

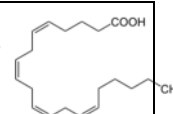
Ungesättigte Fettsäuren und gesättigte Fettsäuren

Die meisten Fettsäuren, speziell in einem leicht sauren Milieu, in einem pH-Bereich von 4.5 bis 6.0, sind fungizid und antimikrobiell wirksam.

Most of the fatty acids, especially in a slightly acidic environment, at a pH range of 4.5 to 6.0, are fungicidal and antimicrobial active.

<http://de.wikipedia.org/wiki/Fetts%C3%A4uren> http://de.wikipedia.org/wiki/Konjugierte_Linols%C3%A4ure
<http://de.wikipedia.org/wiki/Undecylens%C3%A4ure> <http://de.wikipedia.org/wiki/Lein%C3%B6l>

Steuerung der Genaktivität (Hormonwirkung) durch Arachidonsäurederivate (Eicosanoide); Prostaglandine, Leukotriene, Thromboxane.



Control of gene activity (Hormones) by arachidonic acid (eicosanoids); Prostaglandins, leukotrienes, thromboxanes.

Fettsäuren

Kabara JJ, Swieczkowski DM, Conley AJ, Truant JP (1972) Fatty Acids and Derivatives as Antimicrobial Agents. Antimicrob Agents Chemother. 2(1), 23–28. PMID: PMC444260
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC444260/>

Kabara JJ, Vrable R, Lie Ken Jie MSF (1977) Antimicrobial Lipids: Natural and Synthetic Fatty Acids and Monoglycerides. Lipids 12, 753759 <http://www.ncbi.nlm.nih.gov/pubmed/409896>
„Over 40 natural or synthetic lipophilic compounds were screened for antimicrobial activity. Gram (+) bacteria and yeasts but not Gram (-) bacteria were affected by these agents. Epimino and seleno fatty acids are more active than their corresponding straight chain unsubstituted fatty acids. The position of selenium influenced the antimicrobial activity of the fatty acids. The presence and position of a double or triple bond, usually an important factor in long chain fatty acids (greater than C14) had little or no effect in C11 fatty acids. Optimum antimicrobial activity was found for fatty acids and their corresponding monoglycerides when the chain length was C12. The dilaurin derivative was not active“.

Shibasaki I, Kato N (1978) Combined effects on antibacterial activity of fatty acids and their esters against gram-negative bacteria." The pharmacological effect of lipids 1978, 15-24.

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Oh DH, Marshall DL. (1993) **Antimicrobial activity** of ethanol, glycerol monolaurate or lactic acid against *Listeria monocytogenes*. International Journal of Food and Microbiology 20, 239-246

Bergsson G, Arnfinnsson J, Karlsson SM, Steingrimsson O, Thormar H. (1998) In vitro inactivation of ***Chlamydia trachomatis*** by fatty acids and monoglycerides. Antimicrobial Agents and Chemotherapy 42, 2290-2294.

Wichmann C, Naumann PT, Spangenberg O et al. (2003) **Liposomes for microcompartmentation of enzymes and their influence on catalytic activity**. Biochemical and Biophysical Research Communications 310, 1104–1110 <http://www.ncbi.nlm.nih.gov/pubmed/14559229>

Salim A et al. (2004) Investigation of the selective bactericidal effect of several decontaminating solutions on bacterial biofilms including useful, spoilage and/or pathogenic bacteria." Food microbiology 21.1, 11-17.

Batovska DI et al. (2009) Antibacterial study of the medium chain fatty acids and their 1-monoglycerides: individual effects and synergistic relationships. Polish Journal of Microbiology 58.1, 43-47.

