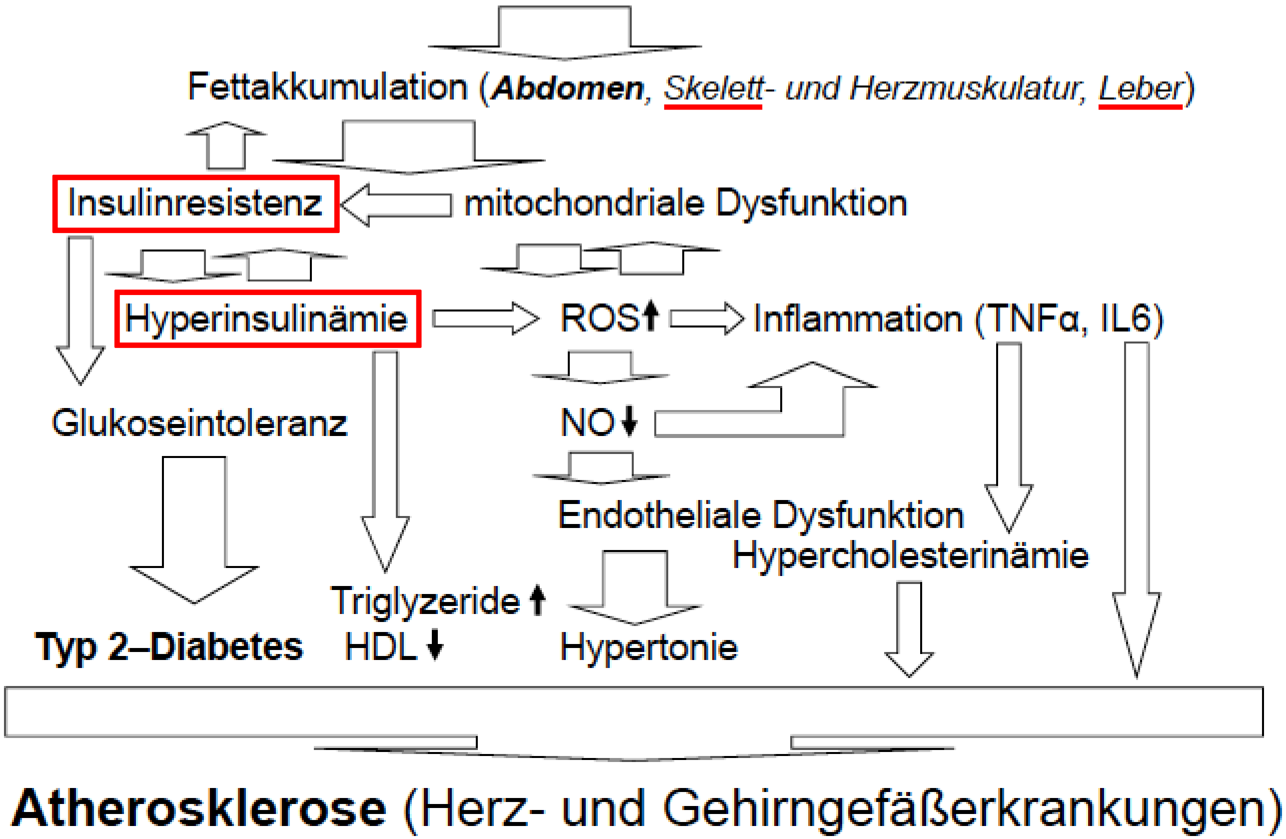
Chartrand JD, et al. Curr Atheroscler Rep 2022;24(4):185-195;

Metabolisches Risiko: Ektopes Fett – nicht „Übergewicht“!

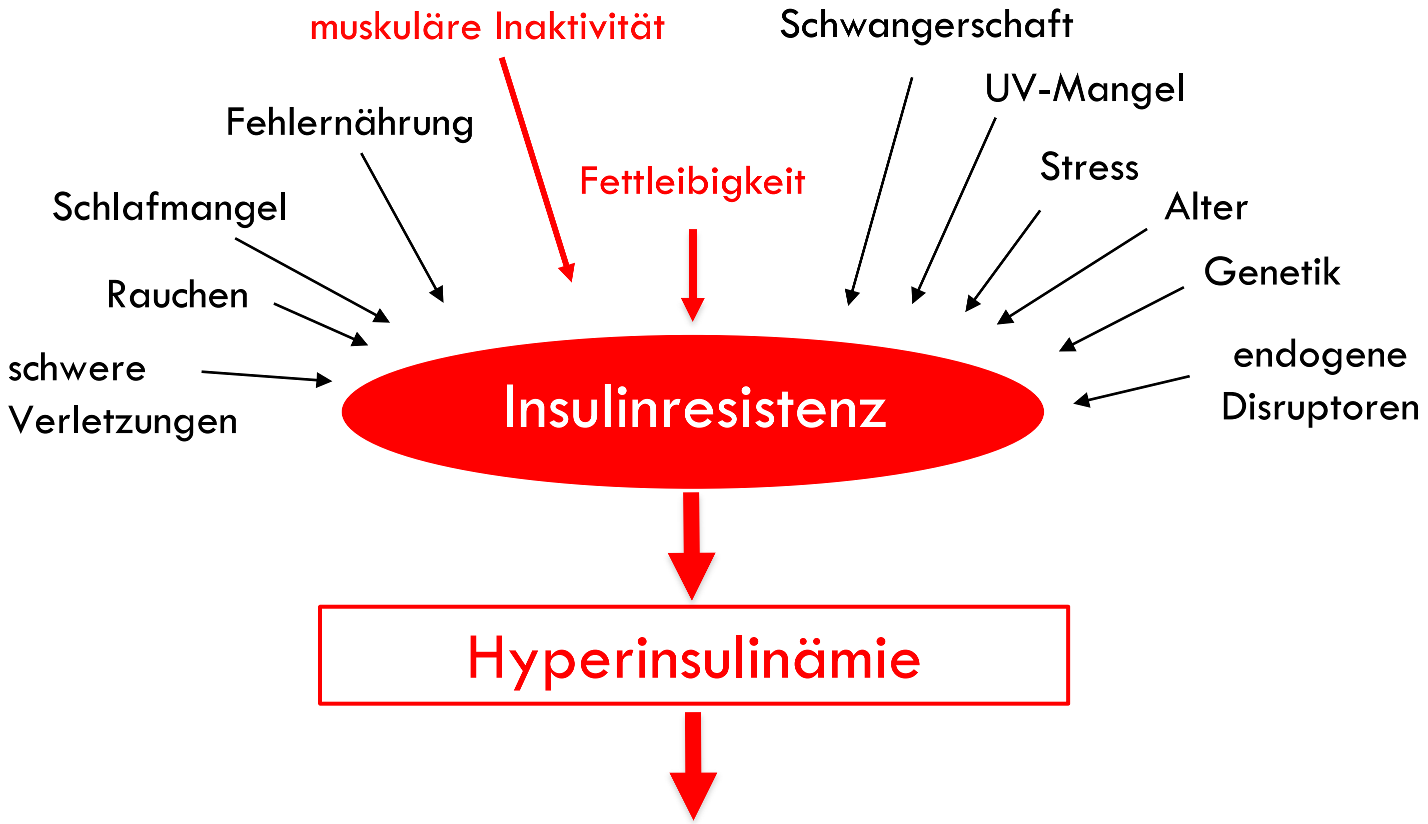


Petersen MC & Shulman GI. Physiol Rev 2018;98:2133–2223

Akkumulation von ektopem Fett fördert Insulinresistenz und Hyperinsulinämie



Burtscher M. Therapeutische Umschau 2015;72(5):293-301

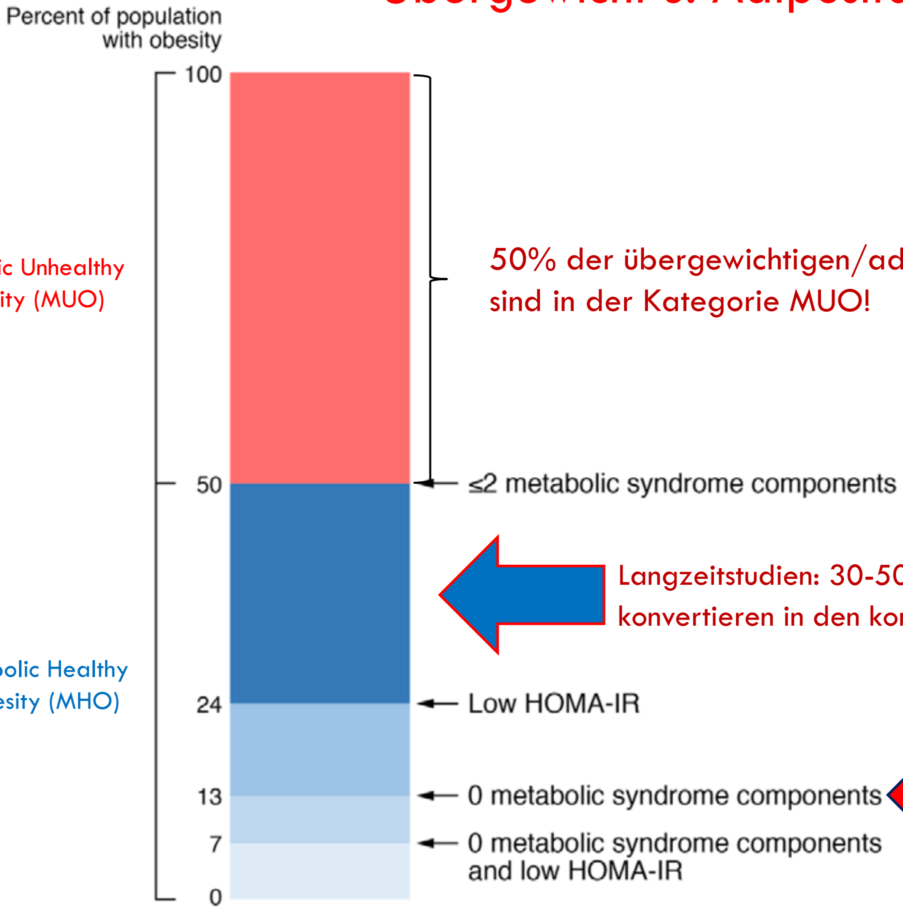


Metabolisches Syndrom, Fettleber, Diabetes, kardiovaskuläre Erkrankungen,
Demenz, sexuelle Dysfunktion, Psoriasis
und andere Zivilisationskrankheiten

Prävalenz von Insulinresistenz / Metabolischem Syndrom bei Übergewicht u. Adipositas in Europa und USA

Metbolic Unhealthy Obesity (MUO)

Metbolic Healthy Obesity (MHO)



