

Title: The relevance of the source of proteins animal or vegetable on the metabolic syndrome and its comorbidities

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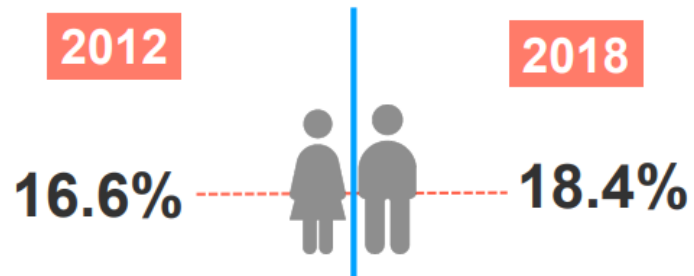
METABOLIC SYNDROME

INTRODUCTION

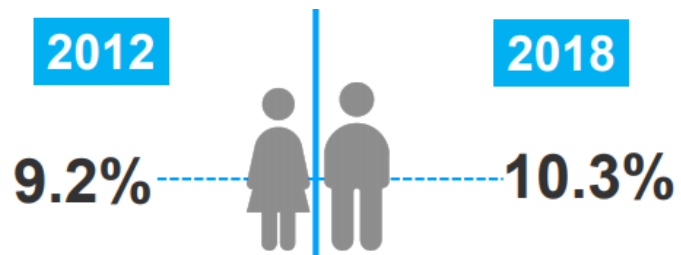
NCEP-ATP III defined metabolic syndrome

Parameters	NCEP- ATP III
Abdominal obesity (waist cm)	Men > 102 cm Women > 88 cm
Glucose	> 110 mg/dL
Triglycerides	>150 mg/dL
Blood pressure	>130/85 mmHg
HDL- Cholesterol	Men < 40 mg/dL Women <50 mg/dL

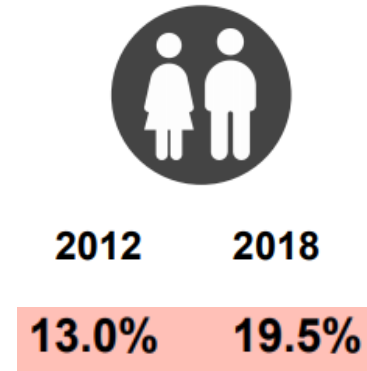
Arterial hypertension



Diabetes

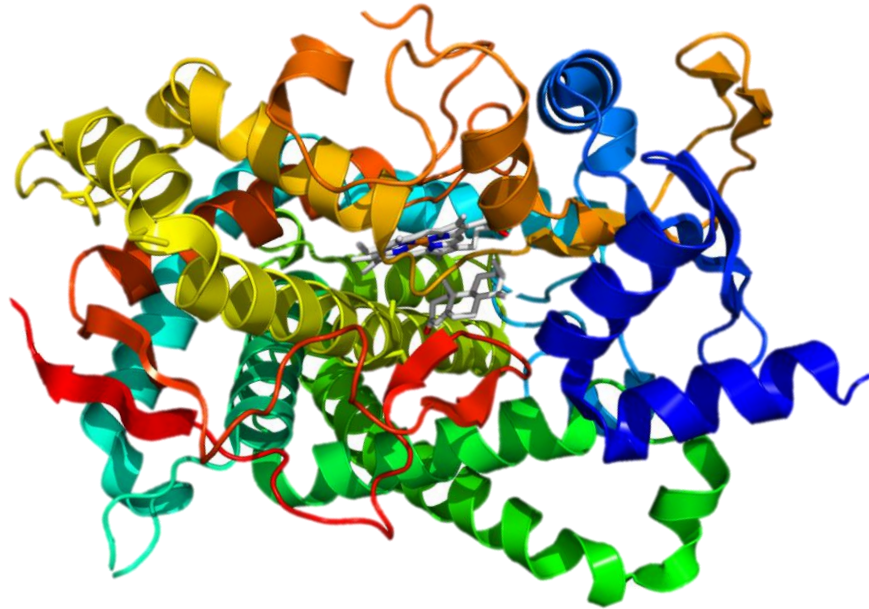


Cholesterol and triglycerides



25% of the world's adult population has MS.

PROTEINS



Proteins are physically and functionally complex macromolecules, serving multiple crucial functions.

BIOACTIVE PEPTIDES

Bioactive peptides are made up of 2 to 15 amino acid residues and their production can be through industrial food processing or during gastrointestinal digestion.