[Rockenfeller P, Ring J, Muschett V](#) et al. (2010) **Fatty acids trigger mitochondrion-dependent necrosis.** *Cell Cycle*. 9(14), 2836-42. Epub 2010 Jul 11. <https://www.ncbi.nlm.nih.gov/pubmed/20647757>

[Huang CB, George B, Ebersole JL](#) (2010) **Antimicrobial activity of n-6, n-7 and n-9 fatty acids** and their esters for oral microorganisms. *Arch Oral Biol*. 2010 August; 55(8): 555–560. doi: [10.1016/j.archoralbio.2010.05.009](https://doi.org/10.1016/j.archoralbio.2010.05.009) PMID: PMC2902640 NIHMSID: NIHMS208512 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2902640/>

Halldor T, Hammer KA, Carson CF (2010) **Antibacterial and Antifungal Activities of Essential Oils** Online DOI: 10.1002/9780470976623.ch11 <http://onlinelibrary.wiley.com/doi/10.1002/9780470976623.ch11/summary>

[Murakami M](#). (2011) **Lipid mediators in life science.** *Exp Anim*. 60(1), 7-20. <http://www.ncbi.nlm.nih.gov/pubmed/21325748>

“...Lipid mediators are involved in many physiological processes, and their dysregulations have been often linked to various diseases such as inflammation, infertility, atherosclerosis, ischemia, metabolic syndrome, and cancer. In this article, I will give an overview of the basic knowledge of various lipid mediators...”.

Darren S, Dumlao DS, Cunningham AM, Wax LE et al. (2012) Dietary Fish Oil Substitution Alters the Eicosanoid Profile in Ankle Joints of Mice. during Lyme Infection 1–3 *The Journal of Nutrition*. doi: 10.3945/jn.112.157883

<http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&ved=0CFYQFjAE&url=http%3A%2Fjn.nutrition.org%2Fcontent%2Fearly%2F2012%2F06%2F12%2Fjn.112.157883.full.pdf&ei=EhSWU5jYPOqu7Aaf0YAq&usq=AFQiCNGq4dlOiwjych4LTkXo5vnHD8AVbg&bvm=bv.68445247.d.ZGU>

„Although dietary FO [Fish oil] substitution reduced the production of inflammatory (n-6) fatty acid-derived eicosanoids, no change in the host inflammatory response or development of disease was detected.“

[Tam VC, Quehenberger O, Oshansky CM](#) et al. (2013) Lipidomic profiling of influenza infection identifies mediators that induce and resolve inflammation. *Cell*. 154(1), 213-27. doi: 10.1016/j.cell.2013.05.052. <http://www.ncbi.nlm.nih.gov/pubmed/23827684>

“Bioactive lipid mediators play a crucial role in the induction and resolution of inflammation.”

[Russell CD, Schwarze J](#). (2014) The role of pro-resolution **lipid mediators in infectious disease.** *Immunology*. 141(2), 166-73. doi: 10.1111/imm.12206. <http://www.ncbi.nlm.nih.gov/pubmed/24400794>

Pratt CL, Brown CR (2014) The role of eicosanoids in experimental Lyme arthritis. *Cellular and Infection Microbiology* 4(69), 1-6 <http://journal.frontiersin.org/Journal/10.3389/fcimb.2014.00069/abstract>
„In this review, we will focus on recent advancements of our understanding of the roles of eicosanoids as inflammatory mediators in the regulation of experimental Lyme arthritis. Eicosanoids, such as PGE₂ and LTB₄, are powerful regulators of inflammatory responses and thus may be important mediators of Lyme arthritis.“

Goc A, Niedzwiecki A, Rath M (2015) In vitro evaluation of antibacterial activity of phytochemicals and micronutrients against *Borrelia burgdorferi* and *Borrelia garinii*. *Journal of applied microbiology* 119.6, 1561-1572.