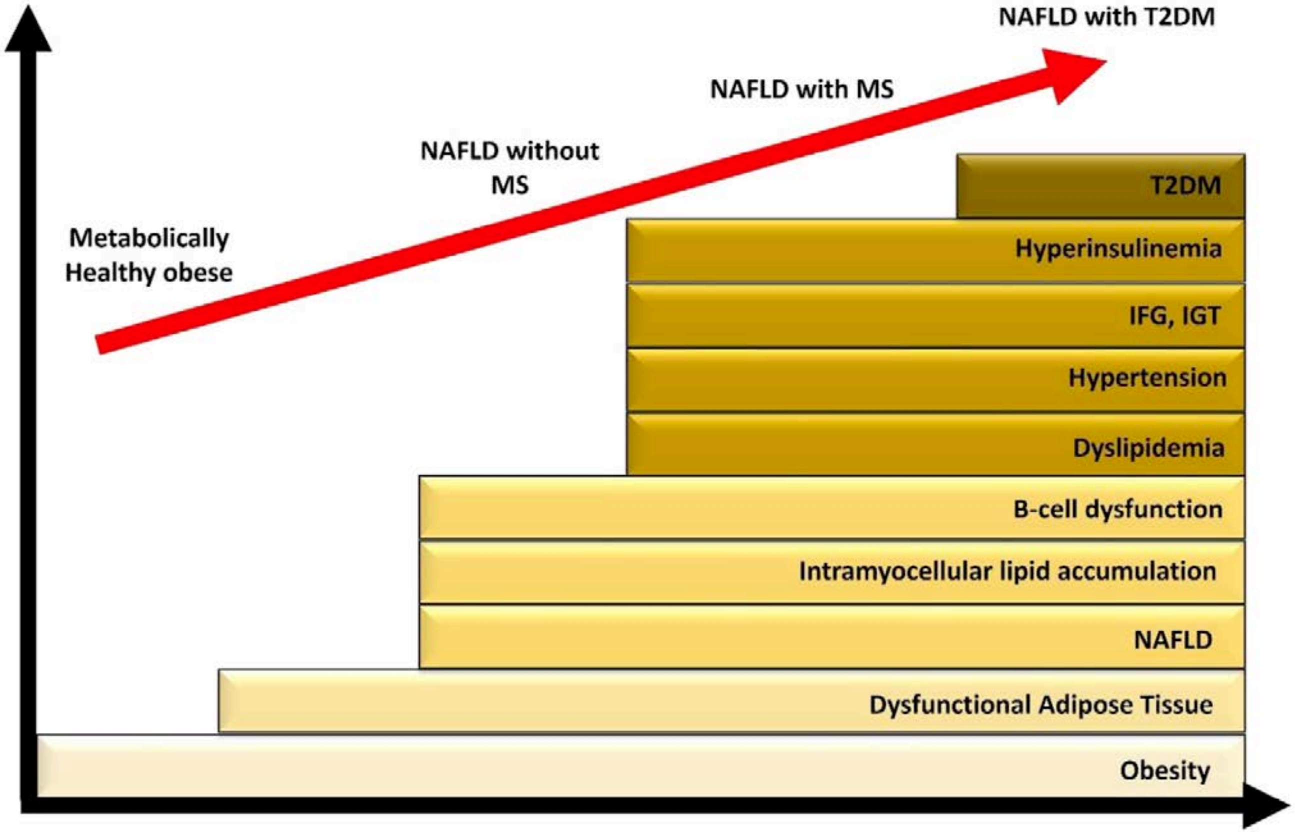
50% der übergewichtigen/adipösen Erwachsenen sind in der Kategorie MUO!

Langzeitstudien: 30-50% der Erwachsenen mit MHO konvertieren in den kommenden 4 -20 Jahren zu MUO!

Nur 13 % ohne metabolisches Syndrom!

Smith GI, et al. J Clin Invest. 2019;129(10):3978-3989

Von anfangs noch „gesunder“ Fettleibigkeit über Fettleber und metabolischem Syndrom zum Typ-2-Diabetes

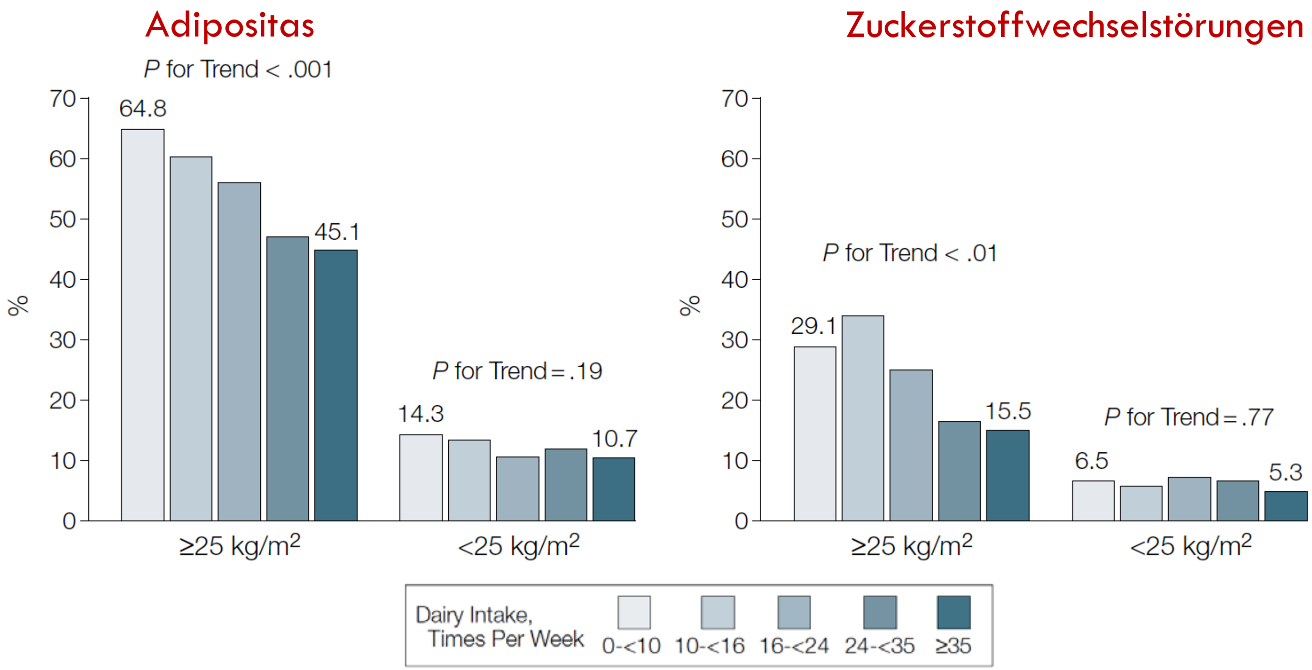


Bril F, et al. Clin Liver Dis 2023; 27:187–210

Beobachtungsstudien: Milchprodukte und MetS

Dairy Consumption, Obesity, and the Insulin Resistance Syndrome in Young Adults
The CARDIA Study

3.157 US-AmerikanerInnen, Alter: 18-30 Jahre; Followed up: 1985/86 – 1995/96.



Pereira MA, et al. JAMA. 2002;287:2081-2089

Dairy Consumption, Obesity, and the Insulin Resistance Syndrome in Young Adults
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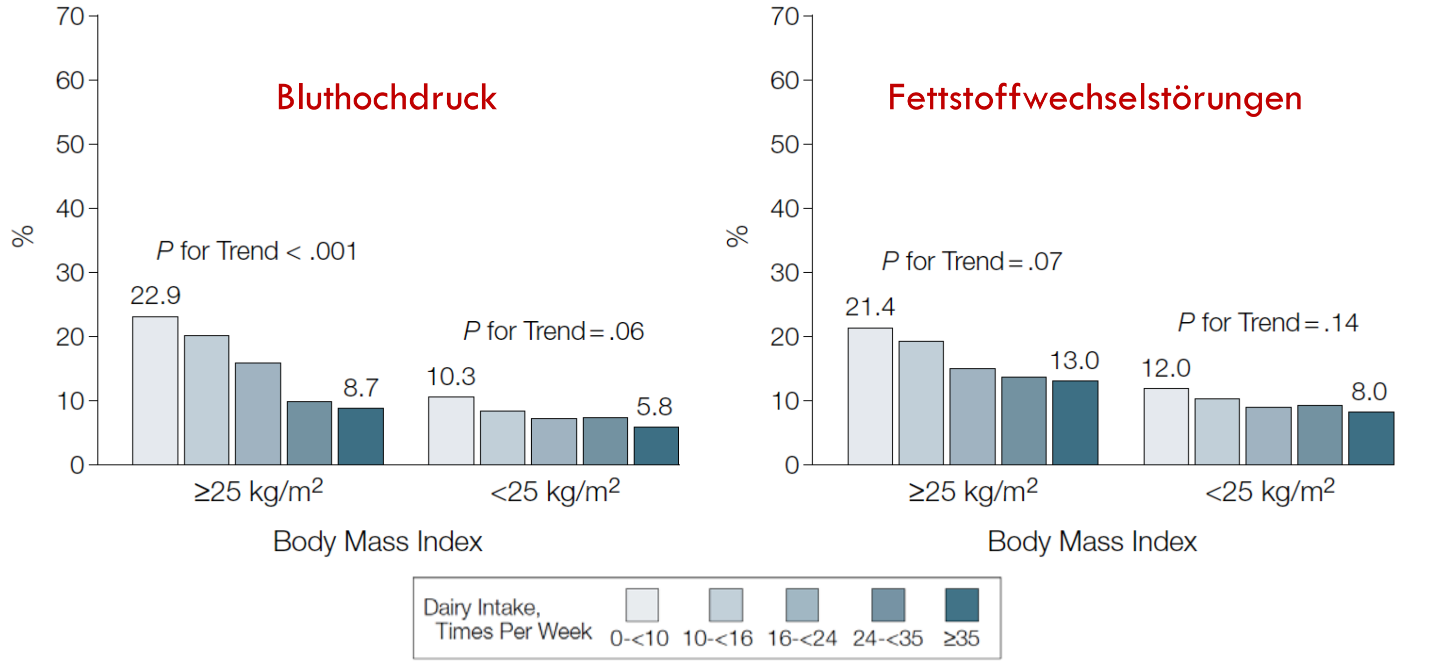


Pereira MA, et al. JAMA. 2002;287:2081-2089

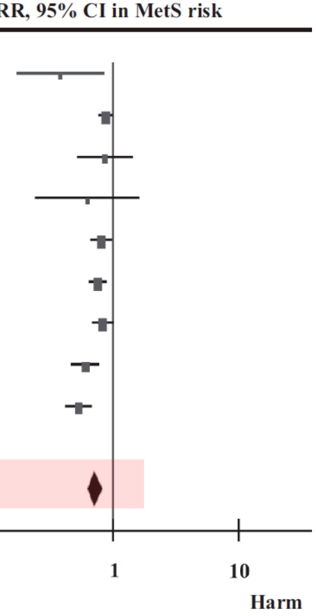
Dairy Product Consumption in the Prevention of Metabolic Syndrome: A Systematic Review and Meta-Analysis of Prospective Cohort Studies

Meta-Analyse: 11 prospektiven Kohortenstudien Milch/Milchprodukte und Inzidenz des MetS

Study, Year	Events	Participants	Weight	RR [95% CI]
Pereira MA et al. (20)	293	909	2.5%	0.38 [0.17, 0,84]
Lutsey PM et al. (19)	3.782	9.514	18.5%	0.87 [0.77, 0.98]
Snijder MB et al. (21)	215	885	5.3%	0.86 [0.52, 1.42]
Louie JCY et al. (18)	155	1.824	1.8%	0.62 [0.24, 0.61]
Baik I et al. (17)	1.325	5.251	15.2%	0.80 [0.66, 0.96]
Shin H et al. (8)	1.240	7.240	16.6%	0.75 [0.64, 0.88]
Babio N et al. (13)	930	1.868	15.1%	0.83 [0.69, 1.00]
Kim D et al. (Men) (23)	1.008	2.859	12.2%	0.60 [0.47, 0.77]
Kim D et al. (Women) (23)	1.095	2.650	12.7%	0.53 [0.42, 0.67]
Total (95% CI)	**10.043**	**33.000**	**100,0%**	**0.73 [0.64, 0.83]**

Heterogeneity: Tau² = 0.02; Chi² = 21.18, df = 8 (P = 0.007); I² = 62%

Test for overall effect: Z = 4.71 (P <0.001)

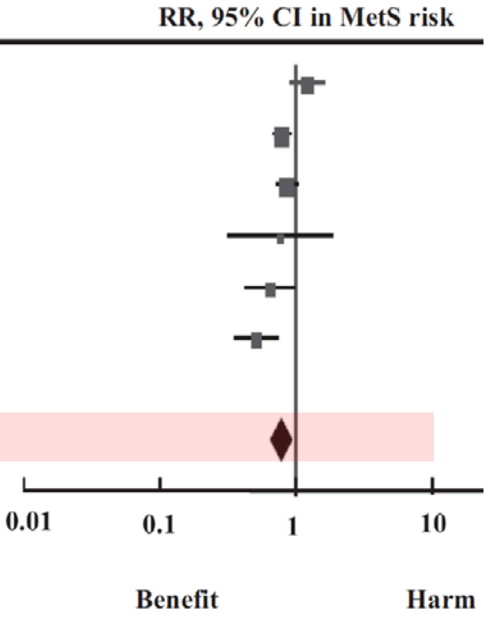


Mena-Sánchez G, et al. Adv Nutr 2019;10:S144–S153.

