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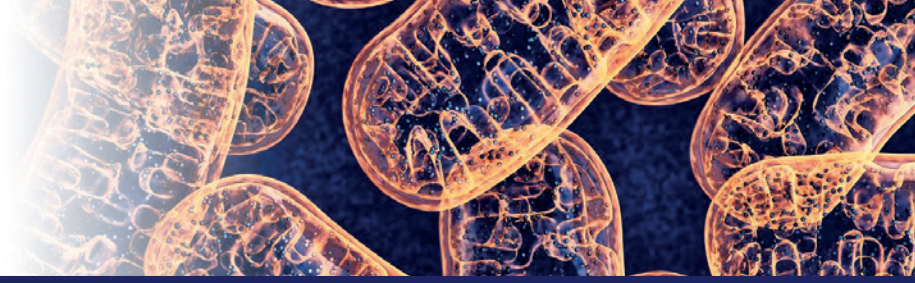

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2nd Edition

Immunometabolism Research

Focus: Cell Metabolism & NAD+ Metabolism

Immunometabolism is a research field that provides new insights into the dynamic cross-talk between the immune system (immunity) and metabolic processes of an organism (metabolism). One of the most important metabolic skills of the cell is the ability to optimally adapt metabolism according to demand or availability. The immune response requires the reallocation of nutrients within immune cells in order to optimize the substrates for ATP production and to build molecules for the production of necessary macromolecules for the proliferation of immune cells. Immunometabolism research tries to understand how metabolism controls the function of immune cells. It can be studied at a **macroscopic level** (e.g. in adipose tissues (see Figure 1) or in a tumor microenvironment) and at a **microscopic** level, the cellular bioenergetics of immune cells (see Figure 2).

The hub of metabolism control is the mitochondria that is known as a conventional cellular energy supplier and as regulator of the metabolism flexibility to control immunometabolism. Cellular metabolism is a critical mediator of the adaptive immunity, but also innate immunity. Indeed, some metabolites can modulate the adaptive characteristics of innate immunity, a property termed **'trained immunity'**.

The activation, growth and proliferation, function and homeostasis of immune cells are linked to dynamic changes in cellular metabolism configurations. The utilization of particular metabolic pathways is controlled by growth factors and nutrient availability and by the balance of internal metabolites, reactive oxygen species (ROS) and reducing/oxidizing substrates. **Major metabolic pathways** (see Figure 2) that shape the immune cell response include glycolysis, the tricarboxylic acid (TCA) cycle, the pentose phosphate pathway (PPP), fatty acid oxidation (FAO), fatty acid synthesis (FAS) and amino acid (AA) metabolism (e.g. Glutamine, Arginine, Tryptophan). The various immune cell subsets use distinct metabolic pathways to promote cell survival, lineage generation and function. Linking metabolism and inflammation/immunity is an approach to understand and possibly target low-grade-chronic inflammation and its associated pathologies, such as obesity (T2D), cancer, autoimmune & autoinflammatory diseases.

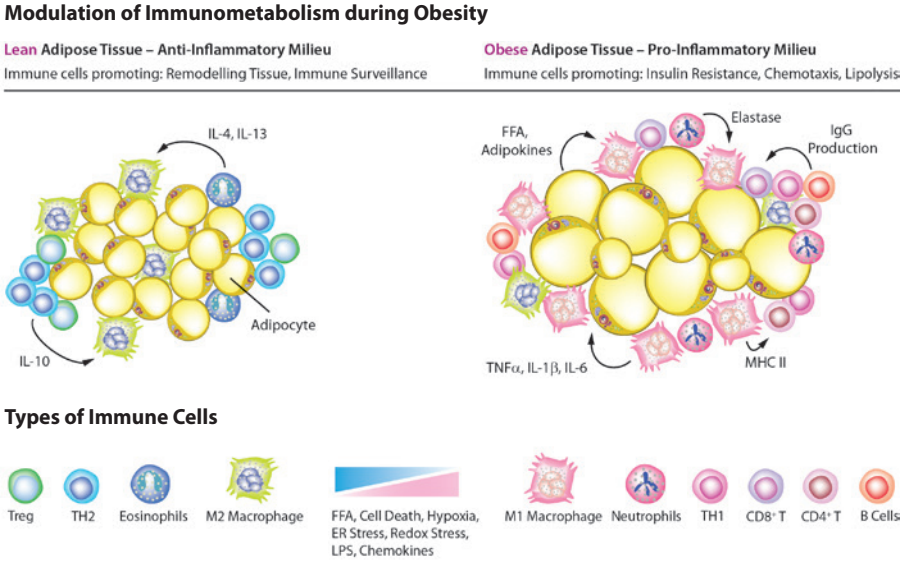


FIGURE 1: Adipose tissue illustrates best the interdependency of both arms of immunometabolism and provides examples of changes in both the lean and obese states. Lean adipose tissue is characterized by an enrichment of immune cells of type 2 immunity necessary for the health of the tissue. Obesity is characterized by an accumulation of inflammatory immune cells due to change in the composition of fatty acids, glucose and oxygen availability that may provide different metabolic substrates to immune cells and adipocytes.