Ungesättigte Fettsäuren <http://de.wikipedia.org/wiki/Omega-3-Fetts%C3%A4uren>

Omega-3-Fettsäuren

Serhan CN et al. (2002) Resolvins: a family of bioactive products of omega-3 fatty acid transformation circuits initiated by aspirin treatment that counter proinflammation signals. *J Exp Med*, 196, 1025-37

Schwab JM, Serhan CN (2006) Lipoxins and new lipid mediators in the resolution of inflammation. *Curr Opin Pharmacol*. 6, 414–20. [PubMed CrossRef](#)

Goldberg RJ, Katz J. (2007) A meta-analysis of the analgesic effects of omega-3 polyunsaturated fatty acid supplementation for inflammatory joint pain. *Pain*. 129, 210–23

Anderson P, Delgado M. (2008) Endogenous anti-inflammatory neuropeptides and pro-resolving lipid mediators: a new therapeutic approach for immune disorders. [J Cell Mol Med](#). 12(5B), 1830-47.

Serhan CN (2009) Systems approach to inflammation resolution: identification of novel anti-inflammatory and pro-resolving mediators. *J Thromb Haemost*. 7(Suppl 1), 44–8. [PubMed CrossRef](#)

Wall R, Ross RP, Fitzgerald GF, Stanton C (2010) Fatty acids from fish: the anti-inflammatory potential of long-chain omega-3 fatty acids. *Nutr Rev*. 68, 280–9

Ko GD, Nowacki NB, Arseneau L, Eitel M, Hum A (2010) Omega-3 fatty acids for neuropathic pain: case series. *Clin J Pain*. 26, 168–72.

Serhan CN (2010) Novel lipid mediators and resolution mechanisms in acute inflammation: to resolve or not? *Am J Pathol*. 177, 1576–91. [PubMed CrossRef](#) <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2947253/>

Norling LV, Serhan CN (2010) Profiling in resolving inflammatory exudates identifies novel anti-inflammatory and pro-resolving mediators and signals for termination. *J Intern Med*. 268, 15–24. [PubMed](#)

Einvik G et al. (2010) A randomized clinical trial on n-3 polyunsaturated fatty acids supplementation and all-cause mortality in elderly men at high cardiovascular risk. *Eur J Cardiovasc Prev Rehabil* 17, 558.

Rauch B et al. (2010) OMEGA, a randomized, placebo-controlled trial to test the effect of highly purified omega-3 fatty acids on top of modern guideline-adjusted therapy after myocardial infarction. *Circulation* 122, 2152.

Galan P et al. (2010) Effects of B vitamins and omega 3 fatty acids on cardiovascular diseases: a randomised placebo controlled trial. *BMJ* 341, c6273.

Kowey PR et al. (2010) Efficacy and safety of prescription omega-3 fatty acids for the prevention of recurrent symptomatic atrial fibrillation: a randomized controlled trial. *JAMA* 304, 2363.

Kwak SM et al. (2010) Efficacy of omega-3 fatty acid supplements (eicosapentaenoic acid and docosahexaenoic acid) in the secondary prevention of cardiovascular disease: a meta-analysis of randomized, double-blind, placebo-controlled trials. *Arch Intern Med* 172, 686.

Rizos EC et al. (2010) Association between omega-3 fatty acid supplementation and risk of major cardiovascular disease events: a systematic review and meta-analysis. *JAMA* 308, 1024.

[Da Young Oh](#), [Saswata Talukdar](#), [Eun Ju Bae](#), (2010) GPR120 Is an Omega-3 Fatty Acid Receptor Mediating Potent Anti-inflammatory and Insulin-Sensitizing Effects. *Cell*, [Volume 142, Issue 5](#), 687-698 <http://www.sciencedirect.com/science/article/pii/S0092867410008883>

Rockefeller P, Ring J, Muschett V et al. (2010) Fatty acids trigger mitochondrion-dependent necrosis. *Cell Cycle*. 9, 14

Long XX, Gao Y, Ping BH (2011) Effect of omega-3 fish oil fat emulsion on the peripheral neuropathy caused by bortezomib. *Zhonghua Xue Ye Xue Za Zhi* 32(9), 633-4. [Full Citation](#)

Gebauer SK, Chardigny JM, Jakobsen MU, et al. (2011) Effects of ruminant trans fatty acids on cardiovascular disease and cancer: a comprehensive review of epidemiological, clinical, and mechanistic studies. *Adv Nutr* 2(4), 332-54. [Abstract](#)

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Anderson EJ, Taylor DA (2012) Omega-3s: Fishing for a Mechanism. [Life Technologies The Scientist Magazine Features](#) November 1, 2012

“Despite abundant evidence supporting their ability to help prevent and treat cardiovascular disease, the therapeutic effectiveness of fish oil–derived fatty acids remains controversial”.

