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:**


**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).

Irisin – A Myokine involved in Exercise & Obesity

Irisin is a recently described exercise and PGC1α-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 secreted from muscle during exercise. Irisin could play an important role in obesity and glucose homeostasis.


### Irisin ELISA Kit

**Irisin Competitive ELISA Kit**

<table>
<thead>
<tr>
<th>PID</th>
<th>SINGLE 96 wells</th>
<th>TWIN PLEX 2 x 96 wells</th>
<th>PENTA PLEX 5 x 96 wells</th>
<th>LIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG-45A-0046</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

**Species reactivity:** Human, Monkey, Mouse, Rat

**Sensitivity:** 1 ng/ml

**Range:** 0.001 to 5 µg/ml

**Detection type:** Colorimetric

**Assay type:** Competitive

**Sample type:** Serum, Plasma, Cell Culture Supernatant


### Related Antibodies & Proteins

**PROTEINS**

<table>
<thead>
<tr>
<th>PID</th>
<th>SIZE</th>
<th>SOURCE</th>
<th>ENDOTOXIN</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irisin (rec.) (CHO)</td>
<td>AG-40B-0136</td>
<td>10 µg</td>
<td>CHO</td>
<td>&lt;0.01EU/µg</td>
</tr>
<tr>
<td>Irisin (rec.) (E. coli)</td>
<td>AG-40B-0103</td>
<td>10 µg</td>
<td>E. coli</td>
<td>&lt;0.1EU/µg</td>
</tr>
<tr>
<td>Irisin:Fc (human) (rec.)</td>
<td>AG-40B-0115</td>
<td>10 µg</td>
<td>HEK 293</td>
<td>&lt;0.1EU/µg</td>
</tr>
<tr>
<td>FNDC4 (rec.) (untagged)</td>
<td>AG-40B-0124</td>
<td>10 µg</td>
<td>E. coli</td>
<td>&lt;0.01EU/µg</td>
</tr>
<tr>
<td>FNDC5 (rec.) (untagged)</td>
<td>AG-40B-0128</td>
<td>10 µg</td>
<td>E. coli</td>
<td>&lt;0.01EU/µg</td>
</tr>
</tbody>
</table>

**ANTIBODIES**

<table>
<thead>
<tr>
<th>PID</th>
<th>SIZE</th>
<th>SOURCE</th>
<th>APPLICATIONS</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>anti-Irisin, pAb (IN102)</td>
<td>AG-25B-0027</td>
<td>100 µg</td>
<td>WB</td>
<td>Hu, Ms, Rt, Mo</td>
</tr>
<tr>
<td>anti-Irisin, pAb (IN102) (Biotin)</td>
<td>AG-25B-0027B</td>
<td>100 µg</td>
<td>WB, ELISA</td>
<td>Hu, Ms, Rt, Mo</td>
</tr>
</tbody>
</table>

**NEW “Browning” Agents**

**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)

**BAIBA – A new contraction-induced Myokine**

**3-Aminoisobutyric acid (BAIBA)**

<table>
<thead>
<tr>
<th>PID</th>
<th>SIZE</th>
<th>SOURCE</th>
<th>MW</th>
<th>CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG-CR1-3596-M250</td>
<td>250 mg</td>
<td></td>
<td>103.1</td>
<td>144-90-1</td>
</tr>
<tr>
<td>AG-CR1-3596-G001</td>
<td>1 g</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Formula:** C₅H₁₀N₂O₂

**Visit our website [www.adipogen.com](http://www.adipogen.com) for a comprehensive overview on products and sizes!**
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)

Other Myokine Related Products
AMPK – A Metabolic Master Switch

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.


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.


AdipoR agonist. AMPK & PGC1α activator. Improves diabetes, glucose and lipid metabolism and insulin sensitivity.


BULK available!

AdipoRon

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

Formula: C_{27}H_{28}N_{2}O_{3}
MW: 428.5
CAS: 924416-43-3

Also Available

Compound 112254 (AMPK activator)
AG-CR1-0155

NEW Compounds with increased Solubility

AdipoRon . HCl (water soluble)
AG-CR1-0156

Compound 112254 . HCl (water soluble)
AG-CR1-0157

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

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

10 mg
50 mg
100 mg

Formula: C_{9}H_{14}N_{4}O_{5}
MW: 258.2
CAS: 2627-69-2

See www.adipogen.com for more Innovative Reagents!