Adapted from H.L. Kammoun, et al.; Rev. Endocr. Metab. Disord. ***15,*** *31 (2014)*

CONTENTS

Research Tools for Major Cell Metabolism Pathways

Glycolysis

The glycolytic metabolic pathway (glycolysis) (see Figure 2) is a multi-enzyme pathway, whereas glucose is intracellularly processed and reduced to pyruvate along with numerous other products. Glycolytic metabolism is a relatively inefficient pathway, generating only two molecules of ATP per unit of glucose. However, glycolytic metabolism allows for the reduction of NAD^+ to NADH, which is used by numerous enzymes as a cofactor, as well as enabling the diversion of intermediate products to biosynthetic growth pathways to support anabolic growth. To maintain glycolytic flux, cells often reduce pyruvate to lactate to recycle NADH and maintain NAD^+ levels. Glycolytic metabolism has a key role in providing biosynthetic intermediates for the synthesis of ribose for nucleotides, amino acids and fatty acids, important and essential in the metabolism of rapidly proliferating cells.

PRODUCT NAME	TARGET	METABOLIC EFFECT	PID	SIZE
STF-31	Glucose Transporter 1 (GLUT1)	Inhibition of Glycolysis	AG-CR1-3693	1 mg | 5 mg | 25 mg
WZB117	Glucose Transporter 1/4 (GLUT1/4)	Inhibition of Glycolysis	AG-CR1-3694	5 mg | 25 mg
Ritonavir	Glucose Transporter 1/4 (GLUT1/4)	Inhibition of Glycolysis	AG-CR1-3683	10 mg | 50 mg
Genistein	Glucose Transporter 4 (GLUT4)	Inhibition of Glycolysis	AG-CN2-0427	10 mg | 50 mg | 250 mg
Kaempferitrin	Glucose Transporter 4 (GLUT4)	Inhibition of Glycolysis	AG-CN2-0039	1 mg | 5 mg
Empagliflozin	Sodium Glucose Co-Transporter 2 (SGLT-2)	Inhibition of Glycolysis (Kidney)	AG-CR1-3619	10 mg | 50 mg
2-Deoxy-D-glucose	Hexokinase (HK)	Inhibition of Glycolysis	AG-CR1-3681	1 g | 5 g
N-Acetyl-D-glucosamine	Hexokinase (HK)	Inhibition of Glycolysis	AG-CN2-0489	250 mg | 1 g | 5 g
3-Bromopyruvic acid	Hexokinase II (HK2)	Inhibition of Glycolysis	AG-CR1-3682	1 g | 5 g
D-Mannoheptulose	Glucokinase/Hexokinase (HK)	Inhibition of Glycolysis	AG-CR1-3695	5 mg | 25 mg
Itaconic acid	Phosphofructokinase (PFKII) Succinate Dehydrogenase (SDH)	Inhibition of Glycolysis Inhibition of the TCA Cycle	AG-CN2-0426	1 g | 5 g
Itaconic acid 4-octyl ester	Phosphofructokinase (PFKII) Succinate Dehydrogenase (SDH)	Inhibition of Glycolysis Inhibition of the TCA Cycle	AG-CR1-3700	10 mg | 50 mg
Heptelidic acid	GAPDH	Inhibition of Glycolysis	AG-CN2-0118	250 µg | 1 mg
Dimethyl fumarate	GAPDH	Inhibition of Glycolysis	AG-CR1-3701	1 g | 5 g | 25 g
AP-III-a4 . HCl	Enolase	Inhibition of Glycolysis	AG-CR1-3696	1 mg | 5 mg
Shikonin	Pyruvate Kinase M2 (PKM2)	Inhibition of HIF-1α Inhibition of Glycolysis	AG-CN2-0487	10 mg | 50 mg
TEPP46 [ML-265]	Pyruvate Kinase M2 (PKM2)	Inhibition of HIF-1α Inhibition of Glycolysis	AG-CR1-3687	1 mg | 5 mg | 25 mg
AZD 7545	Pyruvate Dehydrogenase Kinase 2 (PDK2)	Inhibition of Glycolysis	AG-CR1-3692	1 mg | 5 mg | 10 mg
Sodium dichloro-acetate [DCA]	Pyruvate Dehydrogenase Kinase (PDK)	Inhibition of Glycolysis	AG-CR1-3684	1 g
GSK2837808A	Lactate Dehydrogenase A (LDHA)	Inhibition of Glycolysis	AG-CR1-3685	1 mg | 5 mg
α-Cyano-4-hydroxycinnamic acid	Monocarboxylate Transporter (MCT)	Inhibition of Glycolysis	AG-CR1-3686	1 g
D-Fructose 1,6-diphosphate . 3Na	Glycolysis Substrate	Modulation of Glycolysis	CDX-F0218	1 g | 5 g | 50 g

Pentose Phosphate Pathway

The pentose phosphate pathway (see Figure 2) takes place in the cytosol and serves several key purposes that support cell proliferation and survival. The pentose phosphate pathway allows the diversion of intermediates from the glycolytic pathway towards the production of nucleotide and amino acid precursors and generation of reducing equivalents of NADPH, important in the maintenance of a favorable cellular redox environment and required for fatty acid synthesis.