(2012) Fish Oil Supplements The Medical Letter. 54(1401)

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[Ohira H](#), [Fujioka Y](#), [Katagiri C](#), (2012) Butyrate enhancement of interleukin-1 β production via activation of oxidative stress pathways in lipopolysaccharide-stimulated THP-1 cells. J Clin Biochem Nutr. 50(1), 59–66. Published online 2011 August 24. doi: [10.3164/jcbn.11-22](#) PMID: PMC3246184 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3246184/>

Schleifer D (2012) The perfect solution. How trans fats became the healthy replacement for saturated fats. Technol Cult 53(1), 94-119. [Full Citation](#)

Palmer DJ, Sullivan T, Gold MS, et al. (2012) Effect of n-3 long chain polyunsaturated fatty acid supplementation in pregnancy on infants' allergies in first year of life: randomised controlled trial. BMJ e184. [Abstract](#)

Deckelbaum RJ, Torrejon C (2012) The omega-3 fatty acid nutritional landscape: health benefits and sources. J Nutr 142(3), 587S-591S. [Abstract](#)

Dalli et al. (2012) Resolvin D3 and Aspirin-Triggered Resolvin D3 Are Potent Immunoresolvents. Chemistry & Biology, dx.doi.org/10.1016 .2012.11.010 <http://medicalxpress.com/news/2013-02-aspirin-omega-fatty-acids-inflammation.html#iCp>

Gurzell EA, Teague H, Harris M, Clinthorne J, Shaikh SR, Fenton JI. (2013) DHA-enriched fish oil targets B cell lipid microdomains and enhances in vivo and ex vivo B cell function. J Leukoc Biol 93, 463-470; doi:10.1189/jlb.0812394 <http://medicalxpress.com/news/2013-04-fishy-fish-oil-boost-immune.html#iCp>

[Shinto L](#), [Quinn J](#), [Montine T](#) et al. (2013) A Randomized Placebo-Controlled Pilot Trial of Omega-3 Fatty Acids and Alpha Lipoic Acid in Alzheimer's Disease. J Alzheimers Dis. 2013 Sep 27. [Epub ahead of print] <http://www.ncbi.nlm.nih.gov/pubmed/24077434>

[Niso-Santano M](#), [Malik SA](#), [Pietrocola F](#) et al. (2015) **Unsaturated fatty acids induce non-canonical autophagy.** [EMBO J](#). 34(8),1025-41. doi: 10.15252/embj.201489363. Epub 2015 Jan 13. <http://www.ncbi.nlm.nih.gov/pubmed/25586377>

“Thus, unsaturated fatty acids induce a non-canonical, phylogenetically conserved, autophagic response that in mammalian cells relies on the Golgi apparatus.”

„In summary, our findings demonstrated that unsaturated FAs can induce non-canonical, BECN1-independent autophagy in vitro and in vivo through a phylogenetically conserved mechanism that requires an intact Golgi apparatus.“

Gesättigte Fettsäuren und Attraktivität

Smallegange RC, Qiu YT, Bukovinszkiné-Kiss et al. (2009) **The effect of aliphatic carboxylic acids on olfaction-based host-seeking of the malaria mosquito Anopheles gambiae sensu stricto.** Journal of Chemical Ecology. <http://www.sigmaaldrich.com/catalog/papers/19626371#sthash.v0iGhfgK.dpuf>

“The results show that carboxylic acids play an essential role in the host-seeking behavior of Anopheles gambiae, and that the contribution to blend attractiveness depends on the specific compound studied”.

