Small Molecules

Metformin (Hydrochloride)

AMPK activator; Mitochondrial respiratory chain complex I inhibitor

Catalog #	73252	1 g
	73254	5 g

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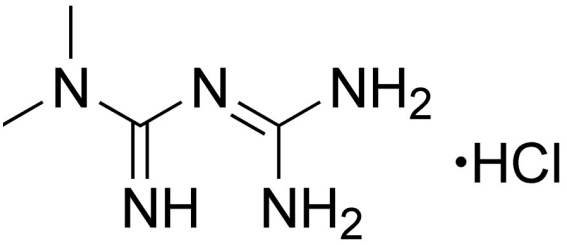
Product Description

Metformin is an activator of the AMP-activated protein kinase (AMPK) pathway, and an inhibitor of mitochondrial respiratory chain complex I (Rena et al.; Viollet et al.). It acts as an antihyperglycemic agent to lower plasma glucose levels and improve insulin sensitivity (Viollet et al.). This product is provided as the hydrochloride salt of the molecule.

Alternative Names:	Apophage; Diaformin; Fornidd; Glucoformin; Glucophage; LA 6023; Melbin; Orabet; Riomet; Walaphage
CAS Number:	1115-70-4
Chemical Formula:	$C_4H_{11}N_5 \bullet HCl$
Molecular Weight:	165.6 g/mol
Purity:	≥ 98%
Chemical Name:	3-(diaminomethylidene)-1,1-dimethylguanidine, monohydrochloride
Structure:	

Properties

Physical Appearance:	A crystalline solid
Storage:	Product stable at -20°C as supplied. Protect from prolonged exposure to light. Stable as supplied for 12 months from date of receipt.
Solubility:	PBS (pH 7.2) ≤ 60 mM For example, to prepare a 50 mM stock solution in PBS, resuspend 1 g in 120.8 mL of PBS (pH 7.2). Prepare stock solution fresh before use. Information regarding stability of small molecules in solution has rarely been reported, however, as a general guide we recommend storage in PBS at -20°C. Aliquot into working volumes to avoid repeated freeze-thaw cycles. The effect of storage of stock solution on compound performance should be tested for each application. For use as a cell culture supplement, stock solution should be diluted into culture medium immediately before use.

Published Applications

DIFFERENTIATION
· Promotes neurogenesis in mouse cortical precursors and human forebrain neural precursors in vitro, and in adult mouse central nervous system in vivo, via activation of the aPKC-CBP pathway (Wang et al.).
METABOLISM
· Stimulates glucose uptake in skeletal muscle and suppresses gluconeogenesis in the liver (Kim et al.; Shaw et al.).
· Reduces fatty liver disease in obese (ob/ob) mice (Lin et al.).
· Inhibits secretion of the adipocyte hormone leptin in mouse brown adipocytes (Klein et al.).
CANCER RESEARCH
· Inhibits tumor cell growth in various cancer cell lines and in mouse xenograft models (Dowling et al.; Isakovic et al.; Zakikhani et al.).
· Inhibits the inflammatory response associated with cancer stem cell growth (Hirsch et al.).

References

Dowling RJO et al. (2012) Metformin in cancer: translational challenges. J Mol Endocrinol 48(3): R31–43.
Hirsch HA et al. (2013) Metformin inhibits the inflammatory response associated with cellular transformation and cancer stem cell growth. Proc Natl Acad Sci USA 110(3): 972–7.
Isakovic A et al. (2007) Dual antiglioma action of metformin: cell cycle arrest and mitochondria-dependent apoptosis. Cell Mol Life Sci 64(10): 1290–1302.
Kim YD et al. (2007) Metformin inhibits hepatic gluconeogenesis through AMP-activated protein kinase-dependent regulation of the orphan nuclear receptor SHP. Diabetes 57(2): 306–14.
Klein J et al. (2004) Metformin inhibits leptin secretion via a mitogen-activated protein kinase signalling pathway in brown adipocytes. J Endocrinol 183(2): 299–307.
Lin HZ et al. (2000) Metformin reverses fatty liver disease in obese, leptin-deficient mice. Nat Med 6(9): 998–1003.
Rena G et al. (2013) Molecular mechanism of action of metformin: old or new insights? Diabetologia 56(9): 1898–906.
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Viollet B et al. (2012) Cellular and molecular mechanisms of metformin: an overview. Clin Sci (Lond) 122(6): 253–70.
Wang J et al. (2012) Metformin activates an atypical PKC-CBP pathway to promote neurogenesis and enhance spatial memory formation. Cell Stem Cell 11(1): 23–35.
Zakikhani M et al. (2006) Metformin is an AMP kinase-dependent growth inhibitor for breast cancer cells. Cancer Res 66(21): 10269–73.

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This product is hazardous. Please refer to the Safety Data Sheet (SDS).