SELECTD REVIEWS ON IMMUNOMETABOLISM:

A guide to immunometabolism for immunologists: L.A. O'Neill, et al.; Nat. Rev. Immunol. **16,** 553 (2016) • Signaling networks in immunometabolism: J. Saravia, et al.; Cell Res. **30,** 328 (2020) • Immunometabolism: From basic mechanisms to translation: L. Makowski, et al.; Immunol. Rev. **295,** 5 (2020) • The emerging field of regulatory B cell immunometabolism: E.C. Rosser & C. Mauri; Cell Metab. **33,** 1088 (2021) • New Developments in T Cell Immunometabolism and Implications for Cancer Immunotherapy: N. Oberholtzer, et al.; Cells **11,** 708 (2022) • Unlocking potential: the role of the electron transport chain in immunometabolism: A. Zotta, et al.; Trends Immunol. **45,** 259 (2024)

Overview on Cell Metabolism Pathways & Small Molecule Modulators

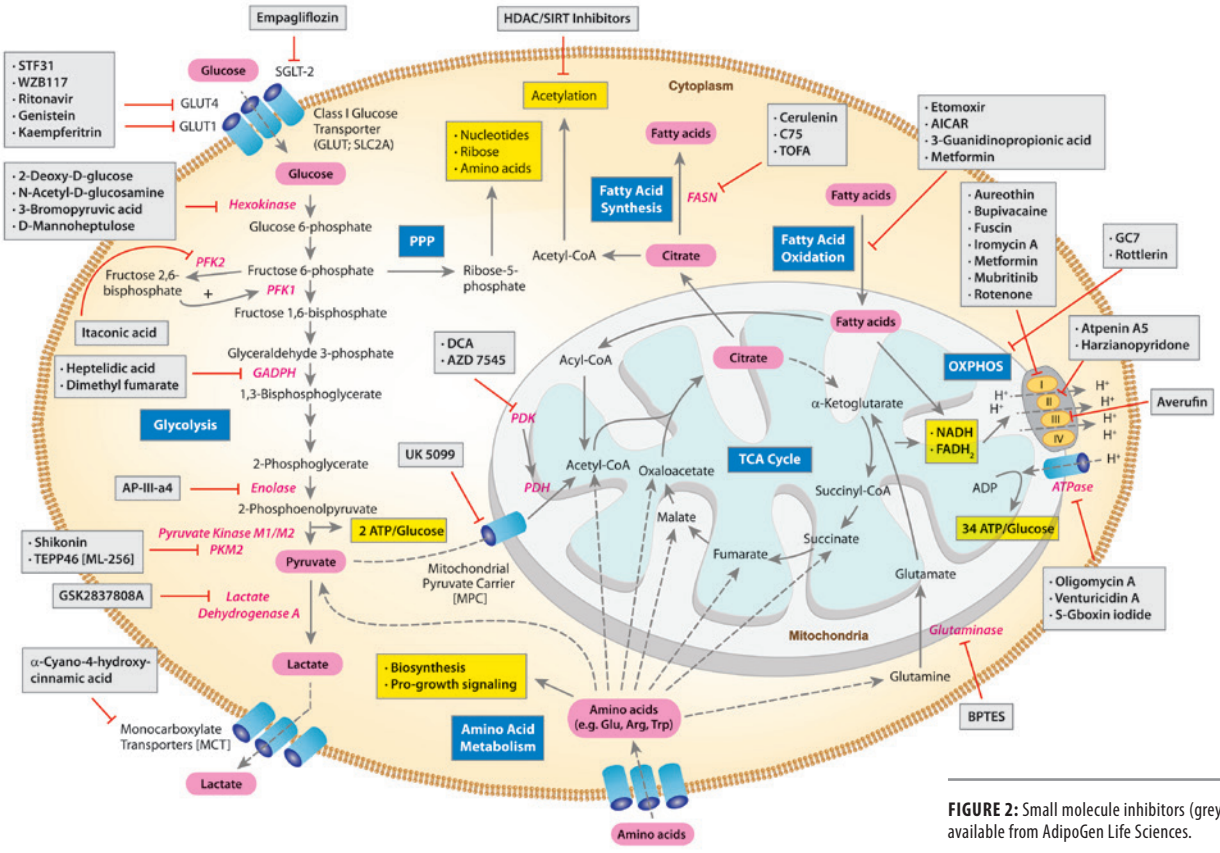


FIGURE 2: Small molecule inhibitors (grey boxes) available from AdipoGen Life Sciences.

Fatty Acid Oxidation Pathway (FAO)

The fatty acid oxidation pathway (see Figure 2) allows for the mitochondrial conversion of fatty acids into numerous products that the cell can further use to generate energy, including Acetyl-CoA, NADH and $FADH_2$ that are processed in the TCA cycle and the electron transport chain to generate tremendous amounts of ATP.

PRODUCT NAME	TARGET	METABOLIC EFFECT	PID	SIZE
(+)-Etomoxir . Na	Carnitine Palmitoyltransferase-1 (CPT-1a)	Inhibition of FAO	AG-CR1-3688	5 mg | 25 mg
AICAR	AMP-activated Protein Kinase (AMPK)	Inhibition of FAO	AG-CR1-0061	10 mg | 50 mg | 100 mg
3-Guanidinopropionic acid	AMP-activated Protein Kinase (AMPK)	Inhibition of FAO	AG-CR1-3678	500 mg | 1 g
Metformin . HCl	AMP-activated Protein Kinase (AMPK) NADH-Coenzyme Q Oxidoreductase	Inhibition of FAO Inhibition of OXPHOS	AG-CR1-3689	1 g | 5 g

Fatty Acid Synthesis Pathway (FAS)

The fatty acid synthesis pathway (see Figure 2) allows cells to generate lipids that are necessary for cellular growth and proliferation from precursors derived from other cell intrinsic metabolic pathways. The activity of the fatty acid synthesis pathway is closely coupled to mTOR signaling, which has been shown to promote fatty acid synthesis through regulation of many of the key enzymes responsible for *de novo* lipid synthesis, including SREBP (Sterol Regulatory Element Binding Protein), FASN (Fatty Acid Synthase) and ACC (Acetyl-CoA Carboxylase), both of which are induced by SREBP. Fatty acid synthesis uses products derived from several other metabolic pathways, notably glycolysis, the TCA cycle and pentose phosphate pathway.