Enig MG (?) Coconut: In Support of Good Health in the 21st Century.
<http://www.apccsec.org/document/ENIG.pdf>

Gesättigte Fettsäuren und Alzheimer Therapie

Caprylsäure, Axona® http://en.wikipedia.org/wiki/Caprylic_acid <http://de.wikipedia.org/wiki/Capryls%C3%A4ure>
[= bakteriostatisch und fungistatisch, entzündungshemmend]

Caprylsäure wird von Bakterien hergestellt. Caprylsäure ist als Triglycerid in zahlreichen Nahrungsmitteln enthalten.

Caprylsäure ist eine gesättigte Fettsäure, C₇H₁₅-COOH (Octansäure, Heptancarbonsäure). Caprylsäure wirkt **fungizid**. Caprylsäure löst das Chitin in der Zellwand von einigen Pilzen.

Bei Candidosis z.B. kann durch Zufuhr von 1200 bis 1800 mg Caprylsäure / Tag die Darmflora normalisiert und Candida frei werden.

Caprylsäure wirkt **insektizid**. Caprylsäure löst den Chitinpanzer von Insekten auf.

Caprylic acid is made by bacteria. Caprylic acid is included as triglyceride in many foods. Caprylic acid is a saturated fatty acid, C₇H₁₅-COOH (octanoic acid, heptanecarboxylic). Caprylic acid is fungicidal. Caprylic solves the chitin in the cell wall of some fungi. In candidiasis e.g. can supply by 1200 to 1800 mg caprylic / day, the intestinal flora is normalized and Candida free.

Caprylic acid is insecticidal. Caprylic acid dissolves the exoskeleton of insects.

Henderson ST, Vogel JL, Barr LJ, et al. (2009) Study of the ketogenic agent AC-1202 in mild to moderate Alzheimer's disease: a randomized, double-blind, placebo-controlled, multicenter trial. *Nutr Metab (Lond)*. 6, 31.

Cunnane S, Nugent S, Roy M, et al. (2011) Brain fuel metabolism, aging, and Alzheimer's disease. *Nutrition*. 27(1), 3-20.

Axona® [prescribing information]. Broomfield, CO: Accera, Inc.; November 2012.

National Institute on Aging. (2013) Alzheimer's disease [fact sheet].
http://www.nia.nih.gov/sites/default/files/alzheimers_disease_fact_sheet_0.pdf

Natura Foundation (2013) <http://www.naturafoundation.net/monografie/Capryls%C3%A4uren.html>

[Shilling M](#), [Matt L](#), [Rubin E](#) (2013) **Antimicrobial effects of virgin coconut oil and its medium-chain fatty acids on Clostridium difficile**. *J Med Food*. 16(12), 1079-85. doi: 10.1089/jmf.2012.0303. <http://www.ncbi.nlm.nih.gov/pubmed/24328700>

Laurylsäure, monolaurin

Preuss HG et al. (2005) Effects of essential oils and monolaurin on Staphylococcus aureus: In vitro and in vivo studies." *Toxicology mechanisms and methods*. 15.4., 279-285.

Lieberman Sh, Enig MG, Preuss HG (2006) A review of monolaurin and lauric acid: natural virucidal and bactericidal agents. *Alternative & Complementary Therapies* 12.6, 310-314

Vidal L, Thuault V, Geffard M et al. (2014) **Lauryl-poly-L-lysine**: A New Antimicrobial Agent? *Journal of Amino Acids*. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3934720/>

[Goc A, Niedzwiecki A, Rath M](#) (2015) **In vitro evaluation of antibacterial activity of phytochemicals and micronutrients against *Borrelia burgdorferi* and *Borrelia garinii*.** *J Appl Microbiol.* 119(6), 1561-72. doi: 10.1111/jam.12970.
<https://www.ncbi.nlm.nih.gov/pubmed/26457476>