Dairy Product Consumption in the Prevention of Metabolic Syndrome: A Systematic Review and Meta-Analysis of Prospective Cohort Studies

Meta-Analyse: 11 prospektiven Kohortenstudien Milch-Konsum und Inzidenz des MetS

Study, Year	Events	Participants	Weight	RR [95% CI]
Lin Y et al. (22)	206	888	18.4%	1.21 [0.90, 1.62]
Shin H et al. (8)	1.240	7.240	25,0%	0.79 [0.67, 0.93]
Babio N et al. (13)	804	1.868	23.6%	0.85 [0.70, 1.03]
Damião R et al. (15)	57	151	4.6%	0.76 [0.31, 1.85]
Kim D et al. (Men) (23)	1.008	2.859	13.3%	0.64 [0.42, 0.97]
Kim D et al. (Women) (23)	750	2.651	15.0%	0.51 [0.35, 0.74]
Total (95% CI)	**4.065**	**15.657**	**100%**	**0.79 [0.64, 0.97]**



Heterogeneity: Chi² = 14.61, df = 5 (P = 0.01); I² = 66%
Test for overall effect: Z = 2.23 (P= 0.03)

Mena-Sánchez G, et al. Adv Nutr 2019;10:S144–S153.

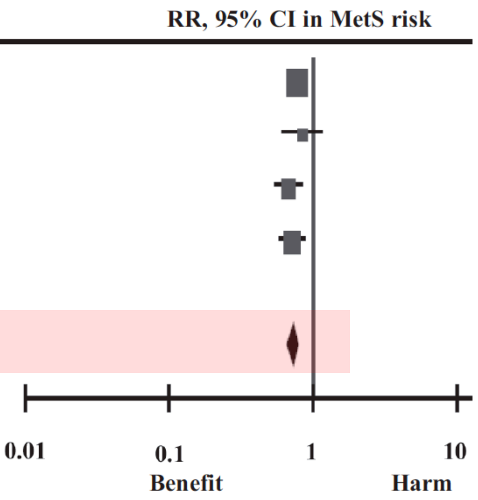
Dairy Product Consumption in the Prevention of Metabolic Syndrome: A Systematic Review and Meta-Analysis of Prospective Cohort Studies

Meta-Analyse: 11 prospektiven Kohortenstudien Joghurt-Konsum und Inzidenz des MetS

Study, Year	Events	Participants	Weight	RR [95% CI]
Babio N et al. (13)	930	1.868	40.2%	0.77 [0.65, 0.91]
Sayón-Orea C et al. (14)	306	8.063	10.7%	0.84 [0.61, 1.16]
Kim D et al. (Men) (23)	1.008	2.859	27.7%	0.71 [0.58, 0.87]
Kim D et al. (Women) (23)	1.095	2.651	21.4%	0.67 [0.53, 0.84]
Total (95% CI)	**3.339**	**15.441**	**100%**	**0.74 [0.66, 0.82]**

Heterogeneity: Chi² = 1.67, df = 1 (P = 0.64); I² = 0%

Test for overall effect: Z = 5.59 (P <0.001)



Mena-Sánchez G, et al. Adv Nutr 2019;10:S144–S153.

Dairy Consumption and Risk of Metabolic Syndrome: Results from Korean Population and Meta-Analysis

Subgroups	No. of Studies	Relative Risk (95% CI)
Milk	20	0.83 (0.78–0.89)
Study design		
Cohort	7	0.83 (0.72–0.97)
Cross-sectional	13	0.83 (0.77–0.90)
Sex		
Men	7	0.83 (0.75–0.92)
Women	7	0.79 (0.69–0.90)
Geographical region		
America	6	0.86 (0.78–0.95)
Asia	10	0.80 (0.72–0.89)
Europe	3	0.87 (0.45–1.71)
Yogurt	12	0.89 (0.83–0.95)
Study design		
Cohort	6	0.84 (0.71–0.98)
Cross-sectional	6	0.93 (0.87–0.99)
Sex		
Men	4	0.86 (0.72–1.02)
Women	4	0.91 (0.81–1.02)
Geographical region		
America	3	0.71 (0.42–1.22)
Asia	6	0.91 (0.84–0.998)
Europe	2	0.78 (0.67–0.91)
Cheese	8	0.98 (0.86–1.11)
Study design		
Cohort	4	1.03 (0.87–1.22)
Cross-sectional	4	0.91 (0.74–1.14)
Geographical region		
America	3	1.07 (0.93–1.25)
Asia	2	0.92 (0.71–1.20)
Europe	2	1.03 (0.65–1.64)

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Meta-Analyse von 12 Kohortenstudien und 25 Querschnittsstudien mit n = 398.877

Dosis-Wirkungs-Analyse

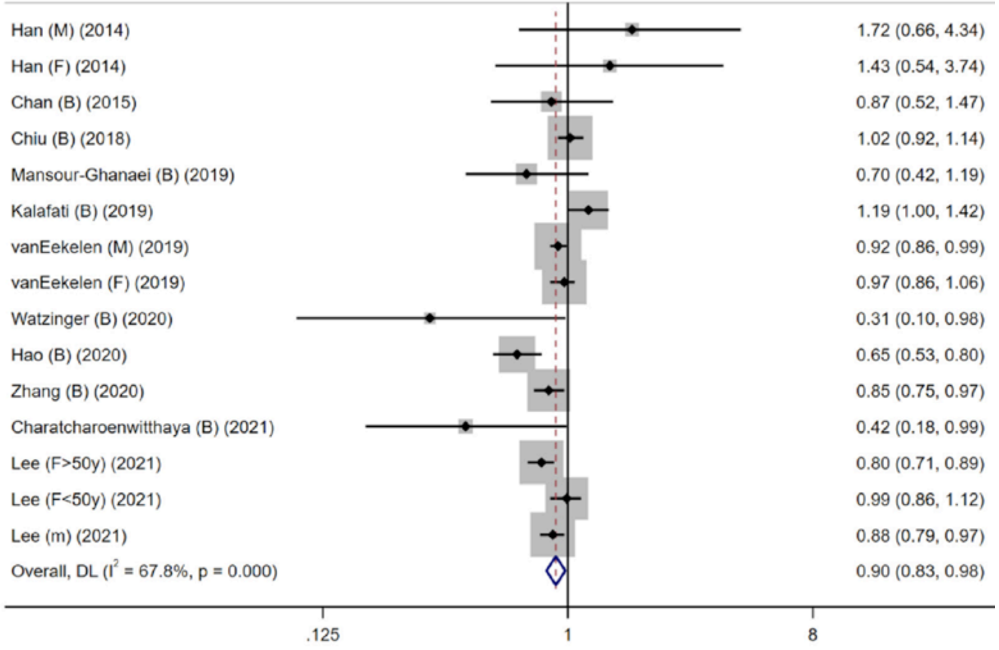
	Studies	Dose	Relative Risk (95% CI)
Total airy	6	400 g/day	0.71 (0.59–0.85)
Milk	5	200 g/day	0.85 (0.79–0.93)
Yogurt	5	200 g/day	0.63 (0.53–0.75)
Cheese	3	50 g/day	0.99 (0.73–1.35)

Jin S, et al. Nutrients 2021;13:1574

Dairy product consumption and risk of non-alcoholic fatty liver disease: A systematic review and meta-analysis of observational studies

[a] Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta, Canada
[b] Department of Cell Biology, University of Alberta, Edmonton, Alberta, Canada
[c] Alberta Health Services, Edmonton, Alberta, Canada
[d] School of Public Health, University of Alberta, Edmonton, Alberta, Canada
[e] Department of Physiology, University of Alberta, Edmonton, Alberta, Canada

OR: NAFLD Risiko für Milch/Milchprodukte



Meta-Analyse von 11 Beobachtungsstudien zur Inzidenz von NAFLD, n=43.649, 11.020 Fälle;

Milchprodukte:	OR=0,90; 95% KI: 0,83-0,98
Fettreiche Milchprod.:	OR=0,38; 95% KI: 0,19-0,75
Milch:	OR=0,86; 95% KI: 0,78-0,95
Joghurt:	OR=0,88; 95% KI: 0,82-0,96
Käse:	OR=1,01; 95% KI: 0,82-1,25

Yuzbashian E, et al. Nutr Metab Cardiovasc Dis. 2023;33:1461-1471.

Dairy products consumption and the risk of hypertension in adults: An updated systematic review and dose–response meta-analysis of prospective cohort studies

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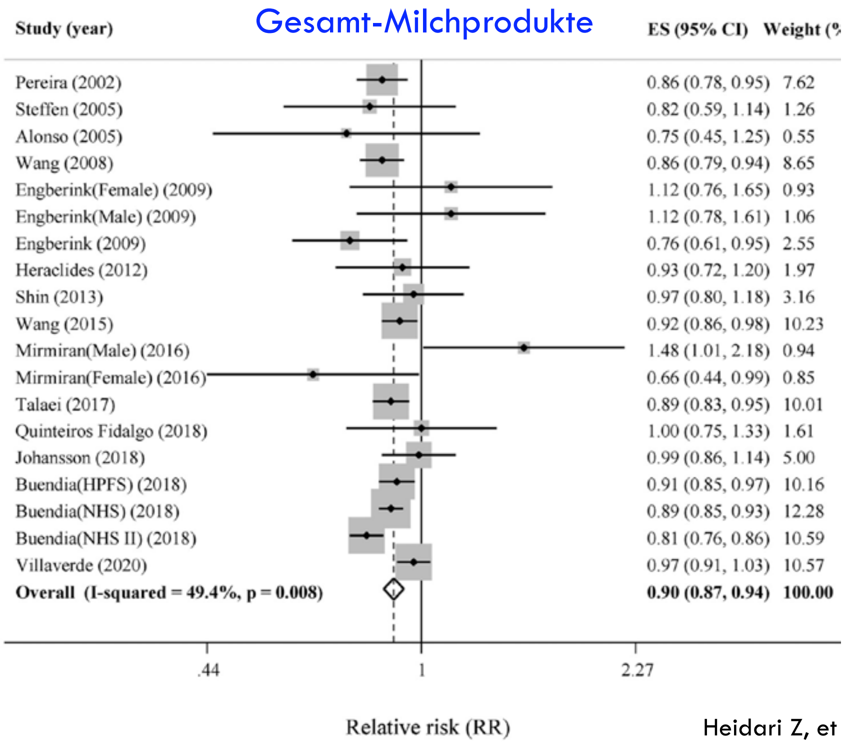
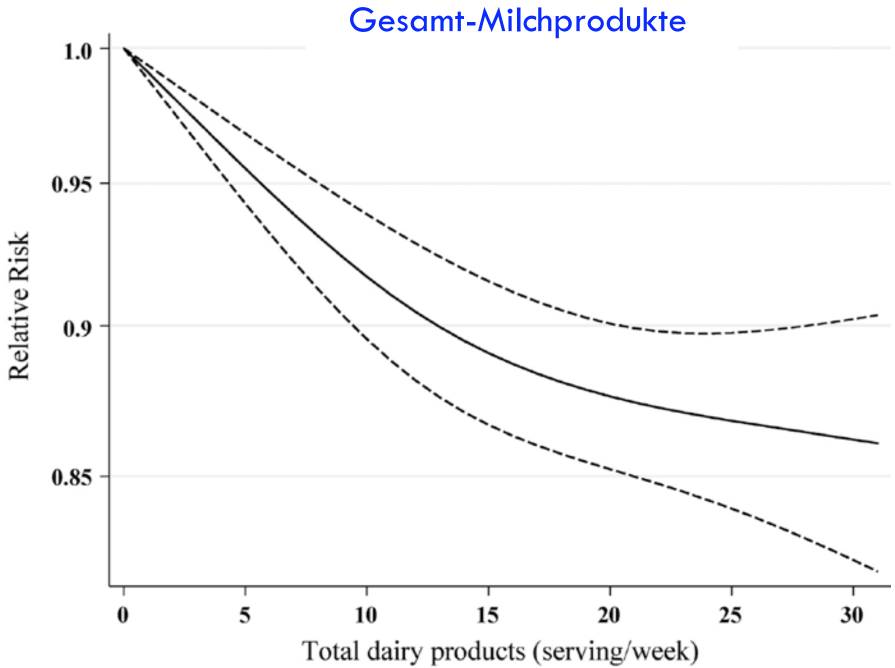
[b] Cardiac Rehabilitation Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran
[c] Shahid Motahari Hospital, Fooladshahr, Isfahan, Iran
[d] Centre for Intelligent Healthcare, Coventry University, Coventry, CV1 5FB, UK
[e] Isfahan Cardiovascular Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran

