BioVendor Group

CLIA

Metabolic syndrome

Adiponectin
Leptin

Diagnostic panel

Introduction

Metabolic syndrome

Metabolic syndrome (MetS) is a group of interrelated health problems that increase the risk of cardiovascular diseases, type 2 diabetes, and other health complications. The main domains of metabolic syndrome include: obesity, insulin resistance, hypertension, dyslipidemia, and elevated levels of certain inflammatory markers.

The role of adipokines

In recent decades, obesity has become one of the most widespread metabolic disorders. Medically, it is defined as a condition of excessive accumulation of fat tissue, which can seriously impair an individual's health.

Modern research shows that adipose tissue is not just a passive energy storage site but also a highly active endocrine organ. It produces and secretes a wide range of biologically active substances called adipokines, including leptin, adiponectin, tumor necrosis factor-α (TNF-α), and interleukin-6 (IL-6). These adipokines play a key role in regulating various physiological processes, including energy metabolism, immune response, and inflammation.

Biomarkers used in the diagnosis of metabolic syndrome

Leptin

– Leptin is a hormone primarily produced by adipose tissue, with its levels in the body closely correlating with body fat – higher fat levels result in higher leptin levels. It plays a crucial role in regulating appetite and maintaining energy balance.

– In women, who generally have a higher percentage of body fat, circulating leptin levels can be up to twice as high as in men with a similar body weight.

– High leptin levels in the blood are often present in individuals with leptin resistance, which can lead to hypertension and other metabolic disorders.

– Leptin plays a key role in the immune response by stimulating the proliferation of T-helper cells and the production of pro-inflammatory cytokines such as IL-6, which promotes the synthesis of C-reactive protein (CRP) in the liver.

Adiponectin

– Adiponectin is a hormone produced by adipocytes that acts as a powerful protective factor against obesity-related disorders, particularly those associated with visceral fat mass.

– This hormone possesses antidiabetic and anti-inflammatory properties, playing a key role in preventing cardiovascular and metabolic diseases, including atherosclerosis and insulin resistance.

– Adiponectin levels are negatively affected by the accumulation of visceral fat, which explains their lower values in obese individuals.

– Low adiponectin levels are associated with the pathogenesis of type 2 diabetes, coronary atherosclerosis, hypertension, and left ventricular hypertrophy, which is often accompanied by diastolic dysfunction.
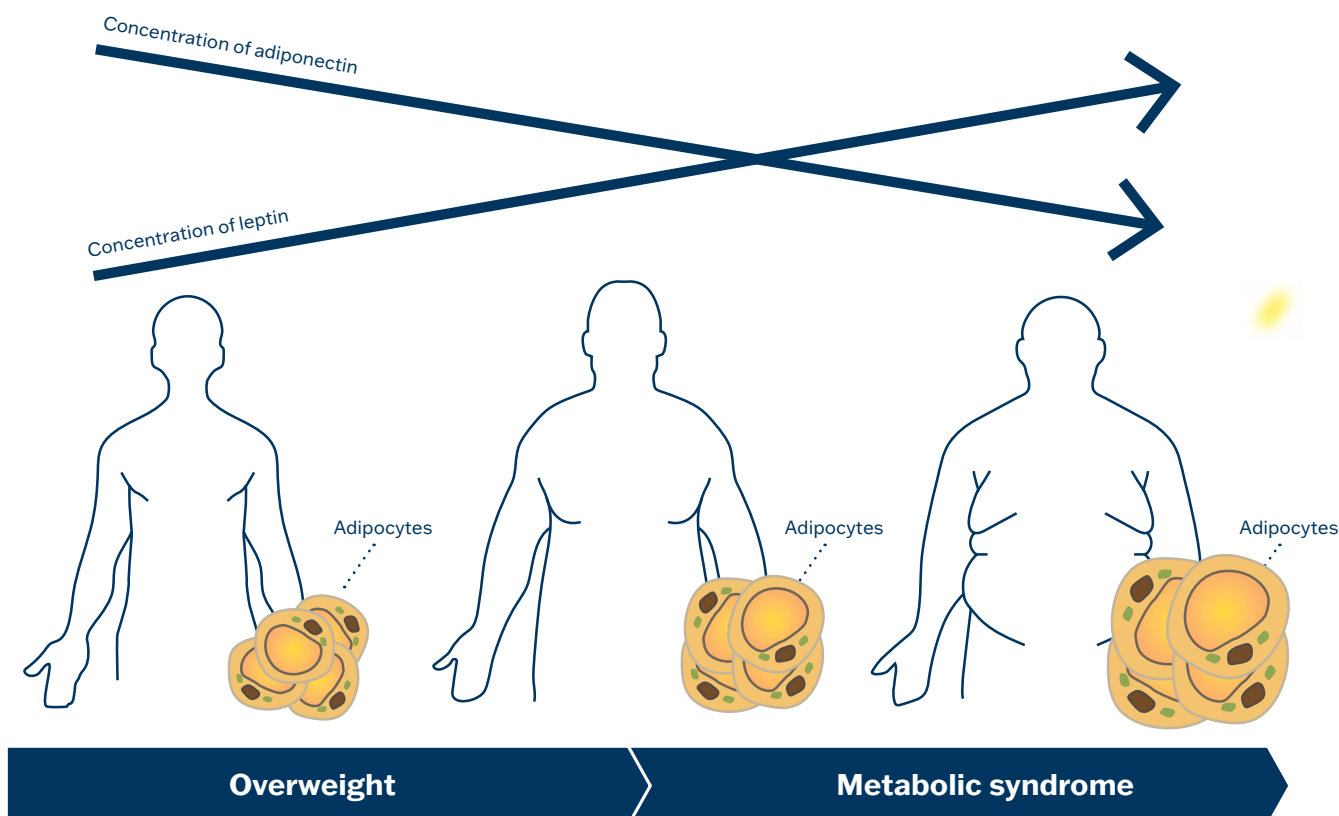
Leptin resistance – focus on children