PRODUCT NAME	TARGET	METABOLIC EFFECT	PID	SIZE
C75 (FASN Inhibitor)	Fatty Acid Synthase (FASN)	Inhibition of FAS	AG-CR1-2904	1 mg | 5 mg
Cerulenin	Fatty Acid Synthase (FASN)	Inhibition of FAS	AG-CN2-0513	5 mg
TOFA	Acetyl-CoA Carboxylase (ACC) Fatty Acid Synthase (FASN)	Inhibition of FAS	AG-CR1-2905	5 mg | 25 mg

Tricarboxylic Acid (TCA) Cycle

The tricarboxylic acid (TCA) cycle (also known as the citric acid cycle or Krebs cycle) (see Figure 2) occurs in the matrix of the mitochondrion and is a major metabolic pathway that is thought to be used in most quiescent or non-proliferative cell settings. Although some quiescent stem cells primarily use glycolysis, the TCA cycle and oxidative phosphorylation (OXPHOS) are a highly efficient mode of ATP generation used by cells whose primary requirements are energy and longevity (34 molecules ATP per unit glucose). Glucose-derived pyruvate or fatty acids are converted into Acetyl-Coenzyme A (Acetyl-CoA) that joins the TCA cycle by aldol condensation with oxaloacetate to form citrate. Glutamate is also a critical fuel for the TCA cycle through its direct conversion into the TCA intermediate α-ketoglutarate. Two major products of the TCA cycle are NADH and FADH2, which can transfer electrons to the electron transport chain to support oxidative phosphorylation and highly efficient ATP generation. In addition, during Krebs/TCA cycle disturbance, intermediates such as succinate, itaconate, fumarate and citrate accumulate in inflammatory macrophages and have different functions. Succinate binds to its receptor SUCNR1 leading to an inflammatory response. Itaconate has anti-inflammatory functions by inhibiting succinate dehydrogenase (which controls levels of succinate, a metabolite with multiple roles in inflammation), glycolysis at multiple levels (which will limit inflammation), activation of the anti-inflammatory transcription factors Nrf2 and ATF3, and inhibition of the NLRP3 inflammasome. Finally, fumarate leads to the release of mitochondrial RNA (mtRNA), which in turn drives the release of type I Interferon.

PRODUCT NAME	TARGET	METABOLIC EFFECT	PID	SIZE
UK 5099	Mitochondrial Pyruvate Carrier (MPC)	Inhibition of TCA Cycle	AG-CR1-3691	1 mg | 5 mg | 10 mg
Propionyl-L-carnitine . HCl	PDH Stimulating Substrate	Modulation of TCA Cycle	AG-CR1-3595	25 mg | 100 mg | 500 mg
(R)-3-Hydroxybutyric acid	Substrate for Acetyl-CoA Generation	Modulation of TCA Cycle	AG-CR1-3616	25 mg | 100 mg
L-Glutamine [H-Gln-OH]	Substrate for Acetyl-CoA Generation	Modulation of TCA Cycle	AG-CR1-3534	1g | 5 g
Succinic acid [Succinate]	Substrate for Acetyl-CoA Generation	Modulation of TCA Cycle	AG-CN2-0521	1g | 5 g
Aureothin	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	BVT-0303	1 mg | 5 mg
Bupivacaine . HCl . H_2O	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	CDX-B0326	1g | 5 g
Fuscin	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	AG-CN2-0138	1mg | 2.5 mg
Iromycin A	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	BVT-0262	500 µg | 1 mg
Metformin . HCl	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	AG-CR1-3689	1g | 5 g
Mubritinib	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	AG-CR1-3755	5 g | 25 g
Rotenone	NADH-Coenzyme Q Oxidoreductase	Inhibition of OXPHOS	AG-CN2-0516	1 g | 5 g
Rottlerin	NADH-Coenzyme Q Oxidoreductase Succinate Cytochrome C Reductase	Inhibition of OXPHOS	AG-CN2-0526	10 mg | 50 mg
Atpenin A5	Succinate-Q Oxidoreductase	Inhibition of OXPHOS	AG-CN2-0100	250 µg | 1 mg
Harzianopyridone	Succinate-Q Oxidoreductase	Inhibition of OXPHOS	AG-CN2-0149	250 µg | 1 mg
Averufin	Succinate Cytochrome C Reductase	Inhibition of OXPHOS	AG-CN2-0527	1 mg
(-)-Arctigenin	Succinate-Q Oxidoreductase Cytochrome C Oxidase	Inhibition of OXPHOS	AG-CN2-0530	10 mg | 50 mg
Oligomycin A	ATP Synthase (ATPases (F1F0))	Inhibition of OXPHOS	AG-CN2-0517	1 mg | 5 mg | 10 mg
S-Gboxin iodide	ATP Synthase (ATPases (F1F0))	Inhibition of OXPHOS	AG-CR1-3533	1 mg | 5 mg
Venturicidin A	ATP Synthase (ATPases (F1F0))	Inhibition of OXPHOS	BVT-0454	1 mg
N1-Guanyl-1,7-diaminoheptane [GC7]	Deoxyhypusine Synthase (DHPS)	Inhibition of OXPHOS	AG-CR1-3702	10 mg | 50 mg