Meta-Analyse von 16 prospektive Kohortenstudien: Inzidenz von Bluthochdruck (Relatives Risiko)

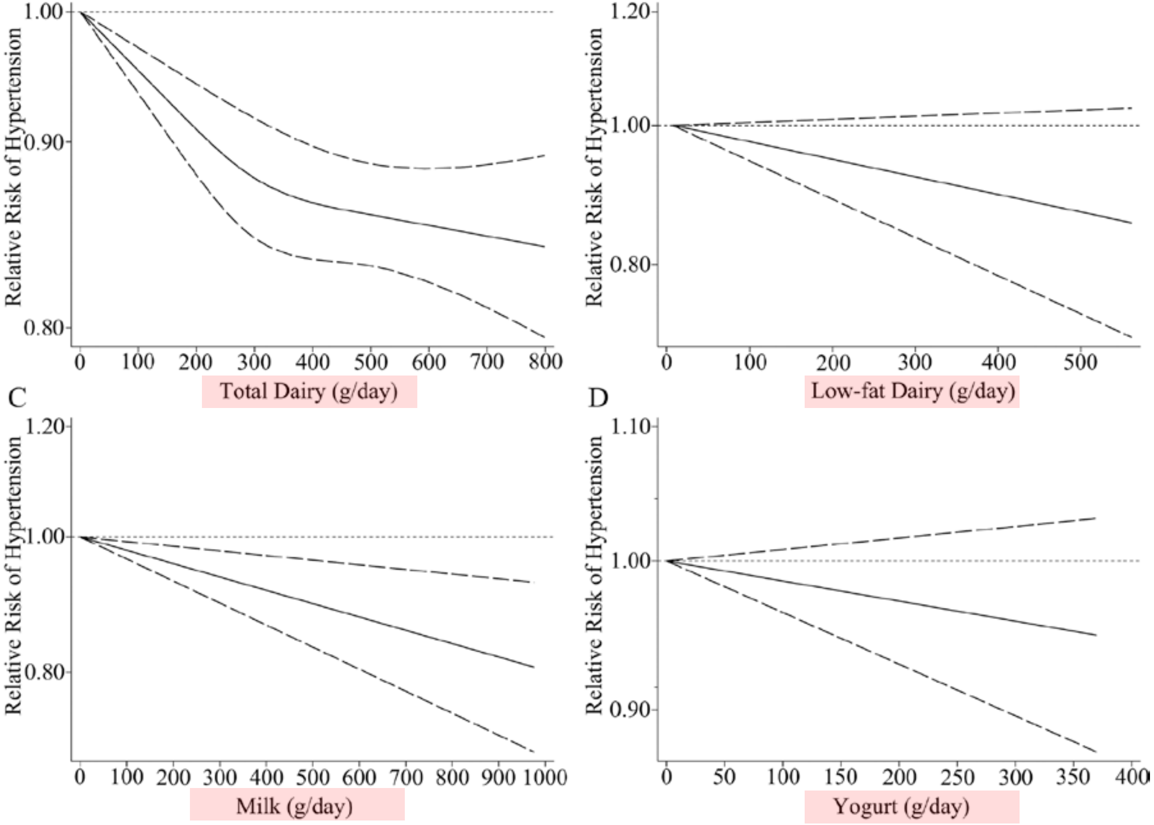




Heidari Z, et al. 2021;31(7):1962-1975.

Consumption of Dairy Products and the Risk of Overweight or Obesity, Hypertension, and Type 2 Diabetes Mellitus: A Dose–Response Meta-Analysis and Systematic Review of Cohort Studies

[1] Department of Biostatistics and Epidemiology, School of Public Health, Shenzhen University Health Science Center, Shenzhen, Guangdong, People's Republic of China; [2] Department of Epidemiology and Biostatistics, College of Public Health, Zhengzhou University, Zhengzhou, Henan, People's Republic of China; [3] Department of Medical Record Management, Shenzhen Qianhai Shekou Free Trade Zone Hospital, Shenzhen, Guangdong, People's Republic of China; [4] Department of Endocrinology, Shenzhen Qianhai Shekou Free Trade Zone Hospital, Shenzhen, Guangdong, People's Republic of China; [5] Guangdong Provincial Key Laboratory of Regional Immunity and Diseases, Shenzhen University Health Science Center, Shenzhen, Guangdong, People's Republic of China; and [6] Department of General Practice, The Affiliated Luohu Hospital of Shenzhen University Health Science Center, Shenzhen, Guangdong, People's Republic of China

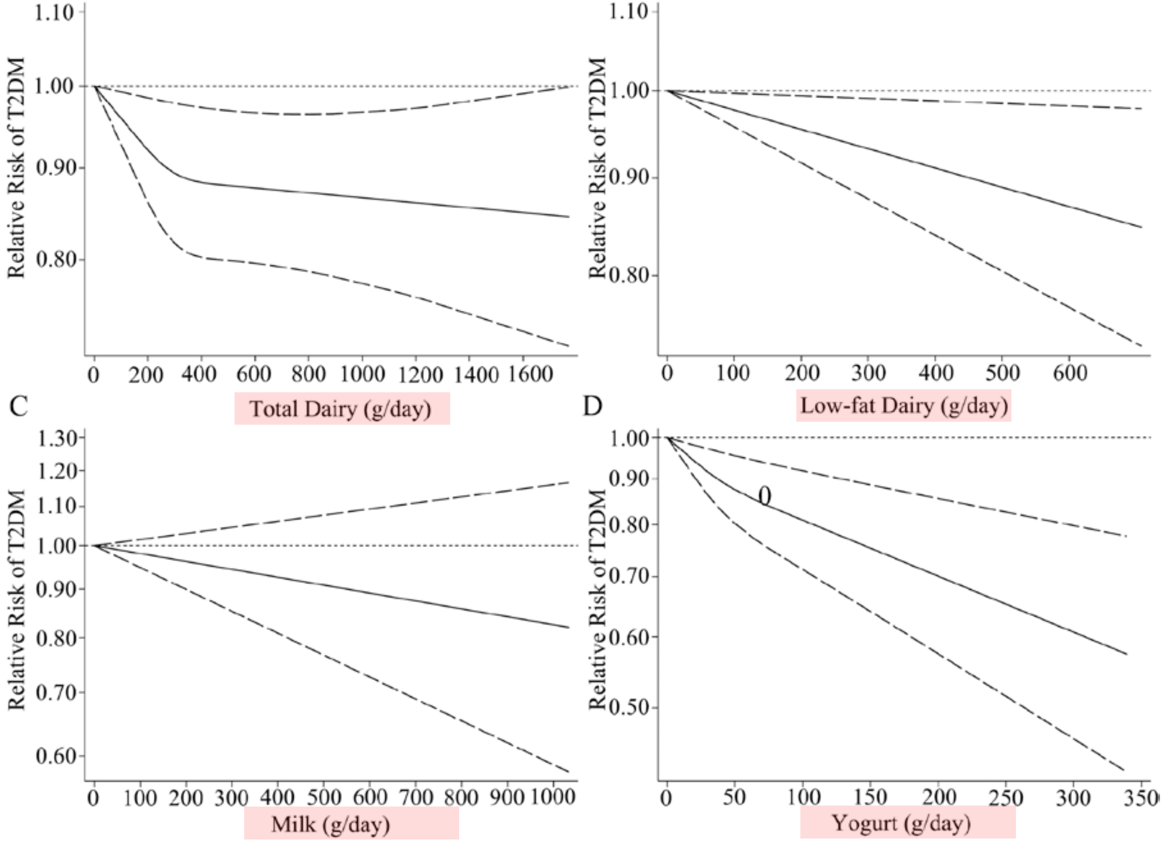


Bluthochdruck: Meta-Analysen
von 17 prospektiven Kohortenstudien

Feng Y, et al. Adv Nutr 2022;13(6):2165-2179

Consumption of Dairy Products and the Risk of Overweight or Obesity, Hypertension, and Type 2 Diabetes Mellitus: A Dose–Response Meta-Analysis and Systematic Review of Cohort Studies

[1] Department of Biostatistics and Epidemiology, School of Public Health, Shenzhen University Health Science Center, Shenzhen, Guangdong, People's Republic of China; [2] Department of Epidemiology and Biostatistics, College of Public Health, Zhengzhou University, Zhengzhou, Henan, People's Republic of China; [3] Department of Medical Record Management, Shenzhen Qianhai Shekou Free Trade Zone Hospital, Shenzhen, Guangdong, People's Republic of China; [4] Department of Endocrinology, Shenzhen Qianhai Shekou Free Trade Zone Hospital, Shenzhen, Guangdong, People's Republic of China; [5] Guangdong Provincial Key Laboratory of Regional Immunity and Diseases, Shenzhen University Health Science Center, Shenzhen, Guangdong, People's Republic of China; and [6] Department of General Practice, The Affiliated Luohu Hospital of Shenzhen University Health Science Center, Shenzhen, Guangdong, People's Republic of China



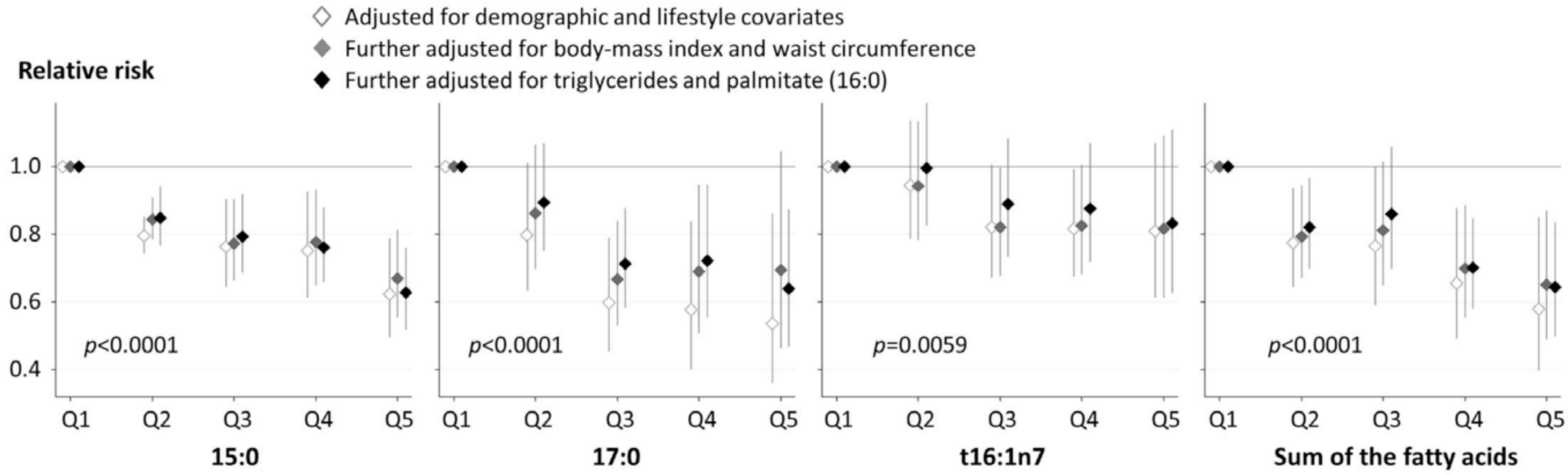
Typ-2-Diabetes: Meta-Analysen von 28 prospektiven Kohortenstudien

Feng Y, et al. Adv Nutr 2022;13(6):2165-2179

Fatty acid biomarkers of dairy fat consumption and incidence of type 2 diabetes: A pooled analysis of prospective cohort studies

16 prospektive Kohortenstudien aus 12 Ländern (7 USA, 7 Europa, 1 Australia, 1 Taiwan); n=63.682 aus allen Alters- und BMI-Bereichen; 9 Jahre Follow-up, 15.180 T2D-Fälle;

