

Myokines

Muscle, Exercise & Obesity

Exercise training enhances muscular endurance and strength, expends calories, exerts beneficial effects on systemic metabolism and combats the development of common diseases such as obesity and type 2 diabetes (T2D), by adaptive structural and metabolic changes in skeletal muscle, including a change in the type of muscle fiber, mitochondrial biogenesis and angiogenesis. Additionally, skeletal muscles secrete cytokines and growth factors, called **myokines** that can potentially act in an autocrine, a paracrine and/or an endocrine manner to modulate metabolic, inflammatory and other processes. The production of myokines may increase during or after exercise due to the activation of contraction-induced signaling pathways, e.g. the calcium signaling pathway or due to changes in energy status within the muscle fibres [1, 2].

Several contraction-regulated myokines have been described including ANGPTL4, Apelin, BDNF, FGF-21, FSTL1, IL-6, IL-7, IL-8, IL-15, LIF, MCP-1, Myonectin (CTRP15), Myostatin, PAI-1, PEDF, VEGF and the very recently described Irisin and Meteorin-like protein [3].

SELECTED REVIEWS:

[1] Muscles, exercise and obesity: skeletal muscle as a secretory organ: B.K. Pedersen & M.A. Febbraio; Nat. Rev. Endocrinol. **8**, 457 (2012) • [2] Secreted proteins from adipose tissue and skeletal muscle - adipokines, myokines and adipose/muscle cross-talk: P. Trayhurn, et al.; Arch. Physiol. Biochem. **117**, 47 (2011) • [3] Adipo-myokines: two sides of the same coin - mediators of inflammation and mediators of exercise: S. Raschke & J. Eckel; Mediators Inflamm. **2013**, 320724 (2013)

Myokine: Protein or metabolite that is produced and secreted by muscle fibers and exerts either paracrine or endocrine effects.

From Cytokines to Myokines

Several cytokines including IL-6, IL-7, IL-8, IL-15, LIF and MCP-1, have been shown to be secreted from muscle after endurance. IL-6 is the best characterized myokine implicated as a co-inducer of the development of obesity-associated insulin resistance, which precedes the development of type 2 diabetes (T2D).

REVIEW: From cytokine to myokine: the emerging role of interleukin-6 in metabolic regulation: M. Pal, et al.; Immunol. Cell Biol. **92**, 331 (2014)

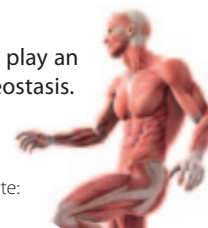
PROTEINS	PID	SIZE	SOURCE	ENDOTOXIN	SPECIES
IL-6 (human) (rec.) (His)	CHI-HR-20006	10 µg 50 µg	E. coli	<1EU/µg	Hu
IL-6 (human):Fc (human) (rec.)	CHI-HF-21006	50 µg 3 x 50 µg	CHO	<0.06EU/µg	Hu
IL-6 (mouse):Fc (human) (rec.)	AG-40B-0108	10 µg 3 x 10 µg	HEK 293	<0.01EU/µg	Ms
IL-7 (human):Fc (human) (rec.) (non-lytic)	CHI-HF-22007	50 µg	CHO	<0.06EU/µg	Hu
IL-8 (human) (rec.) (His)	CHI-HR-20008	10 µg 50 µg	E. coli	<0.1EU/µg	Hu
IL-8 (human):Fc (human) (rec.) (non-lytic)	CHI-HF-22008	10 µg 50 µg	CHO	<0.06EU/µg	Hu
IL-15 (mutant) (human):Fc (human) (rec.)	CHI-HF-21015M	50 µg	CHO	<0.06EU/µg	Hu
CCL2 [MCP-1] (human):Fc (human) (rec.)	CHI-HF-210CCL2	10 µg 50 µg	CHO	<0.06EU/µg	Hu
CCL2 [MCP-1] (mouse):Fc (mouse) (rec.)	CHI-MF-110CCL2	10 µg 50 µg	CHO	<0.06EU/µg	Ms
LIF (human) (rec.) <i>Tested for biological activity in mouse!</i>	AG-40B-0093	10 µg 3 x 10 µg 100 µg	E. coli	<0.05EU/µg	Hu, Ms
ELISA KITS	PID	SIZE	SENSITIVITY	ASSAY TYPE	SPECIES
Cymax IL-6 (human) ELISA Kit	YIF-LF-EK0260	1 x 96 wells	1.160 pg/ml	Sandwich	Hu
Cymax IL-6 (mouse) ELISA Kit	YIF-LF-EK0270	1 x 96 wells	1.138 pg/ml	Sandwich	Ms
Cymax IL-6 (rat) ELISA Kit	YIF-LF-EK0224	1 x 96 wells	26.643 pg/ml	Sandwich	Rt
Cymax IL-7 (human) ELISA Kit	YIF-LF-EK0261	1 x 96 wells	8.829 pg/ml	Sandwich	Hu
Cymax IL-8 (human) ELISA Kit	YIF-LF-EK0262	1 x 96 wells	0.278 pg/ml	Sandwich	Hu
Cymax MCP-1 (human) ELISA Kit	YIF-LF-EK0265	1 x 96 wells	8.709 pg/ml	Sandwich	Hu