ABBREVIATIONS: **NADH-Coenzyme Q Oxidoreductase** = Complex I • **Succinate-Q Oxidoreductase** = Complex II • **Succinate Cytochrome c Reductase** = Complex III • **Cytochrome C Oxidase** = Complex IV

Amino Acid Metabolic Pathways

Various amino acid metabolic pathways (see Figure 2) have several important roles in multiple aspects of cell biology. As can be expected with the large number of individual amino acids, there are diverse metabolic pathways that make use of amino acids as substrates. Amino acids, as a consequence of their utilization as substrates for protein synthesis, are intimately linked to important anabolic cellular signaling pathways, most notably the mTOR pathway and nucleotide synthesis. Some amino acids may play more specific roles in metabolic pathways. By example glutamine, arginine and tryptophan are metabolized through metabolic pathways to support cellular proliferation and anabolic growth.

Glutamine Metabolism

Glutamine metabolism regulates numerous aspects of immune cell function and has been hypothesized to play an important role in immune function in the context of serious illnesses, such as sepsis or burns. Adequate supplies of glutamine have been found to be required for the induction of IL-1 by macrophages in response to LPS stimulation. Glutamine metabolism is also important for the generation of nitric oxide (NO) through feeding into arginine synthesis.

PRODUCT NAME	TARGET	METABOLIC EFFECT	PID	SIZE
BPTES	Glutaminase 1 (GLS1)	Inhibition of Glutaminolysis	AG-CR1-3690	1 mg | 5 mg

Arginine Metabolism

Arginine metabolism has been found to have a key role in the inflammatory function of macrophages. Macrophages use arginine in two distinct metabolic pathways, the nitric oxide synthesis (NOS) pathway and the arginase pathway. Macrophage flux of arginine into the nitric oxide synthesis pathway is associated with an inflammatory M1 phenotype. Arginase catalyzes the hydrolysis of arginine to ornithine and urea. Inherited deficiency of this enzyme results in argininemia, an autosomal recessive disorder characterized by hyperammonemia. Arginase is fundamentally involved in cancer, inflammation, infections, fibrotic diseases, neurobiology, pregnancy and immune regulation in general.

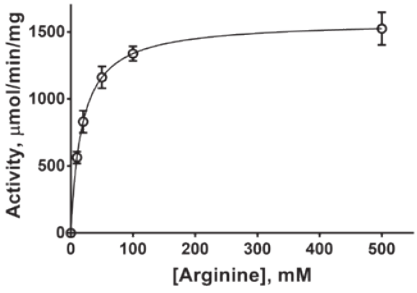
UNIQUE Arginase I (human) (rec.) (highly active)

AG-40T-0124 — 10 µg | 3 x 10 µg

BIOLOGICAL ACTIVITY: 1.6 ± 0.2U/µg protein. One unit is defined as the amount of enzyme that converts 1µmol of L-arginine to L-ornithine and urea per min. at 37°C, pH 9.5.

FIGURE: Arginine dependence on the activity of Arginase I (human) (rec.) (highly active) (AG-40T-0124).

METHOD: The activity was measured at pH 9.5, Mn2+ 1mM at 37°C, by measuring the amount of released urea and according to the protocol from R.T. Schimke, et al.; J. Biol. Chem. **238,** 1012 (1963).



Tryptophan Metabolism

Tryptophan (Trp) is an essential amino acid that cannot be synthesized by the organism and therefore must be part of our diet. It acts as building block in protein biosynthesis and is the only precursor for the endogenous *de novo* biosynthesis of nicotinamide adenine dinucleotide (NAD^+). IDO1 is a heme enzyme that catalyzes the first and rate-limiting step in the main pathway of human tryptophan catabolism, the kynurenine pathway, causing depletion of tryptophan which can lead to halted growth of microbes as well as T cells. IDO1 is an immune checkpoint protein thought to play a role in a variety of pathophysiological processes such as antimicrobial and antitumor defense, neuropathology, immunoregulation and antioxidant activity. Metabolites generated from tryptophan catabolism, such as kynurenine, may play important roles in modulating immune cell function through activation of the aryl hydrocarbon receptor (AHR), which is a ligand-activated transcription factor.

UNIQUE

IDO1

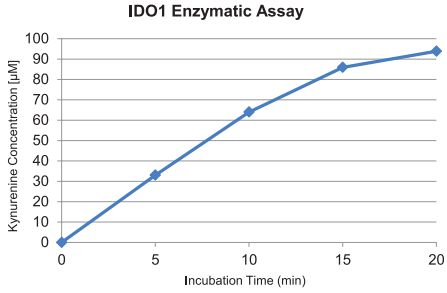
IDO1 (human) (rec.) (His) (highly active)

AG-40B-0161 — 50 µg

Specific Activity: >100'000U/mg protein with L-tryptophan as substrate (activity assay with catalase). One unit is defined as the amount of enzyme that produces 1nmol of N-formylkynurenine (NFK) per hour.