Leptin plays an important role in regulating appetite and energy balance. However, in many children with obesity, leptin's effectiveness is reduced due to leptin resistance. Despite having high leptin levels, they continue to overeat. The brain does not respond adequately to leptin signals, failing to suppress appetite and effectively regulate energy balance. The mechanisms of leptin resistance may include inflammation and metabolic disorders that disrupt leptin signaling. Solutions typically involve lifestyle changes, dietary habits, and physical activity, which can increase adiponectin levels, contributing to anti-inflammatory effects. Diagnosing leptin levels in childhood can reveal the risk of developing metabolic syndrome and other more severe diseases.

Adiponectin-leptin ratio

The adiponectin-leptin ratio (Adpn/Lep) has been proposed as an indicator of adipose tissue dysfunction and as a useful marker for diagnosing metabolic syndrome. It provides a more comprehensive picture of the balance between these two hormones and can highlight potential metabolic imbalances. For example, a low Adpn/Lep may indicate leptin resistance and an increased likelihood of insulin resistance.

Concentration of adiponectin

Concentration of leptin

Adipocytes

Adipocytes

Adipocytes

Overweight

Metabolic syndrome

Personalized approach to prevention and treatment

The ratio of these hormones can help detect early signs of MetS before clinical symptoms emerge. Assessing the Adpn/Lep ratio enables a personalized approach to the prevention and treatment of metabolic syndrome. Based on the results, specific lifestyle changes can be recommended. This ratio can also serve as an indicator of the effectiveness of therapeutic interventions and assist in monitoring metabolic changes. Regular tracking of the ratio can reveal whether the implemented lifestyle modifications are delivering the expected outcomes.

Clinical application

– Diagnostics of metabolic disorders by determining adiponectin in human serum in the general population.