Irisin – A Myokine involved in Exercise & Obesity

Irisin is a recently described exercise and PGC1 α -induced hormone secreted by skeletal muscle in mice and humans. Irisin has been identified as a myokine, which is capable of inducing browning of white adipose tissue leading to brite adipocytes by stimulating UCP1 expression, via the ERK/p38 pathways. The precursor of irisin protein, the type I transmembrane protein fibronectin type III domain-containing protein 5 (FNDC5) is cleaved and secret-

ed from muscle during exercise. Irisin could play an important role in obesity and glucose homeostasis.

SELECTED REVIEWS: Irisin ERKs the fat: J. Wu & B.M. Spiegelman; Diabetes 63, 381 (2014) • Irisin as a muscle-derived hormone stimulating thermogenesis - A critical update: T. Hofmann, et al.; Peptides 54C, 89 (2014)



PID	SINGLE 96 wells	TWIN PLEX 2x96 wells	PENTA PLEX 5x96 wells	LIT
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Irisin ELISA Kit

Irisin Competitive ELISA Kit	AG-45A-0046	✓	✓	✓	✓
Species reactivity:	Human, Monkey, Mouse, Rat	Detection type:		Colorimetric	
Sensitivity:	1 ng/ml	Assay type:		Competitive	
Range:	0.001 to 5 µg/ml	Sample type:		Serum, Plasma, Cell Culture Supernatant	

LIT: Oxytocin secretion is related to measures of energy homeostasis in young amenorrheic athletes: E.A. Lawson, et al.; J. Clin. Endocrinol. Metab. 99, E881 (2014)

Related Antibodies & Proteins

PROTEINS	PID	SIZE	SOURCE	ENDOTOXIN	SPECIES
Irisin (rec.) (CHO)	AG-40B-0136	10 µg 3 x 10 µg	CHO	<0.01EU/µg	Hu, Ms
Irisin (rec.) (E. coli)	AG-40B-0103	10 µg 5 x 10 µg	E. coli	<0.1EU/µg	Hu, Ms
Irisin:Fc (human) (rec.)	AG-40B-0115	10 µg 5 x 10 µg	HEK 293	<0.01EU/µg	Hu, Ms, Rt, Mo
FNDC4 (rec.) (untagged)	AG-40B-0124	10 µg	E. coli	<0.01EU/µg	Hu, Ms, Rt, Mo, Dg
FNDC5 (rec.) (untagged)	AG-40B-0128	10 µg	E. coli	<0.01EU/µg	Hu, Ms, Rt
ANTIBODIES	PID	SIZE	SOURCE	APPLICATIONS	SPECIES
anti-Irisin, pAb (IN102)	AG-25B-0027	100 µg	Rb	WB	Hu, Ms, Rt, Mo
anti-Irisin, pAb (IN102) (Biotin)	AG-25B-0027B	100 µg	Rb	WB, ELISA	Hu, Ms, Rt, Mo



NEW “Browning” Agents

NEW

Meteorin-like Protein

Meteorin-like (Cometin; Subfatin) is a novel adipokine expressed by adipose tissue being downregulated upon caloric restriction. Meteorin-like is also a myokine secreted by muscles during exercise and was shown to convert white adipose cells into brown fat tissue.

LIT: Meteorin-like is a hormone that regulates immune-adipose interactions to increase beige fat thermogenesis: R.R. Rao, et al.; Cell 157, 1279 (2014)

PROTEIN	PID	SIZE	SOURCE	ENDOTOXIN	SPECIES
Meteorin-like (mouse) (rec.)	AG-40B-0149	10 µg 3 x 10 µg	E. coli	<0.1EU/µg	Ms



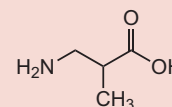
BAIBA – A new contraction-induced Myokine

3-Aminoisobutyric acid (BAIBA)

AG-CR1-3596-M250
AG-CR1-3596-G001

250 mg
1 g

Formula: C₄H₉NO₂
MW: 103.1
CAS: 144-90-1



FGF-21 – Myokine, Adipokine & Hepatokine

Fibroblast growth factors (FGFs) are signaling proteins with diverse functions in development, metabolism and neural function. The biological effects of FGFs are mediated by four structurally related receptor tyrosine kinases FGFR1, FGFR2, FGFR3 and FGFR4. FGF-21 is a unique FGF with metabolic, but not proliferative activities. Hepatic FGF-21 directly acts on white adipocytes to inhibit lipolysis and acts through the brain to increase systemic glucocorticoid levels and suppresses physical activity in response to starvation. Adipocytic FGF-21 induces the browning of white adipose tissue (WAT) and activates brown adipocytes in response to cold

exposure. Myocytic FGF-21 protects against diet-induced obesity and insulin resistance, induces the browning of WAT and protects against cardiac hypertrophy. These findings indicate that FGF-21 plays roles as a hepatokine, adipokine and myokine in metabolism, injury protection and diseases.

