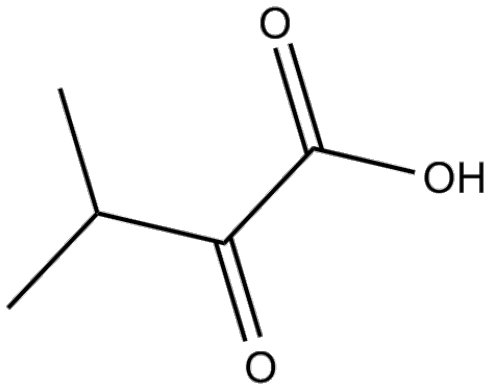
Product Data Sheet

Product Name: Ketoisovaleric acid
Cat. No.: GC13084

Chemical Properties

Cas. No.	759-05-7		
Chemical Name	3-methyl-2-oxobutanoic acid		
SMILES	CC(C(C(O)=O)=O)C		
Formula	$C_5H_8O_3$	M.Wt	116.12
Solubility	≥ 11.6mg/mL in DMSO	Storage	Store at -20°C
General tips	For obtaining a higher solubility , please warm the tube at 37 °C and shake it in the ultrasonic bath for a while.Stock solution can be stored below -20°C for several months.		
Shipping Condition	Evaluation sample solution : ship with blue ice All other available size: ship with RT , or blue ice upon request.		

Structure



Protocol

Cell experiment [1]:

Cell lines Human primary lymphocyte

Product Data Sheet

Preparation Method	Peripheral venous blood was obtained from healthy adult individuals, and the cell was separated by the Ficoll-Hypaque (Pharmacia) gradient method. Lymphocytes (1×10^5 cells) were incubated at 37°C, a humidified atmosphere of 5% CO_2 and 95% air in the presence of phytohaemagglutinin and 20% autologous serum. The cells were treated with 5mM Ketoisovaleric acid within 24h.
Reaction Conditions	5mM; 24h
Applications	Ketoisovaleric acid moderately suppressed lymphocyte DNA synthesis and caused an immunosuppression in vitro.

Animal experiment [2]:

Animal models	Male Wistar rats
Preparation Method	10min before training, a 30-gauge needle was inserted into the guide cannula, protruding 1mm from the tip of the cannula in order to administer a bilateral infusion of 2μl Ketoisovaleric acid into the dorsal hippocampus was administered to male rat, which affected rat performance in the inhibitory avoidance task, suggesting disruption of acquisition.
Dosage form	5μmol/2μl; 10min; intrahippocampal injection
Applications	Ketoisovaleric acid affected rat performance in the inhibitory avoidance task.

References:
[1] SCHLOTTFELDT J, BLAZINA L R, WANNMACHER C M, et al. The effect of organic acids on phytohaemagglutinin-activated proliferation of human lymphocytes in vitro [J]. Int J Immunopharmacol, 1995, 17(3): 175-82.
[2] DE CASTRO VASQUES V, DE BOER M A, DILIGENTI F, et al. Intrahippocampal administration of the alpha-keto acids accumulating in maple syrup urine disease provokes learning deficits in rats [J]. Pharmacol Biochem Behav, 2004, 77(1): 183-90.

Background

Ketoisovaleric acid (KIV) is as a precursor in leucine and valine synthesis [1]. Ketoisovaleric acid can serve as an initial compound in vitamin B5 biosynthesis of Escherichia coli[2]. Long-term high levels of Ketoisovaleric acid are associated with maple syrup urine disease (MSUD)[3, 4].

Ketoisovaleric acid (1 to 5mM; 1h) significantly reduced the content of nonenzymatic antioxidants in the cerebral cortex in vitro, thereby decreasing the antioxidant responsiveness of cortical cells[3]. Ketoisovaleric acid (5mM; 24h) moderately suppressed lymphocyte DNA synthesis, which caused an in vitro immunosuppression[5].

Ketoisovaleric acid (5μmol/2μl; intrahippocampal injection; 10min) was administered to male rat, which provoked rat learning deficits in the inhibitory avoidance task[6]. Ketoisovaleric acid (8μmol/2μl; intrastriatal administraion; 20min) could induce seizures in rats[7].

References:
[1] NSHIMIYIMANA P, LIU L, DU G. Engineering of L-amino acid deaminases for the production of alpha-keto acids from L-amino acids [J]. Bioengineered, 2019, 10(1): 43-51.
[2] CHASSAGNOLE C, DIANO A, LETISSE F, et al. Metabolic network analysis during fed-batch cultivation of Corynebacterium glutamicum for pantothenic acid production: first quantitative data and analysis of by-product formation [J]. J Biotechnol, 2003, 104(1-3): 261-72.
[3] BRIDI R, BRAUN C A, ZORZI G K, et al. alpha-keto acids accumulating in maple syrup urine disease stimulate lipid peroxidation and reduce antioxidant defences in cerebral cortex from young rats [J]. Metab Brain Dis, 2005, 20(2): 155-67.
[4] RABELO F, LEMOS I D S, DAL TOE C P, et al. Acute effects of intracerebroventricular

administration of alpha-ketoisocaproic acid in young rats on inflammatory parameters [J]. Metab Brain Dis, 2023, 38(5): 1573-9.
[5] SCHLOTTFELDT J, BLAZINA L R, WANNMACHER C M, et al. The effect of organic acids on phytohaemagglutinin-activated proliferation of human lymphocytes in vitro [J]. Int J Immunopharmacol, 1995, 17(3): 175-82.
[6] DE CASTRO VASQUES V, DE BOER M A, DILIGENTI F, et al. Intrahippocampal administration of the alpha-keto acids accumulating in maple syrup urine disease provokes learning deficits in rats [J]. Pharmacol Biochem Behav, 2004, 77(1): 183-90.
[7] COITINHO A S, DE MELLO C F, LIMA T T, et al. Pharmacological evidence that alpha-ketoisovaleric acid induces convulsions through GABAergic and glutamatergic mechanisms in rats [J]. Brain research, 2001, 894(1): 68-73.