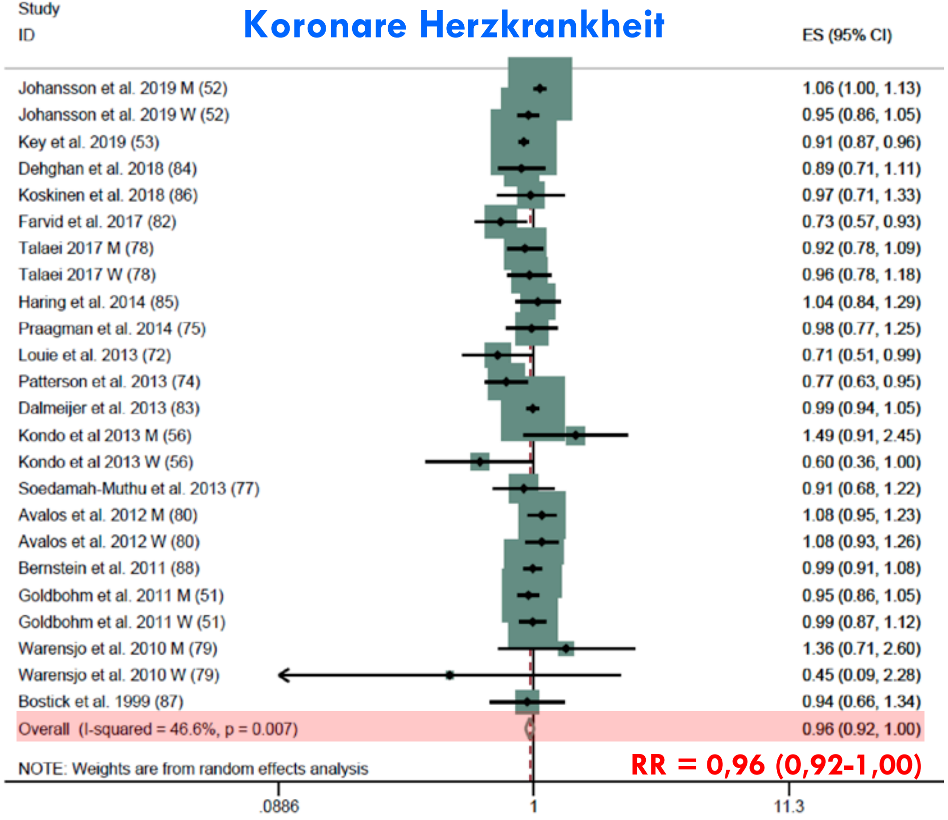
C15:0, C17:0, Ct16:1n-7 => Biomarker für den Konsum von Milchfett/Milchprodukten

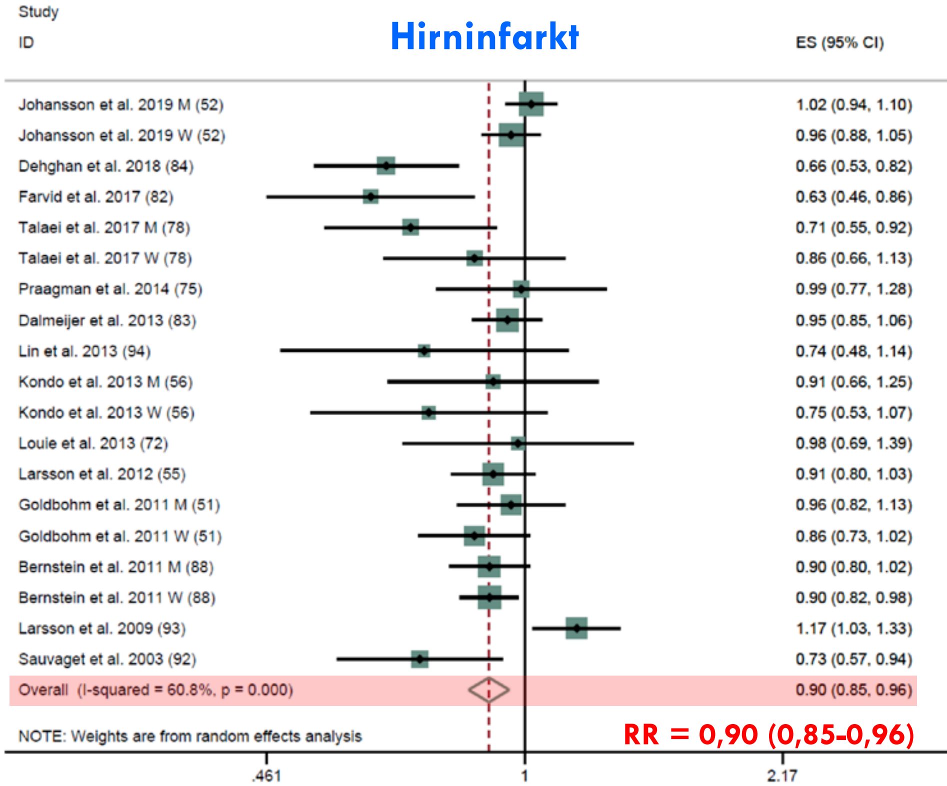


Imamura F, et al. PLoS Med 2018;15(10): e1002670.

Konsum von Milch/Milchprodukten und Herz-Kreislauf-Risiko

Meta-Analyse: Höchster vs niedrigster Konsum





Chen Z, et al. Adv Nutr 2022;13(2):439–454

Consumption of Dairy Foods and Cardiovascular Disease: A Systematic Review

Übersichtsarbeit: Meta-Analysen von Kohortenstudien zu harten kardiovaskulären Endpunkten – und Meta-Analysen von randomisiert-kontrollierten Diät-Interventionsstudien zur kardiovaskulären Risikofaktoren.

Abstract: Limited consumption of dairy foods and use of low-fat products is recommended for cardiovascular (CV) prevention; however, other features besides fat content modulate their metabolic effects. We analyze updated evidence on the relationship of different dairy products (low/full-fat dairy, milk, cheese, yogurt) with CVD by reviewing meta-analyses of cohort studies and individual prospective cohort studies with CV hard endpoints (CVD/CHD incidence/mortality), together with meta-analyses of randomized controlled trials exploring the effect of dairy on major CV risk factors. The analyses provide evidence that moderate dairy consumption (up to 200 g/day, globally) has no detrimental effects on CV health and that their effect depends more on the food type (cheese, yogurt, milk) than on the fat content. These data expand current knowledge and may inform revision of current guidelines for CVD prevention.

Giosuè A, et al. Nutrients 2022;14(4):831.

Kontrollierte Experimente

Sucrose-sweetened beverages increase fat storage in the liver, muscle, and visceral fat depot: a 6-mo randomized intervention study[1–3]

Maria Maersk, Anita Belza, Hans Stødkilde-Jørgensen, Steffen Ringgaard, Elizaveta Chabanova, Henrik Thomsen, Steen B Pedersen, Arne Astrup, and Bjørn Richelsen

RCT bei 47 Übergewichtigen, 6 Monate täglich 1 Liter Test-Getränk;

Cola mit Saccharose (50% Fruktose/50% Glukose); Cola-Light; Milch mit 1,5% Fett;

	Sucrose-sweetened regular cola	Milk
Carbohydrate (g/100 mL)	10.6	4.7
Protein (g/100 mL)	0	3.4
Fat (g/100 mL)	0	1.5
Energy (kJ/d)	1800	1900
Volume (mL)	1000	1000
Energy density (kJ/g)	1.8	1.9

[1] The subjects drank 1 L of 1 of 4 test drinks daily for 6 mo.

Maersk M, et al. Am J Clin Nutr 2012;95:283–9.

Sucrose-sweetened beverages increase fat storage in the liver, muscle, and visceral fat depot: a 6-mo randomized intervention study[1–3]

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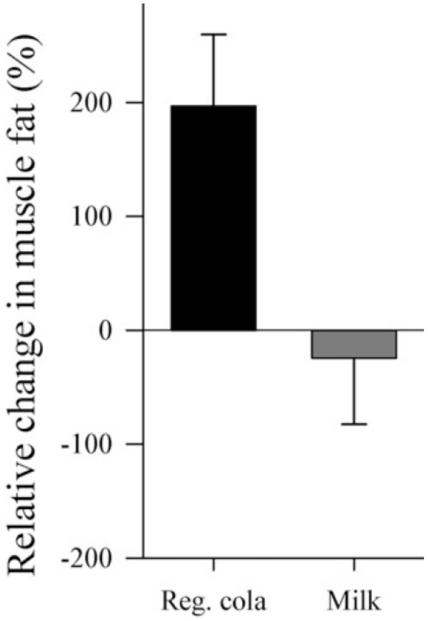
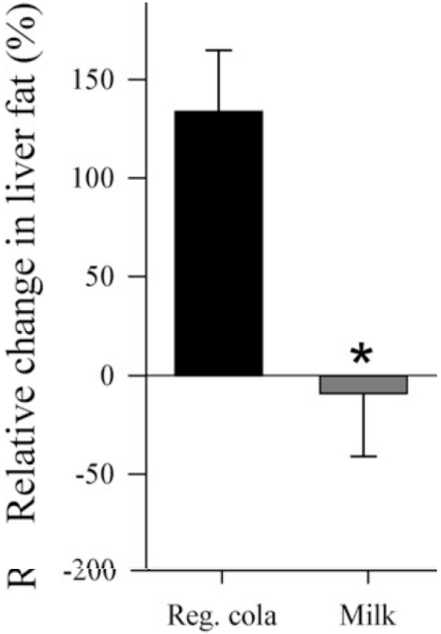
Muskelfett



Leberfett



Maersk M, et al. Am J Clin Nutr 2012;95:283–9.

Sucrose-sweetened beverages increase fat storage in the liver, muscle, and visceral fat depot: a 6-mo randomized intervention study[1–3]

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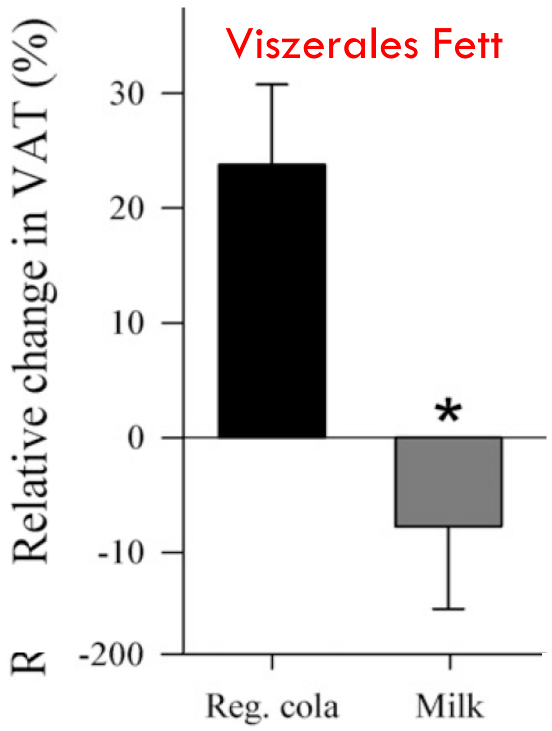


Maersk M, et al. Am J Clin Nutr 2012;95:283–9.