FIGURE: Enzymatic activity assay of IDO (human) (rec.) (His) (highly active) (Prod. No. AG-40B-0161).

METHOD: IDO1 (human) has been tested with a protocol using catalase.



IDO1 Inhibitors

Epacadostat

AG-CR1-3634 — 5 mg | 25 mg

CAS: 1204669-58-8

UNIQUE MMG-0358

AG-CR1-3630 — 1 mg | 5 mg

CAS: 1378976-02-3

Necrostatin-1

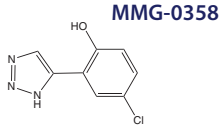
AG-CR1-2900 — 5 mg | 25 mg

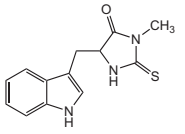
CAS: 4311-88-0

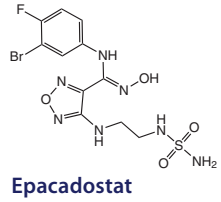
Ebselen

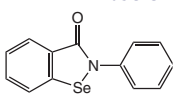
AG-CR1-0031 — 1 mg | 5 mg | 25 mg

CAS: 60940-34-3









NAD+ Metabolism

Nicotinamide adenine dinucleotide (NAD^+) is playing a central role in cellular respiration, the cascade of reactions that generate adenosine triphosphate (ATP) from nutrient breakdown, by acting as a coenzyme for oxidoreductases and dehydrogenases. As co-enzymes, NAD^+ and its phosphorylated and reduced forms, including NADP, NADH and NADPH, are critical for the activities of cellular metabolism. NAD^+ most commonly functions in energy-generating catabolic reactions (such as glycolysis, fatty acid oxidation and TCA cycle), where it is reduced to NADH. The phosphorylated form, NADPH, participates in anabolic reactions, such as fatty acid and cholesterol synthesis. Besides its function in oxidative phosphorylation and redox reactions, NAD^+ has evolved as a substrate for evolutionarily conserved NAD^+-cleaving enzymes, such as poly(ADP-ribose) polymerases (PARPs), sirtuins (SIRTs) and cADP-ribose synthases such as CD38/CD157. NAD^+ levels decrease with age and the deterioration of NAD^+ metabolism promotes several aging-associated diseases, including metabolic and neurodegenerative diseases and various cancers. Upregulation of NAD^+ metabolism, including dietary supplementation with NAD^+ precursors exhibits beneficial effects against aging and aging-associated diseases.

