Fatty acids are essential bioactive compounds that take part in various complex metabolic pathways and thus play a very important role in normal growth and development of humans by regulating structure and functions of membranes, intracellular signaling pathways, gene expression and production of bioactive lipid mediators. Depending upon their dietary source, the type of fat consumed and its health consequences can be determined. Saturated fatty acids like caprylic acid, myristic acid, arachidic acid is obtained from butter, palm and coconut oil, lard etc. whereas unsaturated fatty acids are present in vegetable oils and marine products like algae and fish. Fatty acids are also reported to possess anti-inflammatory, antithrombotic, anti-arrhythmic, hypolipidemic, antimicrobial, anticancer and vasodilatory properties. This review highlights the biological importance of caprylic acid, one of the important medium chain saturated fatty acid.

Key words: Caprylic acid, Fatty acid, Source, Biological Importance

1. Introduction
Caprylic acid (CH₃(CH₂)₆COOH) is a naturally occurring medium chain fatty acid containing eight carbon atoms which is found in triglycerides of butter [1], coconut oil [2, 3], bovina and human milk [4], palm hemp [5]. Fatty acids play a vital role in controlling insulin release [6] and lipid levels in atherosclerosis [7], in myocardial infarction [8], in inflammatory disorders [9] and mood disorders [10], as antimicrobial against Candida albicans [11], Helicobacter pylori [12], Escherichia coli [13].

Caprylic acid is also used commercially in perfume industries for production of esters and also in the manufacture of dyes [14].

Skrivanova et al., 2006 [16] determined antimicrobial activity of fatty acids viz monolaurin, citric, succinic, fumaric, maleic caprylic and lactic acid in culture of two strains of Escherichia coli (CCM 3954, CCM 4225), three strains of Salmonella species (ATCC 13076, K₁ and K₂) and two strains of Clostridium perfringens (CCM 4435, CNCTC 5459) and observed that among all the tested acids, caprylic acid was the only acid capable of inhibiting all the tested strains with the MIC value ranging from 1 to 3 mg/ml.

Shipar, 2007 [17], in his study reported that brain lipid of Metapenaeus brevicornis has antimicrobial activity against disease causing bacteria Shigella dysenterial, Salmonella typhi, Staphylococcus aureus and fungal pathogens Macrophomia phascoloma, Alternaria alternate and Curvularia lunata. Further GLC analysis confirmed that caprylic, myristic, palmitic, stearic and oleic acid are key components of brain lipid responsible for its antimicrobial effects.

Shipar, 2014 [18] reported that lipid obtained from body of red shrimp (Metapenaeus brevicornis) also possess antimicrobial activity against many bacteria like Staphylococcus dysenterial, Bacillus subtilis, Salmonella typhi and Escherichia coli and fungal pathogens like Alternaria alternate and Curvularia...
lunata which is due to the presence of fatty acids viz. caprylic, myristic, palmitic, stearic, arachidic and oleic acid.

b) As antifungal
In a review on antifungal activities of free fatty acids, Carolina et al., 2011 [19] reported the antifungal activity of caprylic acid against Alerania solani, Cucumerinum lagenarium, Fusarium oxysporum, Kluyveromyces marxianus, Mycrothecium verrucaria, Saccharomyces cerevisiae, Trichoderma viride etc.

Elmore et al., 2014 [20] reported the antifungal activity of coconut oil obtained from Cocos nucifera L. against Candida albicans is due to presence of fatty acids like lauric acid, capric acid, caprylic acid etc. He also observed the antibacterial effects of these acids against certain gram-negative organisms (Proteus vulgaris, P. mirabilis, P. rettgeri, Escherichia coli, Serratia marcescens, Pseudomonas aeruginosa, and Salmonella typhimurium), gram-positive organisms (S. aureus, S. epidermidis, beta-hemolytic streptococci, group D streptococcus, Bacillus subtilis, Sarcina lutea, Micrococcus, Nocardia asteroids, Corynebacterium and pneumococcus).

c) In Dermatophilosis
Valipe, 2011 [21] reported the activity of caprylic acid in dermatophilosis (rain rot), a skin infection, caused by Dermatophilus congolensis, a gram positive bacterium which causes heavy loss in animal industry by causing fall in milk yield, and deterioration of hide and meat quality. Further electron microscopy results reveal that caprylic acid disrupts plasma membrane of bacteria which is thus responsible for its action.