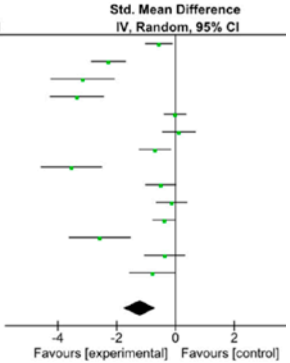
The Effects of Dairy Intake on Insulin Resistance: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

30 randomisiert-kontrollierte Diät-Interventionsstudien aufgenommen;

Milchprodukte und HOMA-Index

Study or Subgroup	Intervention Mean	Intervention SD	Intervention Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Adamsson 2011	-0.11	0.51	38	0.22	0.64	40	7.7%	-0.56 [-1.02, -0.11]
Adamsson 2015	-0.12	0.13	38	0.27	0.2	40	7.4%	-2.28 [-2.85, -1.70]
Asemi 2013	-0.8	0.43	16	1.1	0.71	16	6.1%	-3.16 [-4.23, -2.08]
Asemi 2015	-0.46	0.37	24	0.8	0.37	24	6.6%	-3.35 [-4.25, -2.45]
Benatar 2014	0.08	0.99	58	0.09	0.69	60	7.8%	-0.01 [-0.37, 0.35]
Bowen 2005	-0.35	1.35	25	-0.615	2.87	25	7.5%	0.12 [-0.44, 0.67]
Razavi 2016	-0.8	0.8	30	-0.2	0.9	30	7.5%	-0.70 [-1.22, -0.17]
Stancliffe 2011	-0.59	0.34	20	1.19	0.61	20	6.3%	-3.53 [-4.56, -2.51]
Thompson 2005 I1-HD	-1.27	1.59	31	-0.612	0.895	29	7.5%	-0.50 [-1.01, 0.02]
Thompson 2005 I2-HD+F	-0.717	0.688	30	-0.612	0.895	29	7.5%	-0.13 [-0.64, 0.38]
Wennersberg 2009	-0.6	6.2	55	3.1	12.2	54	7.8%	-0.38 [-0.76, -0.00]
Zemel 2004	-1.22	0.51	14	-0.13	0.28	14	6.2%	-2.57 [-3.61, -1.53]
Zemel 2005 phase 1	-0.72	0.44	17	-0.53	0.57	17	7.2%	-0.36 [-1.04, 0.31]
Zemel 2005 phase 2	-0.93	0.56	17	-0.57	0.18	12	6.9%	-0.78 [-1.55, -0.01]
Total (95% CI)			**413**			**410**	**100.0%**	**-1.21 [-1.74, -0.67]**

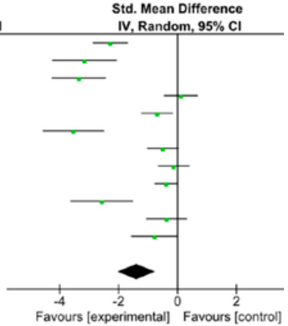
Heterogeneity: Tau² = 0.92; Chi² = 155.68, df = 13 (P < 0.00001); I² = 92%
Test for overall effect: Z = 4.42 (P < 0.00001)



Milchprodukte und HOMA-Index bei BMI>25

Study or Subgroup	Intervention Mean	Intervention SD	Intervention Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Adamsson 2015	-0.12	0.13	38	0.27	0.2	40	8.7%	-2.28 [-2.85, -1.70]
Asemi 2013	-0.8	0.43	16	1.1	0.71	16	7.4%	-3.16 [-4.23, -2.08]
Asemi 2015	-0.46	0.37	24	0.8	0.37	24	7.9%	-3.35 [-4.25, -2.45]
Bowen 2005	-0.35	1.35	25	-0.615	2.87	25	8.7%	0.12 [-0.44, 0.67]
Razavi 2016	-0.8	0.8	30	-0.2	0.9	30	8.8%	-0.70 [-1.22, -0.17]
Stancliffe 2011	-0.59	0.34	20	1.19	0.61	20	7.6%	-3.53 [-4.56, -2.51]
Thompson 2005 I1-HD	-1.27	1.59	31	-0.612	0.895	29	8.8%	-0.50 [-1.01, 0.02]
Thompson 2005 I2-HD+F	-0.717	0.688	30	-0.612	0.895	29	8.8%	-0.13 [-0.64, 0.38]
Wennersberg 2009	-0.6	6.2	55	3.1	12.2	54	9.1%	-0.38 [-0.76, -0.00]
Zemel 2004	-1.22	0.51	14	-0.13	0.28	14	7.5%	-2.57 [-3.61, -1.53]
Zemel 2005 phase 1	-0.72	0.44	17	-0.53	0.57	17	8.5%	-0.36 [-1.04, 0.31]
Zemel 2005 phase 2	-0.93	0.56	17	-0.57	0.18	12	8.2%	-0.78 [-1.55, -0.01]
Total (95% CI)			**317**			**310**	**100.0%**	**-1.39 [-2.03, -0.75]**

Heterogeneity: Tau² = 1.15; Chi² = 136.85, df = 11 (P < 0.00001); I² = 92%
Test for overall effect: Z = 4.25 (P < 0.0001)



Sochol KM, et al. Nutrients 2019;11:2237;

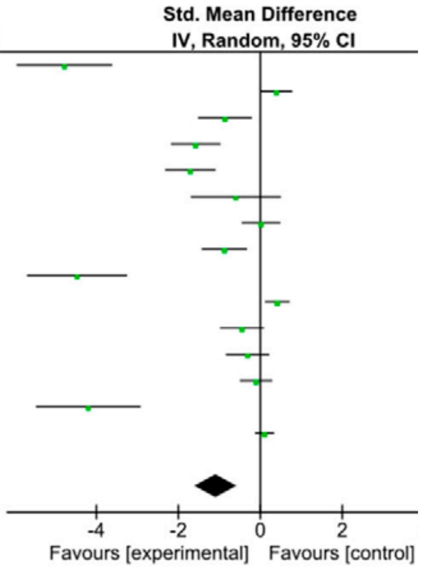
The Effects of Dairy Intake on Insulin Resistance: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

30 randomisiert-kontrollierte Diät-Interventionsstudien aufgenommen;

Milchprodukte und Taillenumfang

Study or Subgroup	Intervention Mean	Intervention SD	Intervention Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Asemi 2015	-5.3	0.7	24	-1.9	0.7	24	5.5%	-4.78 [-5.92, -3.63]
Benatar 2014	0.4	3.1	58	-0.7	2.4	60	7.3%	0.40 [0.03, 0.76]
Faghih 2011	-6.32	2.57	22	-3.98	2.77	20	6.8%	-0.86 [-1.50, -0.23]
Josse 2011 I1-MD	-1.8	0.7	30	-0.6	0.8	30	6.9%	-1.58 [-2.16, -0.99]
Josse 2011 I2-HD	-1.9	0.7	30	-0.6	0.8	30	6.9%	-1.71 [-2.30, -1.11]
Lukaszuk 2007	-11.28	5.23	7	-8.66	2.51	7	5.7%	-0.60 [-1.68, 0.48]
Manios 2006	-5.8	5.1	39	-5.9	5.5	36	7.2%	0.02 [-0.43, 0.47]
Razavi 2016	-4.2	1.9	30	-2.6	1.7	30	7.0%	-0.88 [-1.41, -0.34]
Stancliffe 2011	-2.8	0.8	20	-0.2	0.1	20	5.4%	-4.47 [-5.67, -3.27]
Tanaka 2014	-1.5	4.1	102	-3.2	4.1	98	7.4%	0.41 [0.13, 0.69]
Thompson 2005 I1-HD	-11.6	6.1	30	-8.8	6.3	29	7.0%	-0.45 [-0.96, 0.07]
Thompson 2005 I2-HD+F	-11	7.6	31	-8.8	6.3	29	7.0%	-0.31 [-0.82, 0.20]
Wennersberg 2009	-0.9	3.1	55	-0.6	2.6	54	7.3%	-0.10 [-0.48, 0.27]
Zemel 2005	-3.99	0.48	18	-0.58	1.04	16	5.2%	-4.20 [-5.45, -2.94]
Zemel 2008	-7.5	4.3	169	-7.9	3.3	169	7.5%	0.10 [-0.11, 0.32]
Total (95% CI)			**665**			**652**	**100.0%**	**-1.09 [-1.61, -0.58]**

Heterogeneity: Tau² = 0.91; Chi² = 243.51, df = 14 (P < 0.00001); I² = 94%
Test for overall effect: Z = 4.16 (P < 0.0001)



Sochol KM, et al. Nutrients 2019;11:2237;

Milk and Dairy Product Consumption and Inflammatory Biomarkers: An Updated Systematic Review of Randomized Clinical Trials

[1]Department of Nutrition, Institute of Basic Medical Sciences, University of Oslo, Oslo, Norway; [2]Norwegian National Advisory Unit on Familial Hypercholesterolemia, Oslo University Hospital, Oslo, Norway; [3]Department of Biochemistry and Molecular Biology II, School of Pharmacy; and [4]Institute of Nutrition and Food Technology "José Mataix," Biomedical Research Center, University of Granada, Granada, Spain; [5]ibs.GRANADA, University Hospital Complex of Granada, Granada, Spain; and [6]CIBEROBN (CIBER Physiopathology of Obesity and Nutrition CB12/03/30028), Institute of Health Carlos III, Madrid, Spain

Systematische Übersicht von 16 Diät-Experimenten

The most common inflammatory markers analyzed were hs-CRP, IL-1β, IL-6, MCP-1, and TNF-α (23–29). Three reports included sICAM-1 and sVCAM-1 (23). Adiponectin (27), macrophage inflammatory protein-1α (MIP-1α) (25), and retinol-binding protein 4 (RBP-4) (29) were measured, however, with no significant changes or differences between the groups. Three studies, in addition to the study by Pei et al. (18), investigated the effect of the intervention on gene expression levels (24, 26, 27).

In conclusion, the consumption of milk or dairy products did not show a proinflammatory effect in healthy subjects or individuals who were overweight or obese or had other metabolic abnormalities. The evidence from long-term supplementation showed a weak anti-inflammatory effect in both healthy and metabolically abnormal adults. The evidence from acute and short-term interventions is scarce and thus inconclusive. Further studies need to be developed with enhanced designs and better reporting, and the characterization of the dairy products should be included.

Ergebnis: Keine oder leicht anti-entzündliche Effekte

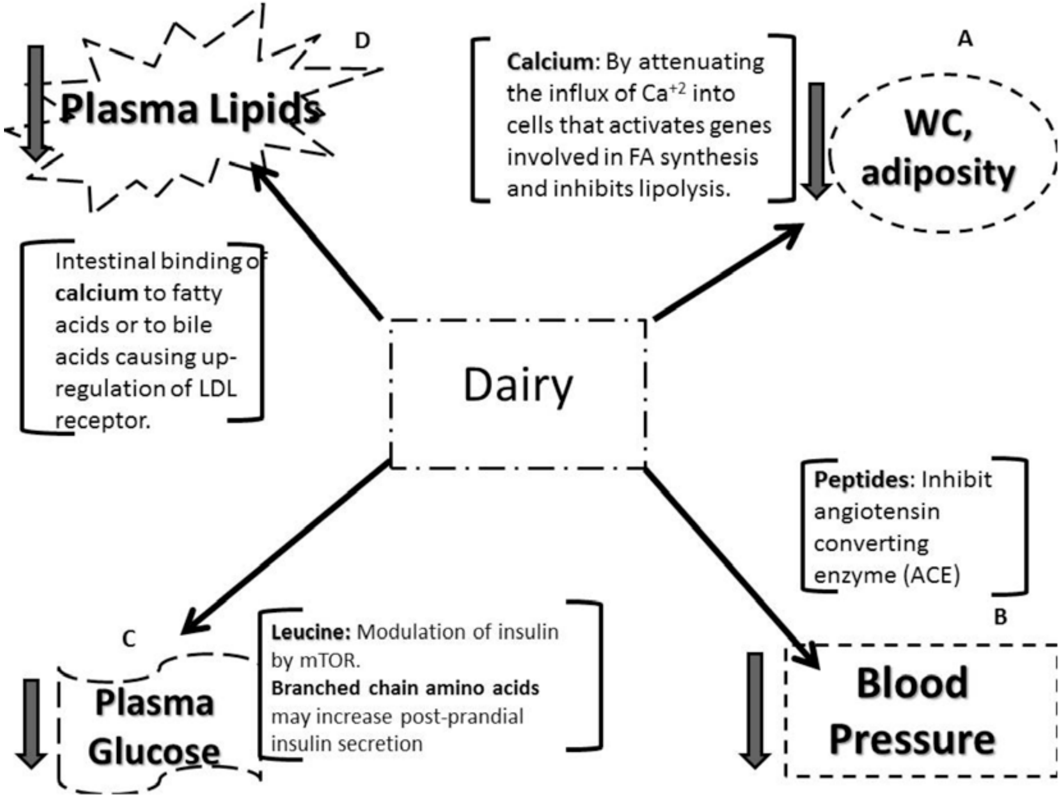
Ulven SM, et al. Adv Nutr 2019;10:S239–S250.

Mechanismen

Effects of Dairy on Metabolic Syndrome Parameters: A Review

Christine E. Dugan, PhD, and Maria Luz Fernandez, PhD*

Department of Nutritional Sciences, University of Connecticut, Storrs, Connecticut



Dugan C, et al. Yale J Biol Med 2014;87:135-147.