– Diagnostics of metabolic disorders by determining leptin in human serum in the general population.
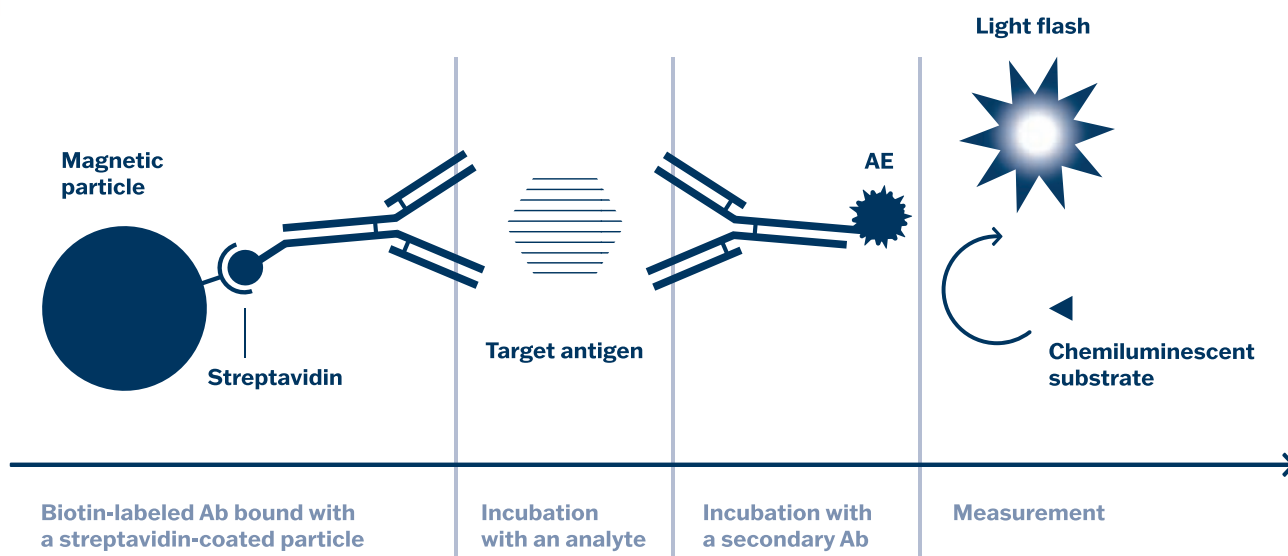
Test characteristics

	Adiponectin	Leptin
Sample	serum (13 µl)	serum (13 µl)
Measuring range	12.5–800 ng/ml	1–64 ng/ml
Assay time	15 min	22 min

How does CLIA method work?

CLIA- Chemiluminescent Immunoassay is a highly advanced method known for its complete automation, rapidity, specificity, and sensitivity. It leverages magnetic particles to separate antigens in immunocomplexes and utilizes flash chemiluminescence for precise detection. The magnetic particle suspension enables automation, reduces reaction times significantly, and enhances specificity. Flash chemiluminescence using acridinium ester produces a strong light signal even at extremely low antigen concentrations, measured in relative light units (RLU). CLIA kits are specifically designed for seamless operation on the KleeYa® automated platform.

Magnetic particle

Streptavidin

Target antigen

AE

Light flash

Chemiluminescent substrate

Biotin-labeled Ab bound with a streptavidin-coated particle

Incubation with an analyte

Incubation with a secondary Ab

Measurement

CLIA kits

Diagnostic CLIA kits are used for diagnosing metabolic disorders by measuring adiponectin and leptin in human serum in the general population. The quantitative automated kit is designed for professional use in laboratories with the KleeYa® analyzer.

Control set CLIA

Control sets CLIA are designed to ensure the accuracy and reliability of results obtained from analyses using CLIA kits.

Ease of use

– Fully automated method
– Kits include all necessary reagents, incl. calibrators
– Control materials are available as independent sets

Advantages

– High diagnostic sensitivity and specificity
– Low sample (10 µl) and reagent consumption
– Short test time
– Wide measuring range
– Full traceability of reagent consumption and number
  of tests available using RFID tags
– LIS connectivity available
– Superior customer service

Ordering information

CLIA kits

Diagnostic CLIA kits are used for diagnosing metabolic disorders by measuring adiponectin and leptin in human serum in the general population on KleeYa® analyzer.

Kit	Catalogue number	Number of tests	
CLIA Adiponectin	CL-ADP050	50	IVD C€
CLIA Leptin	CL-LEP050	50	**RUO**

Control sets

Control sets CLIA are designed to ensure the accuracy and reliability of results obtained from analyses using CLIA kits.

Control sets	Catalogue number	Number of tests
Control set CLIA Adiponectin	CL-ADPCON	2× 20
Control set CLIA Leptin	CL-LEPCON	2× 20

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