SELECTED REVIEW: FGF21 as a Hepatokine, Adipokine, and Myokine in Metabolism and Diseases: N. Itoh; Front. Endocrinol. 5, 107 (2014)

NEW

	PID	SINGLE 96 wells	TWIN PLEX 2x96 wells	PENTA PLEX 5x96 wells	LIT
FGF-21 (human) ELISA Kit	AG-45B-5001	✓			
Species reactivity:	Human	Detection type:			Colorimetric
Sensitivity:	7 pg/ml	Assay type:			Sandwich
Range:	30 to 1920 pg/ml	Sample type:			Serum, Plasma, Cell Culture Supernatant

PROTEINS	PID	SIZE	SOURCE	ENDOTOXIN	SPECIES
FGF-21 (human) (rec.)	AG-40A-0091	10 µg 50 µg	HEK 293	<0.1EU/µg	Hu
FGF-21 (human) (rec.) (His)	AG-40A-0098	10 µg 50 µg	HEK 293	<0.1EU/µg	Hu
FGF-21 (human):Fc (human) (rec.)	AG-40A-0095	10 µg 50 µg	HEK 293	<0.1EU/µg	Hu
FGF-21 (mouse) (rec.)	AG-40B-0143	10 µg 3 x 10 µg	HEK 293	<0.01EU/µg	Ms
FGF-21 (mouse) (rec.) (His)	AG-40A-0099	10 µg 50 µg	HEK 293	<0.1EU/µg	Ms
FGF-21 (mouse):Fc (human) (rec.)	AG-40A-0097	10 µg 50 µg	HEK 293	<0.1EU/µg	Ms
ANTIBODIES	PID	SIZE	SOURCE / ISOTYPE	APPLICATIONS	SPECIES
anti-FGF-21 (human), mAb (FG204-3)	AG-20A-0067	50 µg 100 µg	Mouse IgG2bκ	ELISA, WB	Hu
anti-FGF-21 (mouse), pAb	AG-25A-0076	100 µg	Rabbit	ELISA, WB	Ms
anti-FGF-21, mAb (FG224-7)	AG-20A-0051	100 µg	Rat IgG1κ	ELISA, WB	Hu, Ms
anti-FGF-21, pAb	AG-25A-0074	100 µg	Rabbit	ELISA, IHC, WB	Hu, Ms

Other Myokine Related Products

PROTEINS	PID	SIZE	SOURCE	ENDOTOXIN	SPECIES
ANGPTL4 (fibrinogen-like domain) (human) (rec.)	AG-40A-0070	10 µg 50 µg	HEK 293	<0.1EU/µg	Hu
ANGPTL4 (fibrinogen-like domain) (mouse) (rec.)	AG-40A-0115	10 µg 50 µg	HEK 293	<0.1EU/µg	Ms
ANGPTL4 (mouse) (rec.)	AG-40A-0075	10 µg 50 µg	COS-7	<0.1EU/µg	Ms
PEDF (human) (rec.)	AG-40B-0077	10 µg 3 x 10 µg	CHO	<0.1EU/µg	Hu
PEDF (mouse) (rec.)	AG-40B-0118	10 µg 3 x 10 µg	CHO	<0.01EU/µg	Ms
VEGF 164 (mouse) (rec.)	AG-40T-0044	5 µg 20 µg	Sf9	N/A	Ms
VEGF 165 (human) (rec.)	AG-40T-0045	5 µg 20 µg	Sf9	N/A	Hu
VEGF-C (human) (rec.) (His)	AG-40T-0046	20 µg	Sf9	N/A	Hu
VEGF-C (rat) (rec.) (His)	AG-40T-0048	5 µg 20 µg	Sf9	N/A	Rt
VEGFR-1, Soluble (human) (rec.)	AG-40T-0049	5 µg 20 µg	Sf9	N/A	Hu
ANTIBODIES	PID	SIZE	SOURCE / ISOTYPE	APPLICATIONS	SPECIES
anti-ANGPTL4 (human), mAb (Kairos-1)	AG-20A-0038	50 µg 100 µg	Mouse IgG1κ	ELISA, IHC, WB	Hu
anti-ANGPTL4 (mouse), mAb (Kairos 142-2)	AG-20A-0054	100 µg	Rat IgG2aλ	ELISA, WB	Ms
anti-PEDF (human), mAb (rec.) (Serpy-1-4)	AG-27B-0014	100 µg	Human IgG2λ	ELISA, WB	Hu
anti-PEDF, pAb (IN104)	AG-25B-0029	100 µg	Rabbit	ELISA, WB	Hu, Ms
anti-VEGF-A (human), mAb (3(6D3))	AG-20T-0105	200 µg	Mouse IgG1	ELISA, WB, FUNC (Neutralization)	Hu