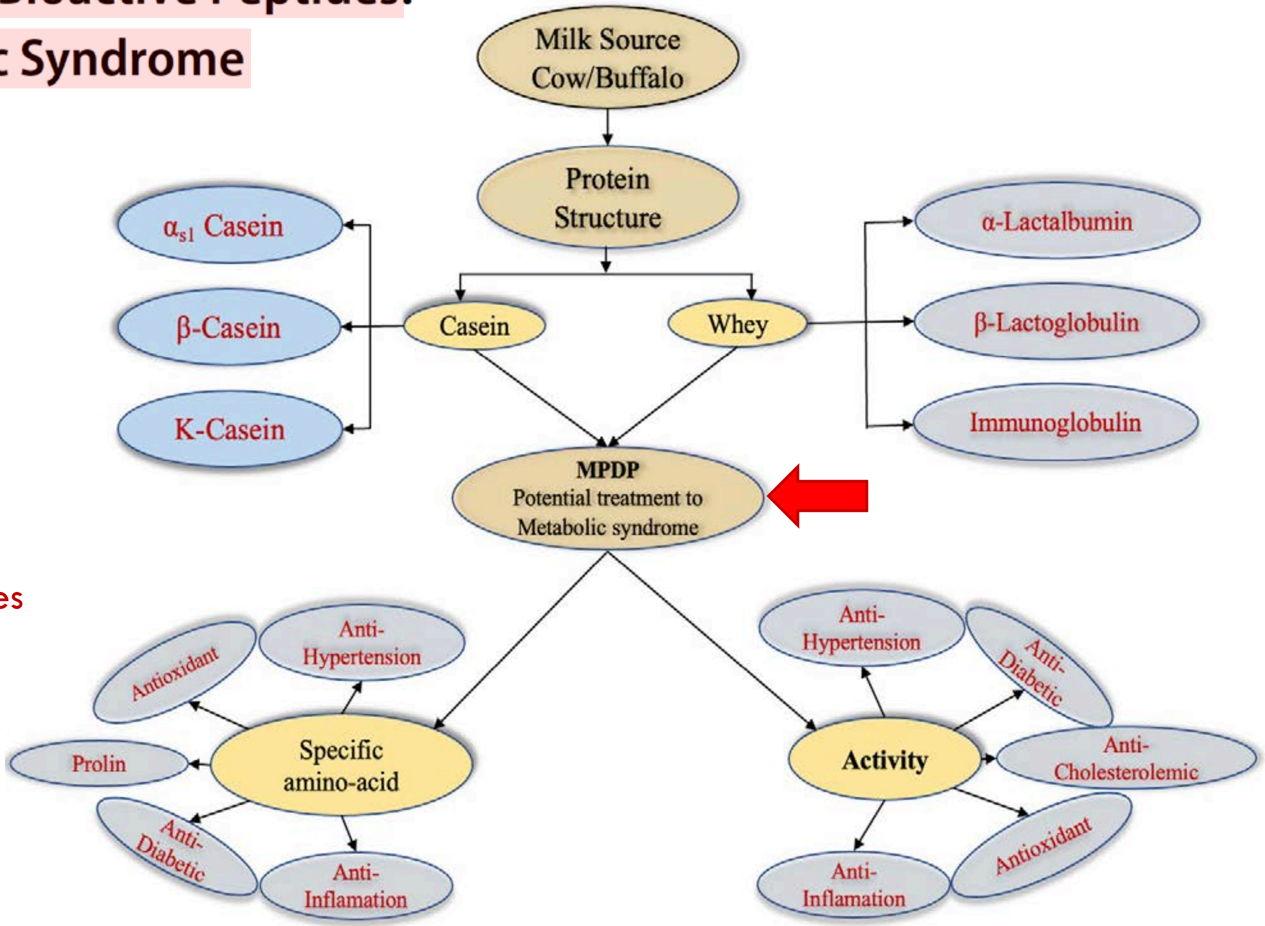
Dairy Milk Protein–Derived Bioactive Peptides: Avengers Against Metabolic Syndrome

[1] Institute of Nutrition, Mahidol University, 999 Phutthamonthon 4 Road, Salaya, Nakhon Pathom 73170, Thailand

[2] Department of Nutrition and Dietetics, Central Campus of Technology, Tribhuvan University, Kirtipur, Nepal

[3] Department of Food Science, College of Food and Agriculture, United Arab Emirates University, Al Ain 15551, United Arab Emirates

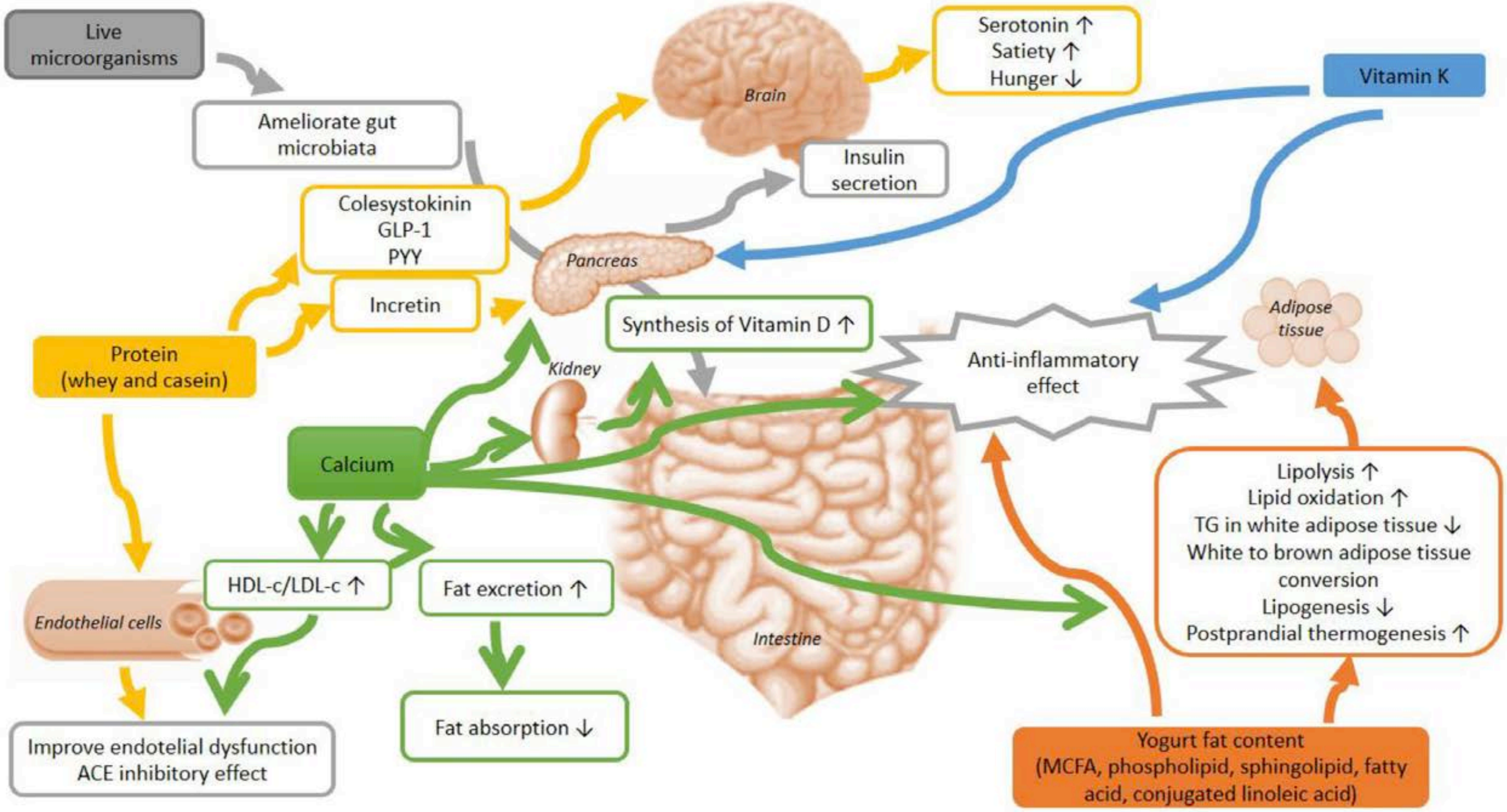
[4] Department of Food Science and Nutrition, College of Agriculture and Food Sciences, King Faisal University, Al-Hofuf, P. O. Box 400, Al-Ahsa 31982, Saudi Arabia



MPDP = Milk Protein–Derived Peptides

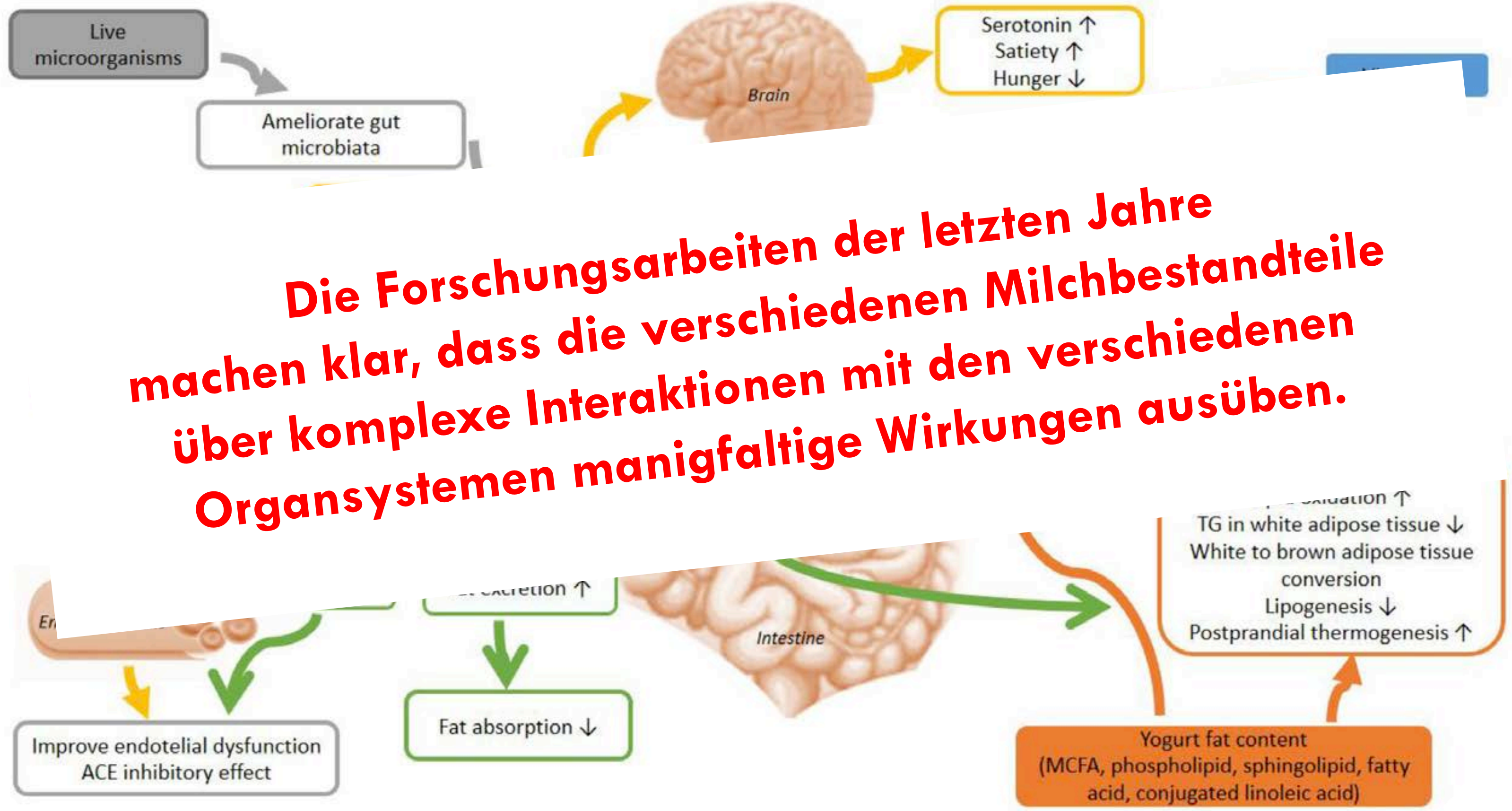
Koirala P, et al. Current Nutrition Reports 2023;12:299–317

Traditional plain yogurt: a therapeutic food for metabolic syndrome?



Baspinar B, et al. Crit Rev Food Sci Nutr. 2021;61(18):3129-3143.