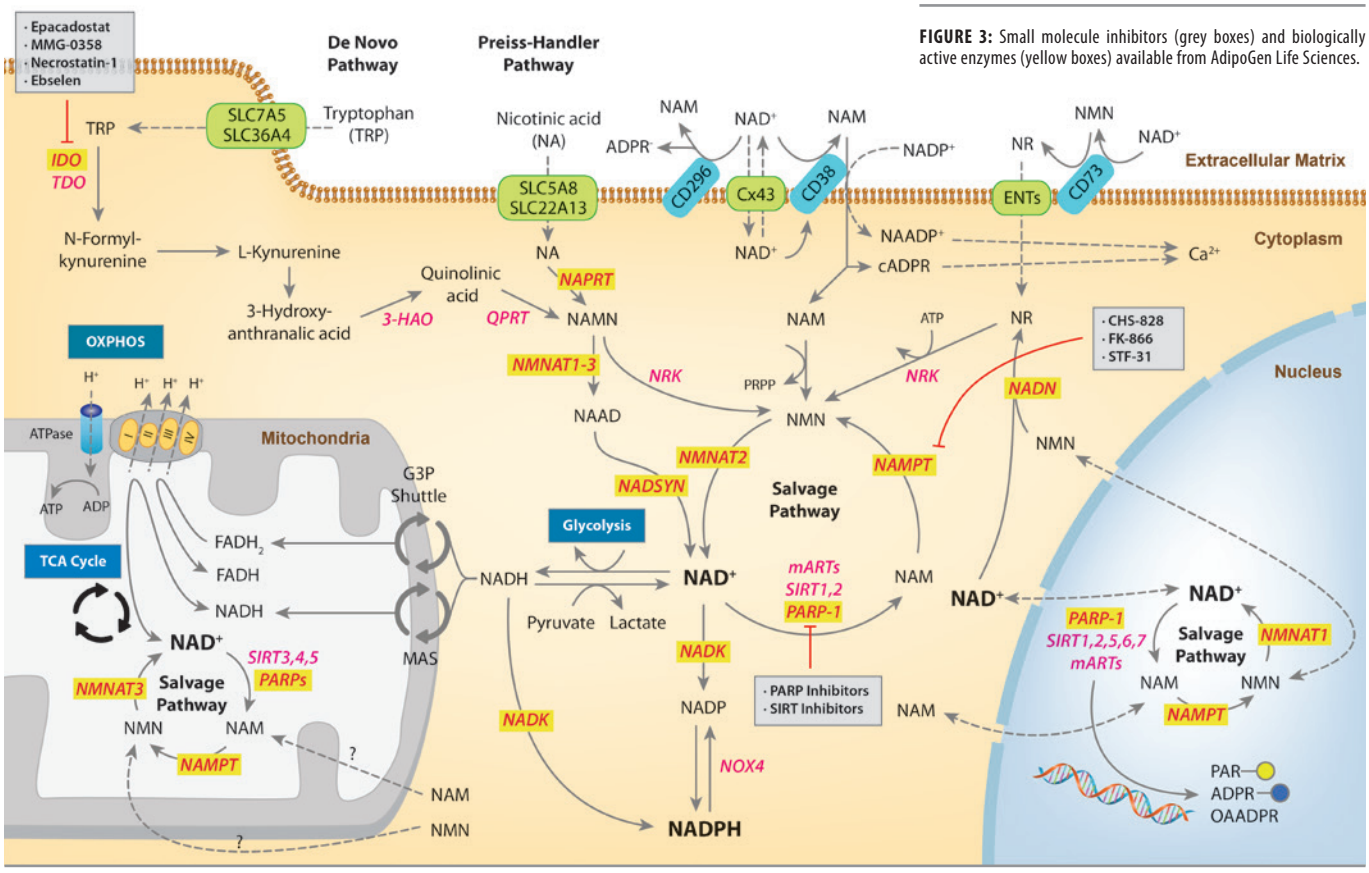


FIGURE 3: Small molecule inhibitors (grey boxes) and biologically active enzymes (yellow boxes) available from AdipoGen Life Sciences.

Biologically Active Enzymes

PRODUCT NAME	BIOLOGICAL ACTIVITY	PID	SIZE
NAD Kinase (human) (rec.) (His) (highly active)	≥1 U/mg protein	AG-40T-0091	50 µg
NAD Kinase (catalytic domain) (human) (rec.) (His) (highly active)	≥2 U/mg protein	AG-40T-0090	50 µg
NAD Kinase (B. subtilis) (rec.)	~2.6 U/mg protein	AG-40T-0106	50 µg
NAD Kinase (M. tuberculosis) (rec.) (His)	~1.2 U/mg protein (Substrate: NAD (+ ATP)) ~3.8 U/mg protein (Substrate: NAD (+ poly(P))	AG-40T-0107	50 µg
NAD Nucleotidase (H. influenzae) (rec.)	Depending on Substrate	AG-40T-0110	50 µg
NAD Synthetase (B. subtilis) (rec.)	~0.3 U/mg protein	AG-40T-0109	50 µg
NAD Synthetase (M. tuberculosis) (rec.) (His)	~0.1 U/mg protein	AG-40T-0108	50 µg
NAPRTase (human) (rec.) (His)	~0.27 U/mg protein	AG-40T-0105	50 µg
NAPRTase (B. subtilis) (rec.)	~0.8 U/mg protein	AG-40T-0104	50 µg
NMNAT1 (human) (rec.) (His) (highly active)	≥5 U/mg protein	AG-40T-0092	10 µg | 50 µg
NMNAT3 (human) (rec.) (His) (highly active)	≥2 U/mg protein	AG-40T-0093	10 µg | 50 µg

Nicotinamide Phosphoribosyltransferase (Nampt)

Nampt (Nicotinamide Phosporibosyltransferase) converts nicotinamide (Nam), that arises endogenously from NAD^+-dependent signaling processes to nicotinamide mononucleotide (NMN), which is further converted to NAD^+ through nicotinamide mononucleotide adenylyltransferases (NMNATs), making it a regulator of the intracellular NAD^+ pool. Through its NAD^+-biosynthetic activity, Nampt influences the activity of NAD^+-dependent enzymes, thereby regulating cellular metabolism. In addition to its enzymatic function, extracellular Nampt (also called Visfatin or PBEF1) has cytokine-like activity. Altered levels of Nampt are associated with various metabolic disorders, including obesity, non-alcoholic fatty liver disease (NAFLD) and type 2 diabetes by influencing the oxidative stress response, apoptosis, lipid and glucose metabolism, inflammation and insulin resistance. Nampt plays a crucial role in cancer cell metabolism and is often overexpressed in tumor tissues, making it an attractive therapeutic cancer drug target.

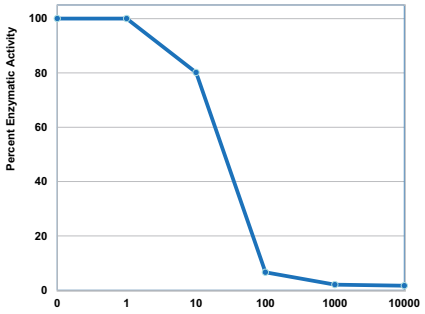
NEW Nampt (mouse) (rec.) (enzymatically active)

AG-40B-0179 — 50 µg

Biological Activity: 0.5µg to 5µg of Nampt (mouse) (rec.) (enzymatically active) show activity in a colorimetric Nampt assay.

FIGURE: Nampt (mouse) (rec.) (enzymatically active) (AG-40B-0179) is inhibited by the specific Nampt inhibitor CHS-828 (AG-CR1-0064).

METHOD: The protein Nampt (mouse) (rec.) (1µM) is tested for activity in vitrousing the Cyclex NAMPT Colorimetric Assay Kit (Cyclex/MBL, CY-1251) in the presence of different concentrations of CHS-828 (dissolved in DMSO). The IC_{50} of CHS-828 is 40nM in this experiment.



Nicotinamide Phosphoribosyltransferase (Nampt) Inhibitors

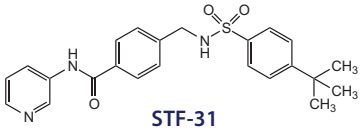
NEW STF-31

AG-CR1-3693 — 1 mg | 5 mg | 25 mg

CAS: 724741-75-7

Specific nicotinamide phosphoribosyltransferase (Nampt) inhibitor (IC_{50}=19nM), consequently blocking the NAD^+ salvage pathway and leading to blockage of GLUT1 expression.

