Ergosterol

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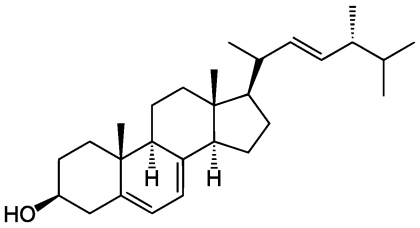	
Identifiers	
CAS number	57-87-4 [1] ✓
PubChem	444679 [2]
ChemSpider	392539 [3] ✓
UNII	Z30RAY509F [4] ✓
EC number	200-352-7 [5]
MeSH	Ergosterol [6]
ChEBI	CHEBI:16933 [7] ✓
ChEMBL	CHEMBL1232562 [8] ✗
Jmol-3D images	Image 1 [9]
Properties	
Molecular formula	$C_{28}H_{44}O$
Molar mass	396.65 g/mol
Melting point	160.0 °C
Boiling point	250.0 °C
✗ (verify) [10] (what is: ✓/✗?) Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	

Ergosterol (ergosta-5,7,22-trien-3β-ol) is a sterol found in fungi, and named for ergot, a common name for the members of the fungal genus *Claviceps* from which ergosterol was first isolated. Ergosterol does not occur in plant or animal cells. It is a component of yeast and fungal cell membranes, serving the same function cholesterol serves in animal cells.

Ergosterol is occasionally reported analytically to occur in grasses such as rye[11] and alfalfa (including alfalfa sprouts), and in plant flowers such as hops.[12] However, such detection is usually assumed to be detection of fungal growth upon (and sometimes contamination of) of the plant, as fungi form an integral part of the grass decay system. This ergosterol assay technique may thus be used to assay grass, grain, and feed systems for fungal content.[13][14]

Since ergosterol is the provitamin of vitamin D_2, the UV radiation of fungus-bearing grass materials can result in vitamin D_2 production,[15] but this is production of a form of vitamin D from fungus ergosterol (much as in UV radiation of yeasts and mushrooms) and is not true vitamin D production by the plant itself from UV light, a process

that cannot happen.

Vitamin D_2 precursor

Ergosterol is a biological precursor (a provitamin) to vitamin D_2. It is turned into viosterol by ultraviolet light, and is then converted into ergocalciferol, a form of vitamin D also known as D_2 or D2.[16] For this reason, when yeast (such as brewer's yeast) and fungi (such as mushrooms), are exposed to ultraviolet light, significant amounts of vitamin D_2 are produced. Such vitamin D_2 serves as the only available dietary source of vitamin D for those who eat no animal products, although such persons can obtain ample vitamin D through exposure to sunlight.

A related process of producing food vitamin D from fungi (though not a process acceptable to vegans) occurs when milk-cows are fed diets of UV-irradiated-yeast (which contains D_2 produced from the ergosterol in the yeast). This form of the vitamin is eventually excreted as D_2 in cow milk. However, this process for increasing vitamin D in milk was never as common as "supplementing" milk directly, by adding vitamin D_3 to the milk. It was also not as common as the earlier Steenbock process, in which milk was exposed directly to ultraviolet light, which converts milk's natural 7-dehydrocholesterol content to vitamin D_3.

Target for antifungal drugs

Because ergosterol is present in cell membranes of fungi, yet absent in those of animals, it is a useful target for antifungal drugs. Ergosterol is also present in the cell membranes of some protists, such as trypanosomes.[17] This is the basis for the use of some antifungals against West African sleeping sickness.

Amphotericin B, an antifungal drug, targets ergosterol. It binds physically to ergosterol within the membrane, and, thus, creates a polar pore in fungal membranes. This causes ions (predominantly potassium and protons) and other molecules to leak out, which will kill the cell.[18] Amphotericin B has been replaced by safer agents in most circumstances, but is still used, despite its side effects, for life-threatening fungal or protozoan infections.

Miconazole, itraconazole, and clotrimazole work in a different way, inhibiting synthesis of ergosterol from lanosterol. Ergosterol is a smaller molecule than lanosterol; it is synthesized by combining two molecules of farnesyl pyrophosphate, a 15-carbon-long terpenoid, into lanosterol, which has 30 carbons. Then, two methyl groups are removed, making ergosterol. The "azole" class of antifungal agents inhibit the enzyme that performs these demethylation steps in the biosynthetic pathway between lanosterol and ergosterol.

Other uses

Ergosterol is also used as an indicator of fungal biomass in soil. Though it does degrade over time, if kept below freezing in a dark environment, this degradation can be slowed or even stopped completely.

Research has shown ergosterol may have antitumor properties.[19][20]

Toxicity

Ergosterol powder is an irritant to skin, eyes, and the respiratory tract. Ingestion of large amounts can cause hypercalcemia, which (if prolonged) can lead to calcium salt deposits in the soft tissues and, in particular, the kidneys.[21]

References

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[2] http://pubchem.ncbi.nlm.nih.gov/summary/summary.cgi?cid=444679

[3] http://www.chemspider.com/392539

[4] http://fdasis.nlm.nih.gov/srs/srsdirect.jsp?regno=Z30RAY509F

[5] http://esis.jrc.ec.europa.eu/lib/einecs_IS_reponse.php?genre=ECNO&entree=200-352-7

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[7] https://www.ebi.ac.uk/chebi/searchId.do?chebiId=16933

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[10] http://en.wikipedia.org/wiki/Special%3Acomparepages?rev1=461094825&page2=%3AErgosterol

[11] (http://www.ncbi.nlm.nih.gov/pubmed/21919518)

[12] (http://www.ncbi.nlm.nih.gov/pubmed/17760411)

[13] (http://wwww.aslo.org/lo/toc/vol_46/issue_3/0573.pdf)

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[21] Material Safety Data Sheet (http://fscimage.fishersci.com/msds/28224.htm), Fisher Scientific

External links

- Safety (MSDS) data for ergosterol (http://ptcl.chem.ox.ac.uk/MSDS/ER/ergosterol.html) Oxford University (2005)

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