Piperine

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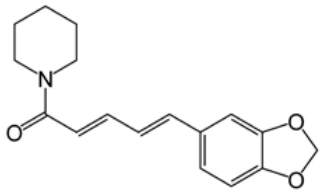	
	
Identifiers	
CAS number	94-62-2 [1] ✓
SMILES	
Properties	
Molecular formula	$C_{17}H_{19}NO_3$
Molar mass	285.34 g mol^{-1}
Density	1.193 g/cm^3
Melting point	130 °C, 403 K, 266 °F
Boiling point	*decomposes*
Hazards	
MSDS	MSDS for piperine [2]
✓ (what is this?) (verify) [3] Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	

For the organic compound used in drug production, see: Piperidine

Piperine is the alkaloid[4] responsible for the pungency of black pepper and long pepper, along with chavicine (an isomer of piperine). It has also been used in some forms of traditional medicine and as an insecticide. Piperine forms monoclinic needles, is slightly soluble in water and more so in alcohol, ether or chloroform: the solution in alcohol has a pepper-like taste. It yields salts only with strong acids. The platinichloride $B_4{\bullet}H_2PtCl_6$ forms orange-red needles. ("B" denotes one mole of the alkaloid base in this and the following formulae.) Iodine in potassium iodide added to an alcoholic solution of the base in presence of a little hydrochloric acid gives a characteristic periodide, $B_2{\bullet}HI{\bullet}I_2$, crystallising in steel-blue needles, mp. 145°C. Anderson[5] first hydrolysed piperine by alkalis into a base and an acid, which were later named[6] piperidine and piperic acid respectively. The alkaloid was synthesised[7] by the action of piperoyl chloride on piperidine.

Preparation

Piperine is commercially available. If desired, it may be extracted from black pepper using dichloromethane.[8] The amount of piperine varies from 1-2% in long pepper, to 5-9% in the white and the black peppers of commerce.[9] Further, it may be prepared by treating the solvent-free residue from an alcoholic extract of black pepper, with a solution of sodium hydroxide to remove resin (said to contain chavicine, an isomer of piperine) and solution of the washed, insoluble residue in warm alcohol, from which the alkaloid crystallises on cooling.

Biological activity

The pungency caused by capsaicin and piperine is caused by activation of the heat and acidity sensing TRPV ion channel TRPV1 on nociceptors (pain sensing nerve cells).[10]

Piperine has also been found to inhibit human CYP3A4 and P-glycoprotein, enzymes important for the metabolism and transport of xenobiotics and metabolites.[11] In animal studies, piperine also inhibited other enzymes important in drug metabolism.[12] [13] By inhibiting drug metabolism, piperine may increase the bioavailability of various compounds and alter the effectiveness of some medications.[12] Notably, piperine may enhance bioavailability of curcumin by 2000% in humans.[14]

In February 2008, researchers discovered that piperine can stimulate pigmentation in the skin, together with the exposure to UVB light.[15] [16]

Piperine was discovered by Hans Christian Ørsted in 1819, he isolated it from the fruits of Piper nigrum, the source plant of both the black and white pepper grains.[17] Piper longum and Piper officinarum (Miq.) C. DC. (=Piper retrofractum Vahl), two species called "long pepper" also found containing it by Flückiger and Hanbury.[18] West African Pepper also contains it.[19]

See also

- Piperidine, a cyclic six-membered amine that results from hydrolysis of piperine
- Capsaicin, the active piquant chemical in chili peppers
- Allyl isothiocyanate, the active piquant chemical in mustard, radishes, horseradish, and wasabi
- Allicin, the active piquant flavor chemical in raw garlic and onions (see those articles for discussion of other chemicals in them relating to pungency, and eye irritation)

References

[1] http://www.commonchemistry.org/ChemicalDetail.aspx?ref=94-62-2

[2] https://fscimage.fishersci.com/msds/04545.htm

[3] http://en.wikipedia.org/wiki/%3Apiperine

[4] *Merck Index*, 11th Edition, **7442**

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[18] *Pharmacographia* (London: Macmillan & Co., 1879), p. 584.

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