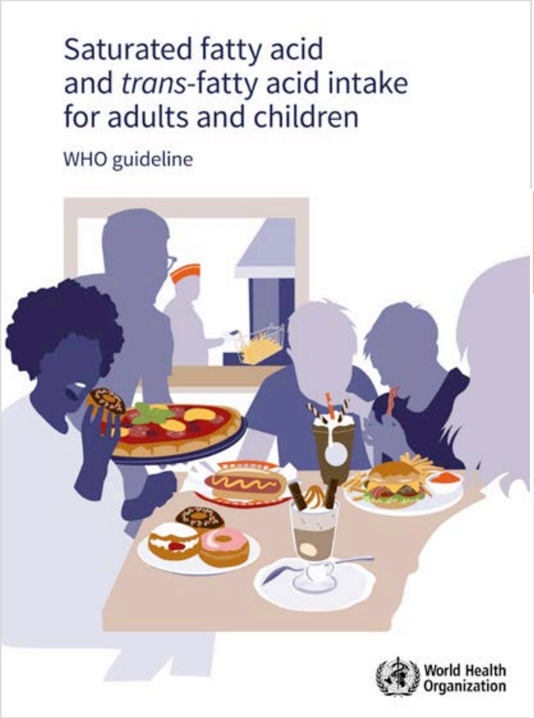
Traditional plain yogurt: a therapeutic food for metabolic syndrome?



Die Forschungsarbeiten der letzten Jahre machen klar, dass die verschiedenen Milchbestandteile über komplexe Interaktionen mit den verschiedenen Organsystemen manigfaltige Wirkungen ausüben.

Baspinar B, et al. Crit Rev Food Sci Nutr. 2021;61(18):3129-3143.

Alles klar?



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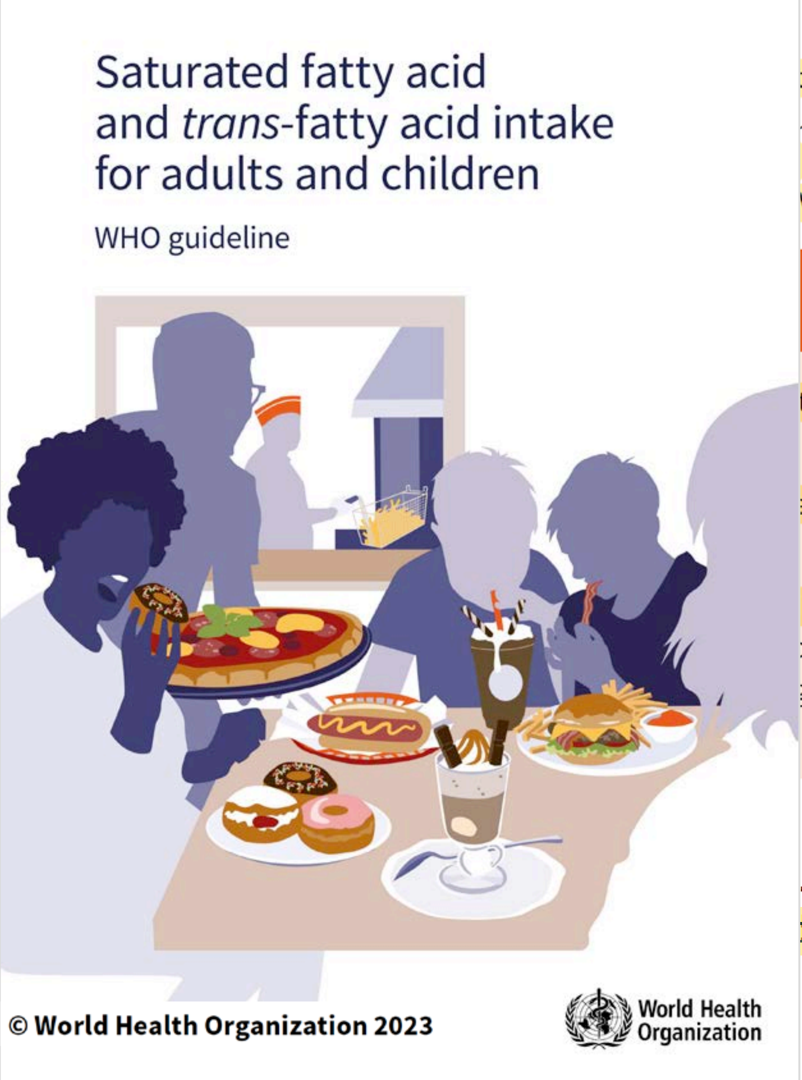


C … ty in the world. Modifiable risk factors such
a … use of alcohol are major risk factors. Among
o … and *trans*-fatty acids (TFA) in the diet have
b … VDs.

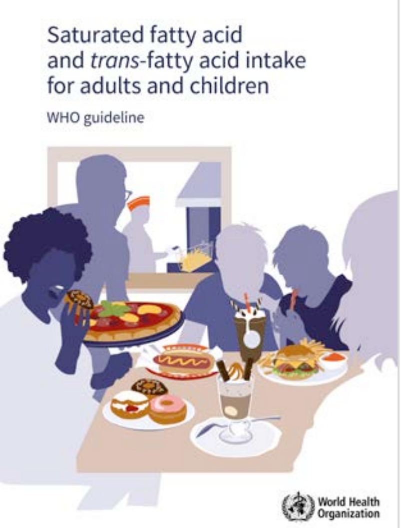
… ted fatty acid intake to 10% of total

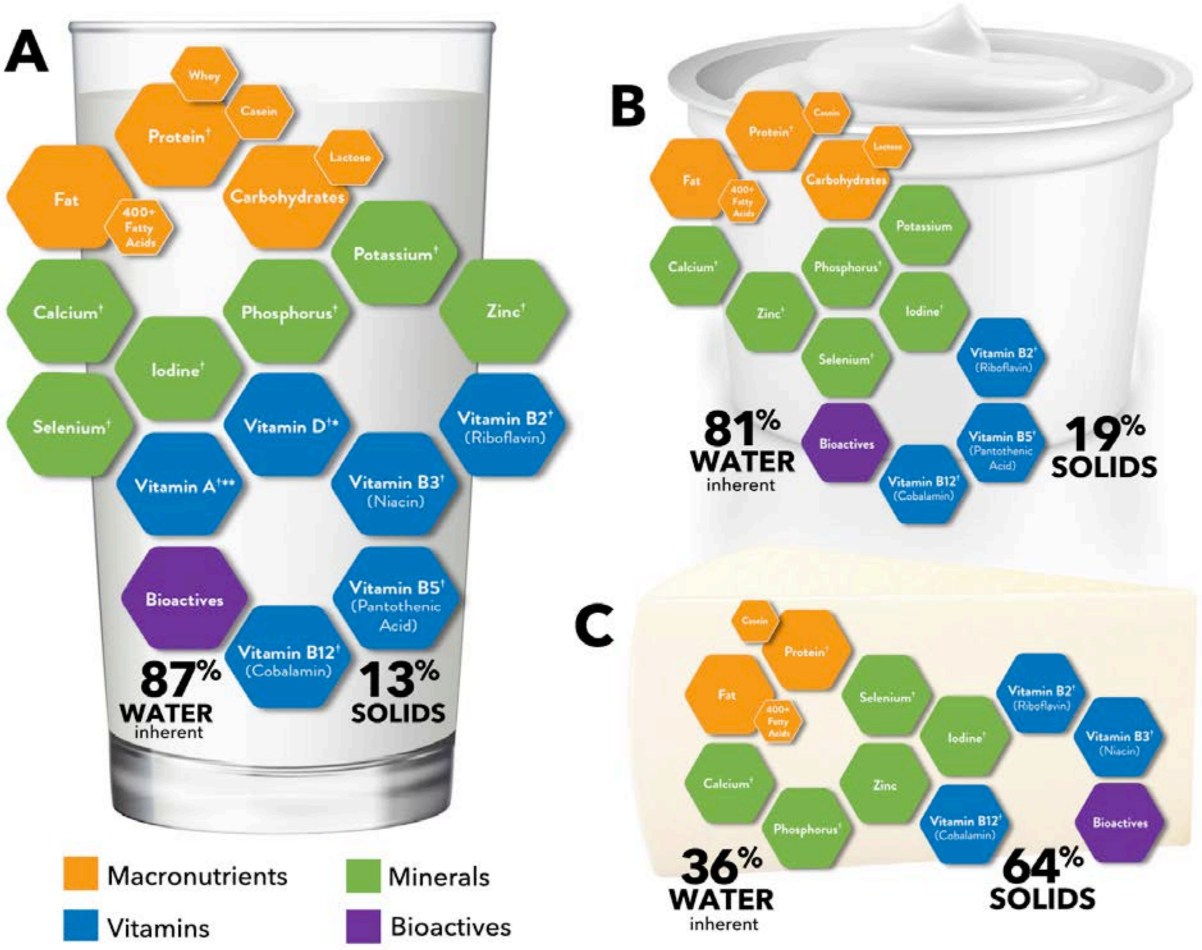
… e to less than 10% of total energy intake

… iet with polyunsaturated fatty
… cids from plant sources (*conditional*
… g naturally occurring dietary fibre, such
… *recommendation*).

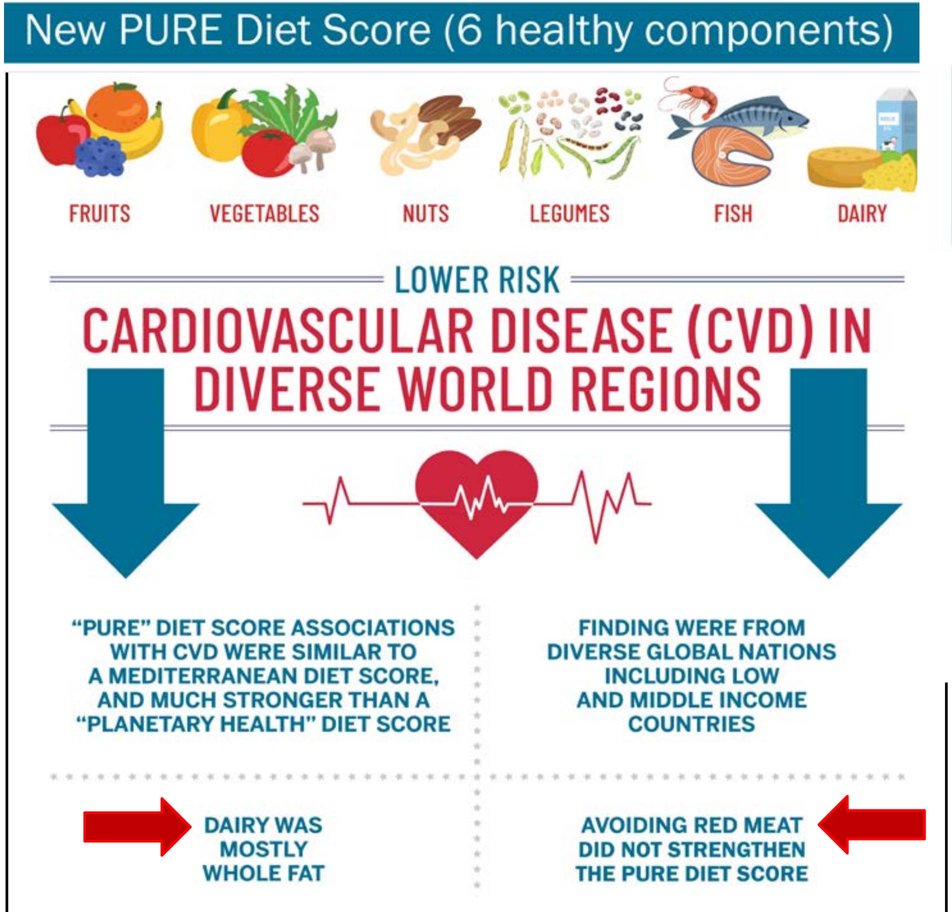
These recommendation … . However, foods containing
high levels of SFA shoul … d level of intake.

Bestimmt ein Inhaltstoff tatsächlich den Gesundheitswert?





„a modest amount of meat or whole grains can be part of a healthy diet.“



Mozaffarian D. Eur Heart J. 2023;44(28):2580–2582

Vielen Dank für Ihr Interesse und Ihre Aufmerksamkeit

Post.

www.nicolai-worm.de