AMPK – A Metabolic Master Switch

From the Manufacturer!

AMPK (AMP-activated protein kinase) is an enzyme that plays a role in cellular energy homeostasis, regulating several intracellular systems including hepatic fatty acid oxidation and ketogenesis, inhibition of cholesterol synthesis, lipogenesis and triglyceride synthesis, stimulation of skeletal muscle fatty acid oxidation and muscle glucose uptake as well as modulation of insulin secretion by pancreatic β cells.

SELECTED REVIEW: Past strategies and future directions for identifying AMP-activated protein kinase (AMPK) modulators: S.E. Sinnott & J.E. Brenman; Pharmacol. Ther. 143, 111 (2014)

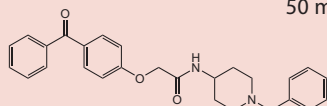
NEW

AdipoRon *BULK available!*

AG-CR1-0154-M010
AG-CR1-0154-M050

10 mg
50 mg

Formula: C₂₇H₂₈N₂O₃
MW: 428.5
CAS: 924416-43-3



AdipoR agonist. AMPK & PGC1 α activator. Improves diabetes, glucose and lipid metabolism and insulin sensitivity.

LIT: A small-molecule AdipoR agonist for type 2 diabetes and short life in obesity: M. Okada-Iwabu, et al.; Nature 503, 493 (2013) • Cell Biology. Ronning after the adiponection receptors: W.L. Holland & P.E. Scherer; Science 342, 1460 (2013)

Also Available

Compound 112254 (AMPK activator)

AG-CR1-0155

10 mg | 50 mg

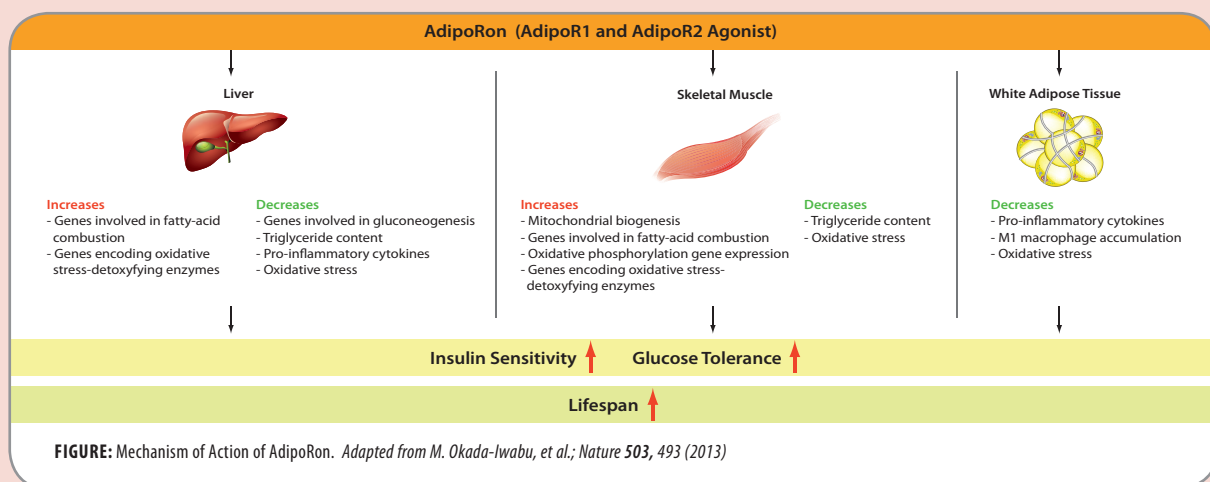
NEW Compounds with increased Solubility

AdipoRon . HCl (water soluble)

AG-CR1-0156

Compound 112254 . HCl (water soluble)

AG-CR1-0157



AICAR – Cell permeable AMPK Activator

BULK

AG-CR1-0061-M010
AG-CR1-0061-M050
AG-CR1-0061-M100

10 mg
50 mg
100 mg

Formula: C₉H₁₄N₄O₅
MW: 258.2
CAS: 2627-69-2

See www.adipogen.com for more Innovative Reagents!

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