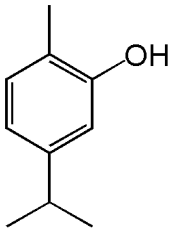
Carvacrol

Carvacrol[1]	
	
Identifiers	
CAS number	499-75-2 [2] ✓
PubChem	10364 [3]
ChemSpider	21105867 [4] ✓
UNII	9B1J4V995Q [5] ✓
KEGG	C09840 [6] ✓
ChEMBL	CHEMBL281202 [7] ✓
Jmol-3D images	Image 1 [8]
Properties	
Molecular formula	$C_{10}H_{14}O$
Molar mass	150.217 g/mol
Density	0.9772 g/cm^3 at 20 °C
Melting point	1 °C, 274 K, 34 °F
Boiling point	237.7 °C, 511 K, 460 °F
Solubility in water	slightly soluble
Solubility	soluble in ethanol, diethyl ether, carbon tetrachloride, acetone[9]
✓ (what is this?) (verify) [10] Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	

Carvacrol, or **cymophenol**, $C_6H_3CH_3(OH)(C_3H_7)$, is a monoterpenoid phenol. It has a characteristic pungent, warm odor of oregano and a *pizza-like* taste.[11]

Natural occurrence

Carvacrol is present in the essential oil of *Origanum vulgare*, oil of thyme, oil obtained from pepperwort, and wild bergamot. The essential oil of Thyme subspecies contains between 5% and 75% of carvacrol, while *Satureja* (savory) subspecies have a content between 1% and 45%. The Origanum species majorana and Dittany of Crete are rich in carvacrol, 50% resp. 60-80%.[12]

Biological properties and use

Carvacrol inhibits the growth of several bacteria strains, e.g. *Escherichia coli*[13] and *Bacillus cereus*. Its low toxicity together with its pleasant taste and smell suggests its use as a food additive to prevent bacterial contamination.[14] In *Pseudomonas aeruginosa* it causes damages to the cell membrane of these bacteria and, unlike other terpenes, inhibits the proliferation of this germ.[15] The cause of the antimicrobial properties is believed to be disruption of the bacteria membrane.[16] [17]

It is a potent activator of the human ion channels transient receptor potential V3 (TRPV3) and A1 (TRPA1).[18] Application of carvacrol on the human tongue, as well as activation of TRPV3, causes a sensation of warmth. In addition carvacrol also activates, but rapidly desensitizes the *pain receptor* TRPA1 explaining its pungency.[18]

It activates PPAR and suppresses COX-2 inflammation [19] .

In rats carvacrol is quickly metabolized and excreted. The main metabolic route is esterification of the phenolic group with sulfuric acid and glucuronic acid. A minor pathway is oxidation of the terminal methyl groups to primary alcohols. After 24 hours only very small amounts of carvacrol or its metabolites could be found in urine, indicating an almost complete excretion within one day.[20]

Synthesis and derivatives

Carvacrol may be synthetically prepared by the fusion of cymol sulfonic acid with caustic potash; by the action of nitrous acid on 1-methyl-2-amino-4-propyl benzene; by prolonged heating of five parts of camphor with one part of iodine; or by heating carvol with glacial phosphoric acid or by performing a dehydrogenation of carvone with a Pd/C catalyst. It is extracted from Origanum oil by means of a 50% potash solution. It is a thick oil which sets at 20 °C to a mass of crystals of melting point 0°C, and boiling point 236-237 °C. Oxidation with ferric chloride converts it into dicarvacrol, whilst phosphorus pentachloride transforms it into chlorcymol.

List of the plants that contain the chemical

- Origanum compactum [21]
- Origanum dictamnus [22]
- Origaum microphyllum [23]
- Origanum onites [24] , [25]
- Origanum scabrum [23]
- Origanum vulgare [26] , [27]
- Thymus glandulosus [21]

Toxicology

Carvacrol, like other essential oils, does not have many long-term genotoxic risks. The cytotoxic ability of carvacrol on prooxidant activity can make it an effective antiseptic and antimicrobial agent. [28] Carvacrol has been found to show antioxidant activity.

Antimicrobial activity:

- 25 different periodontopathic bacteria and strains[29]
- *Cladosporium herbarum* [29]
- *Penicillium glabrum*[29]
- Fungi such as *F. moniliforme*, *R. solani*, *S. sclerotirum*, and *P. capisci*[29]

Compendial status

- British Pharmacopoeia [30]

Notes & references

- This article incorporates text from a publication now in the public domain: Chisholm, Hugh, ed (1911). *Encyclopædia Britannica* (11th ed.). Cambridge University Press.

[1] "Carvacrol data sheet from Sigma-Aldrich" (http://www.sigmaaldrich.com/catalog/search/ProductDetail/ALDRICH/W224502). .

[2] http://www.commonchemistry.org/ChemicalDetail.aspx?ref=499-75-2

[3] http://pubchem.ncbi.nlm.nih.gov/summary/summary.cgi?cid=10364

[4] http://www.chemspider.com/21105867

[5] http://fdasis.nlm.nih.gov/srs/srsdirect.jsp?regno=9B1J4V995Q

[6] http://www.kegg.jp/entry/C09840

[7] https://www.ebi.ac.uk/chembldb/index.php/compound/inspect/CHEMBL281202

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