Fettsäuren und Antivirale Effekte, fatty acids and antiviral effects

Sands JA, Auperin DD, Landin PD, Reinhardt A, Cadden SP (1978) Antiviral effects of fatty acids and derivatives: **lipid-containing bacteriophages as a model system in The Pharmacological Effect of Lipids** (JJ Kabara, ed) American Oil Chemists' Society, Champaign IL, 75-95

Hierholzer JC, Kabara JJ (1982) In vitro effects of monolaurin compounds on enveloped RNA and DNA viruses. *Journal of Food Safety.* 4, 1-12

Thormar H, Isaacs EC, Brown HR, Barshatzky MR, Pessolano T (1987) **Inactivation of enveloped viruses and killing of cells by fatty acids and monoglycerides.** *Antimicrobial Agents and Chemotherapy* 31, 27-31

Isaacs CE, Kim KS, Thormar H. (1994) Inactivation of enveloped viruses in human bodily fluids by purified lipids. *Annals of the New York Academy of Sciences* 724, 457-464

[Gorres KL¹, Daigle D, Mohanram S, Miller G.](#) (2014) Activation and repression of Epstein-Barr virus and Kaposi sarcoma-associated herpesvirus lytic cycles by **short- and medium-chain fatty acids.** *J Virol.* [Epub ahead of print] <http://www.ncbi.nlm.nih.gov/pubmed/24807711>

„IMPORTANCE: Lytic reactivation of EBV and KSHV is needed for persistence of the virus and plays a role in carcinogenesis. Our direct comparison highlights the mechanistic differences of lytic reactivation between related human oncogenic gammaherpesviruses. Our findings have therapeutic implications, as fatty acids are found in the diet and produced by human microbiota. Small molecule inducers of the lytic cycle are desired for oncolytic therapy. Inhibition of viral reactivation, alternatively, may prove useful in cancer treatment. Overall, our findings contribute to understanding pathways that control the latent to lytic switch and identify naturally occurring molecules that may regulate this process.“

Fettsäuren und Neoplasma

Die Frage der **Karzinogenität oder Antikarzinogenität von Fettsäuren** wurde kontrovers diskutiert. Diese Frage ist bis heute ungeklärt.
Ungesättigte Fettsäuren könnten karzinogen wirken wegen der freien Elektronen.

Enig MG, Munn RJ, Keeney M (1978) **Dietary fat and cancer trends – a critique.** *Fed Proc* 37(9), 2215-2220 <http://www.ncbi.nlm.nih.gov/pubmed/566221>

Lim-Sylianco CY. (1987) **Anticarcinogenic effect of coconut oil.** *The Philippine Journal of Coconut Studies* 12, 89-102

Riede I. (2014) **Membrane Fluidity: About the Origin of Autoimmunity.** *Open Journal of Immunology* 4, 9-13 <http://www.scirp.org/journal/PaperInformation.aspx?paperID=43791#.UzbeckJ9JeE>
http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CD0QFjAB&url=http%3A%2F%2Fwww.scirp.org%2Fjournal%2FPaperDownload.aspx%3FpaperID%3D43791&ei=B942U-vKHIfDtAbW94Fw&usq=AFQjCNE7Dj88cNW7uYH63u0_rrQi4M_UXQ&bvm=bv.63808443,d.Yms

Chernet, B., & Levin, M. (2014). **Transmembrane voltage potential of somatic cells controls oncogene-mediated tumorigenesis at long-range.** *Oncotarget*, 5. This work was published May 1, 2014, online in advance of print. <http://www.ncbi.nlm.nih.gov/pubmed/24830454>
„Based on published data on the voltage-mediated changes of butyrate flux through the SLC5A8 transporter, we present a model linking resting potentials of host cells to the ability of oncogenes to initiate tumorigenesis. Antibiotic data suggest that the relevant butyrate is generated by a native bacterial

species, identifying a novel link between the microbiome and cancer that is mediated by alterations in bioelectric signaling.“

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