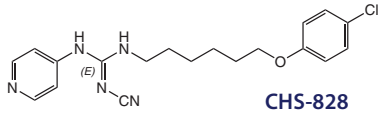
LIT: NAMPT is the cellular target of STF-31-like small-molecule probes: D.J. Adams, et al.; ACS Chem. Biol. **9,** 2247 (2014)


STF-31

CHS-828 [GMX1778]

AG-CR1-0064 — 5 mg | 25 mg

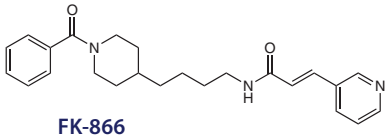
CAS: 200484-11-3


CHS-828

FK-866

AG-CR1-0011 — 1 mg | 5 mg | 25 mg

CAS: 658084-64-1


FK-866

Best-in-class Nampt (Visfatin/PBEF) ELISA Kits

ELISA KITS	PID	SIZE	SENSITIVITY	RANGE	SAMPLES
Nampt (human) ELISA Kit	AG-45A-0006Y	96 wells | 2 x 96 wells	30 pg/ml	0.125 to 8 ng/ml	Serum
Nampt (human) (IntraCellular) ELISA Kit	AG-45A-0008Y	96 wells	30 pg/ml	0.25 to 16 ng/ml	Cell Lysates
Nampt (mouse/rat) Dual ELISA Kit	AG-45A-0007Y	96 wells | 2 x 96 wells	50 pg/ml	0.5 to 32 ng/ml	Serum

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UNIQUE

Mitochondrial Pyruvate Carrier 2 (MPC-2) Monoclonal Antibody

Pyruvate is the end-product of glycolysis, a major substrate for oxidative metabolism, and a branching point for glucose, lactate, fatty acid and amino acid synthesis. The mitochondrial enzymes that metabolize pyruvate are physically separated from cytosolic pyruvate pools and rely on a membrane transport system to shuttle pyruvate across the impermeable inner mitochondrial membrane (IMM). Two proteins, mitochondrial pyruvate carriers MPC-1 and MPC-2, form a heterooligomeric complex in the IMM to facilitate pyruvate transport. This step is required for mitochondrial pyruvate oxidation and carboxylation-critical reactions in intermediary metabolism that are dysregulated in several common metabolic diseases.

anti-MPC-2, mAb (JCM-1)

AG-20B-0071 100 µg

Clone: JCM-1
Isotype: Mouse IgG2bκ
Cross-reactivity: Human | Mouse
Application: Western Blot (1 µg/ml) | Immunoprecipitation (1:200) | Immunocytochemistry (1:400)

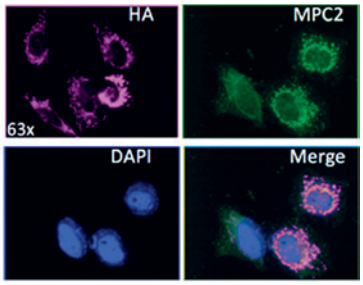

FIGURE: Immunofluorescence analysis of HeLa cells overexpressing hMPC2-HA.
Picture Courtesy of Sylvie Montessuit, Jean-Claude Martinou Lab, University of Geneva

LATEST INSIGHT

Mitochondria and NAD⁺ Homeostasis

NAD⁺-dependent enzymes, including poly-ADP-ribosyltransferases (PARPs) and sirtuins, are distributed across organelles. By compartmentalizing NAD⁺, cells can maintain distinct pools of NAD⁺ and NADH, optimizing metabolic reactions in each compartment and balancing NAD⁺ consumption with biosynthesis to adjust metabolic flux to meet energetic and metabolic demands. Levels of NAD⁺ decline with age, and recent research emphasizes the importance of maintaining optimal compartment-specific NAD⁺ levels for various physiological processes, such as energy metabolism, neuronal function, DNA repair and genomic stability, gene expression, and epigenetic regulation.

Aging is associated with a decrease in cellular NAD⁺ levels, but how do cells cope with persistently decreased NAD⁺ concentrations? The research group led by Mathias Ziegler (University of Bergen, Norway) showed that subcellular NAD⁺ pools are interconnected, with mitochondria acting as a buffer to maintain NAD⁺-dependent processes in overconsuming organelles, highlighting the critical role of mitochondria in NAD⁺ homeostasis.

LIT: Subcellular NAD⁺ pools are interconnected and buffered by mitochondrial NAD⁺: L.E. Hoyland, et al.; Nat. Metab. **6,** 2319 (2024)

See Page 6 & 7 for Related Products!

Immunometabolism & Inflammasomes

Inflammasomes are multi-protein complexes whose activity has been implicated in physiological and pathological inflammation. Recent studies implicated several compounds traditionally linked to metabolism (targeting hexokinase or PKM2) in modulation of inflammasome signaling, suggesting that glycolysis and mitochondrial metabolism control the NLRP3 inflammasome.

GET our Updated Inflammasome Brochure, including the VALIDATED Inflammasome Antibodies from AdipoGen Life Sciences!

REVIEW: Unlocking potential: the role of the electron transport chain in immunometabolism: A. Zotta, et al.; Trends Immunol. **45,** 259 (2024)

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