Oligomycin C
PRODUCT DATA SHEET

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Product Name:	Oligomycin C
Product Number:	O019
CAS Number:	11052-72-5
Molecular Formula:	$C_{45}H_{74}O_{10}$
Molecular Weight:	775.1
Appearance:	White Lyophilisate
Solubility:	Soluble in ethanol, methanol, DMSO and DMF. Practically insoluble in water.
Source:	Streptomyces diastatochromogenes
Storage Conditions:	-20°C
Description:	Oligomycin C is a minor analog of a class of macrocyclic lactones isolated from selected strains of *Streptomyces* spp. It is a non-selective inhibitor of mitochondrial F_1F_0 ATP synthase in eukaryotes. Oligomycins exhibit apoptotic cytotoxicity and mitochondrial toxicity. It can induce apoptosis in a variety of cell types. It is practically free of homologs. Oligomycin is a macrolide antibiotic complex from *Streptomyces.* It is an inhibitor of mitochondrial F_1F_0 ATP synthase. The Oligomycin complex was first reported in 1954, from a strain of *Streptomyces diastatochromogenes* from soil and highly active against fungi. The Oligomycin class includes the analogs/isomers A through G. Different isomers are highly specific for the disruption of mitochondrial metabolism. Oligomycin can be used to study the mechanistic aspects of ATP formation in tumor cell biology and apoptosis. Oligomycin C is soluble in ethanol, methanol, DMSO and DMF. Practically insoluble in water. Additional Oligomycin products can be found here.
Mechanism of Action:	Oligomycin inhibits phosphoryl group transfer in mitochondrial membrane-bound ATP synthase (F_1F_0 ATPase), blocking proton translocation and leading to hyperpolarization of inner mitochondrial membrane. The result is that mitochondrial ATP is not synthesized, as this enzyme is responsible for ATP production in mammals via a rotary catalytic mechanism. After more than 50 years of studies on the binding site of Oligomycin, a team at the Rosalind Franklin University (North Chicago, IL) discovered that it binds to the subunit-c of the F_0 portion of the ATP synthase. The residues involved in the binding site are conserved from yeast to humans (Symersky et al, 2012).

Spectrum: Oligomycin is active against *Rhodotorula gultinis*, *Aspergillus niger* and other molds.

Microbiology Applications A number of mutations in yeast have been shown to confer resistance to Oligomycin.

Cancer Applications Mitochondria are regulators in apotosis, thus are a target for cancer research. Oligomycin was found to bypass doxorubicin resistance and block P-glycoprotein activity. P-glycoprotein causes multidrug resistance, and extrudes anticancer drugs to the extracellular environment using ATP. The result was that it triggered apoptosis in drug-resistant HepG2 cells (Li et al, 2002).

Oligomycin can be used to measure oxygen consumption rate and extracellular acidification rates in breast cancer cell lines, contributing to our understanding of molecular pathways that contribute to breast cancer progression (Furth et al, 2018).

References:

Fitch ME, Chang CM and Parslow (2000) The BH3 domain is required for caspase-independent cell death induced by Bax and oligomycin. Cell Death Differ.7(4):338-349 PMID 10773818

Miyoshi N, Oubrahim H, Chock PB And Stadtman ER (2006) Age-dependent cell death and the role of ATP in hydrogen peroxide-induced apoptosis and necrosis. Proc. Natl. Acad. Sci. USA 103(6):1727-1731 PMID 16443681

Peachman KK, Lyles DS and Bass DA (2001) Mitochondria in eosinophils: functional role in apoptosis but not respiration. Proc. Natl Acad. Sci. USA 98(4):1717-1722 PMID 11172017

Atzmon A et al (2018) Drug screening identifies sigma-1-receptor as a target for the therapy of VWM leukodystrophy. Front. Mol. Neurosci 11. 336 pp. doi 10.3389

Dame ZT, Islam MT, Helmke E, von Tiedemann A, and Laatsch H(2016). Oligomycins and pamamycin homologs impair motility and induce lysis of zoospores of the grapevine downy mildew pathogen, Plasmopara viticola. FEMS Microbiol Lett. 2016 363(16) pii: fnw167. PMID 27354061

Furth N et al (2018) LATS1 and LATS2 suppress breast cancer progression by maintaining cell identity and metabolic state. Life Sci. Alliance. 1(5):e201800171 PMID 30456386

Jastroch M (2010) Mitochondrial proton and electron leaks. *Essays in biochemistry* 47:53-67 doi:10.1042/bse0470053

Li YC et al (2002) Mitochondria-targeting drug Oligomycin blocked P-glycoprotein activity and triggered apoptosis in doxorubicin-resistant HepG2 cells. Pharmacol. 50:55-62 PMID 15211078

Raini G et al (2017) Mutant elF2B leads to impaired mitochondrial oxidative phosphorylation in vanishing white matter disease. J. Neurochem. 141(5):694-707

Smith RM, Peterson WH and McCoy E (1954) Oligomycin, a new antifungal antibiotic. Antibiotics and Chemother. 4(9):962-970

Symersky J et al (2012) Oligomycin frames a common drug-binding site in the ATP synthase." *Proc. Natl. Acad. Sci. of the USA* 109(35):13961-5 PMID 22869738