d) In Bovine mastitis
Bovine mastitis is the single most important cause of economic loss to the dietary industry, and is characterized by inflammation of the mammary gland, usually caused by microbial infection. Mastitis can lead to increased production costs due to culling, medication, disordered milk, delayed genetic progress, and reduced milk yield and milk quality, which combined lead to a huge economic drain on the industry. Nair et al., 2005 [22] tested caprylic acid and monocaprylin for their bactericidal activity against the major bovine mastitis pathogens Streptococcus agalactiae, Streptococcus dysgalactiae, Streptococcus suberis, Staphylococcus aureus, and Escherichia coli in milk and caprylic acid was found active against all tested strains and thus has the potential to be used as an alternative or adjunct to antibiotics for treatment of bovine mastitis.

e) Against intestinal pathogens
Santos et al., 2008 [23] in a study on ten day old broiler chickens reported that caprylic acid supplemented in feed is active against Campylobacter jejuni which is one of the leading cause of human foodborne illness (mainly poultry products) in United States so reducing Campylobacter jejuni in intestinal tract will reduce contamination of poultry products and eggs.

Skrivanova et al., 2008 [24], found caprylic acid to be effective in the reduction of enteropathogenic Escherichia coli in caecum and faeces of rabbits infected with EPEC O103 or O128.

Hanczakowska et al., 2011 [25] reported that caprylic, capric and fumaric acids when given in piglet feed decreased the amount of Escherichia coli in small intestine and thus work as antibiotic replacement.

Kollanoor et al., 2012 [26] investigated efficacy of feed supplemented with caprylic acid for reducing Salmonella enterica serovar enteritidis colonization in commercial broiler chickens and observed that caprylic acid potentially reduces the pathogen’s ability to invade intestinal epithelial cells by downregulating key invasion genes, hilA and hilD.

Begum et al., 2015 [27] observed that caprylic acid extract-supplemented diet improved growth performance, relative weight of bursa of Fabricius and reduced mortality rate, breast muscle and caecal E. coli counts in broiler chickens.

f) As Antiparasitic
The in vitro antiparasitic effect of caprylic acid was studied by Hirazawa et al., 2001 [28] against several fish parasites i.e. Cryptocaryon irritans (theronts), monogenean Benedenia seriola (oncomiracidia and adults), copepod Pseudocaligus fugu (copepods and adults) and myxosporean Kudoa shiomiensis (spores). It was observed that caprylic acid at a concentration of 1mM had a parasiticidal effect against C. irritans theronts, B. seriola oncomiracidia and K. shiomiensis spores and a contractile effect against B. seriola adults, but had no clear effect against P. fugu copepodids and adults.

g) In Crohn’s disease
Hoshimoto et al., 2002 [29] revealed the inhibitory effect of caprylic acid on IL-8 gene transcription in differentiated Caco-2 cells and thus has potential in treatment of Crohn’s disease. Further, they suggested that inhibition of IL-8 gene transcription by caprylic acid is not dependent on transcription factor inhibition or the induction of H4 acetylation in its promoter.

h) As preservative
Chaudhary et al., 2008 [30] reported preservative effectiveness of caprylic acid derivatives (mainly capryl hydrazides) against Staphylococcus aureus MTCC 2901, Bacillus subtilis MTCC 2063, and Escherichia coli MTCC 1652 in Aluminium Hydroxide Gel–USP.

i) Decreased mortality in rabbits
Skrivanova and Marounek, 2002 [31] studied the effects of an oil containing triglycerols of caprylic and capric acid on growth, mortality, and digestibility of nutrients in growing rabbits. From their study, they concluded that medium chain fatty acids supplied as triacylglycerols decreased high mortality of growing
rabbits under practical conditions but had no effect on the rate of growth.

j) Antioxidants
Kidwai et al., 2011 [32] synthesized acyl derivatives of coumarins using different acids viz. acetic acid, caprylic acid, myristic acid, capric acid, palmitic acid etc. and reported the antioxidant potential of these compounds using DPPH radical scavenging activity and ABTS radical cation activity method.

k) Role on food consumption or body weight
De Sousa et al., 2006 [33] found that caprylic acid is capable of producing a signal that inhibits feeding (decreased food intake) in rats which may be due to increase in hepatic fatty acid oxidation by the caprylic acid.

Further Lemarie et al., 2015 [34] observed the effect of dietary caprylic acid on food consumption and found that dietary caprylic acid decreases plasma unacylated ghrelin in rats without increasing plasma acylated ghrelin, thus having no role on body weight or food consumption and therefore dietary limit of caprylic acid need not to be changed.

l) In enterocolitis
Skrivanova et al., 2008 [35] found caprylic acid to be active against coliform bacteria by improving the resistance of weaned rabbits to enterocolitis.

m) Production and purification of immunoglobulin
Caprylic acid is also reported to be used in production [36] and purification [37] of human immunoglobulin.

References


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