Antimicrobials

Opiates

Antioxidants

Antihypercholesterolemic

Antithrombotic

Antihypertensive

Hypoglycemic

ANIMAL PROTEIN

**EFFECT OF CONSUMPTION OF
ANIMAL PROTEIN ON GLUCOSE
METABOLISM**

**EFFECT OF CONSUMPTION OF
ANIMAL PROTEIN ON LIPID
METABOLISM**

**EFFECT OF CONSUMPTION OF
ANIMAL PROTEIN ON BLOOD
PRESSURE**

VEGETAL PROTEIN

**EFFECT OF CONSUMPTION OF
VEGETAL PROTEIN ON GLUCOSE
METABOLISM**

**EFFECT OF CONSUMPTION OF
VEGETAL PROTEIN ON LIPID
METABOLISM**

**EFFECT OF VEGETAL PROTEIN
CONSUMPTION ON BLOOD
PRESSURE**

ANIMAL PROTEIN

DESCRIPTION	RESULTS	AUTHORS
Therapeutic effect of undigested goby fish muscle proteins (UGP) and their hydrolysates (GPHs) was investigated in rats fed a high-fat, high-fructose (HFFD) diet.	In the rats that were administered with GPHs, a significant decrease in their blood glucose levels and α -amylase activity; however, in those with UGP treatment, blood glucose values did not decrease.	Nasri y col., 2015
Evaluated the effect of the consumption of whey protein (WP) and its hydrolyzate (WPH) on the concentrations of glucose and insulin in the blood in young adults.	The WP in small amounts and when consumed before a meal, reduces postprandial blood glucose levels, as well as food intake	Akhavan y col., 2010

ANIMAL PROTEIN

DESCRIPTION	RESULTS	AUTHORS
Evaluated the effect of krill protein hydrolyzate (KPH) on lipid and bile acid (BAs) metabolism in mice.	In the group of mice with KPH, hepatic fatty acid catabolism increased as the activity of the target PPAR α CPT-2 gene increased.	Ramsvik y col., 2013
Determined the effects of chickpea albumin hydrolyzate (CAH) on the lipid profile of mice fed a high-fat diet	The triglyceride content of the three CAH groups decreased by 15.50% (LD), 19.01% (MD) and 36.55% (HD), compared to the high-fat diet group.	Xue y col., 2012

ANIMAL PROTEIN

DESCRIPTION	RESULTS	AUTHORS
Evaluated the ACE inhibitory activity of a cod hydrolyzate (CPH) and its bioactive peptides (CF3).	The CF3 peptide reduced blood pressure within the first 2 hours after oral administration and was maintained until after 24 hours.	Girgih y col., 2015
Evaluate the effect of an egg white hydrolysate (EWH) on spontaneously hypertensive rats. Low dose EWH (250mg / kg body weight) and high dose EWH (1000mg / kg body weight).	The reduction was only significant in those rats that were administered with the high dose.	Jahandideh y col., 2016

VEGETAL PROTEIN

DESCRIPTION	RESULTS	AUTHORS
Investigated <i>in vitro</i> the effect of soybean sprout peptides on the inhibition of DPP-IV, salivary α -amylase, and intestinal α -glucosidase.	The peptides of 5-10 and > 10 kDa are effective in inhibiting the DPP-IV enzyme and the peptides of 5-10 and <5 kDa showed better inhibition of the enzymes α -amylase and α -glucosidases.	González y col., 2018
Evaluated the effect of consuming a bean protein concentrate (BPC) and cooked bean flour (WCB).	Significant reduction in triglyceride levels was found in the groups supplemented with PCBs and WCB, in addition to lower glucose and insulin concentrations compared to the control group.	Hernández y col., 2020
Studied the efficacy of a decapeptide of a potato protein hydrolyzate obtained with alcalase (APPH) in male mice induced to diabetes by means of streptozotocin.	The animals that were administered with APPH, the blood glucose levels were regulated, the levels of glycated hemoglobin (HbA1c), triglycerides (TG) and total cholesterol (TC) were reduced.	Marthandam y col., 2019

VEGETAL PROTEIN

DESCRIPTION	RESULTS	AUTHORS
Evaluated the effects of soybean β -conglycinin and glycinin on the lipid profile in normal and obese mice.	The triglyceride and glucose levels in the group of mice with a diet supplemented with β -conglycinin were lower than in the control (casein) and conglycinin groups.	Moriyama y col., 2004
Evaluated the effect of the consumption of 11S globulin isolated from chickpea on the lipid profile in adult male Wistar rats with hypercholesterolemia.	The group supplemented with 11S globulin, the serum triglyceride levels were 28.77% lower than those of the group of animals with hypercholesterolemia.	Amaral y col., 2014
Evaluated the effects of defatted rice bran protein (DRBP), fresh rice bran protein (FRBP), DRBP hydrolyzate (DRBPH), as well as FRBP hydrolyzate (FRBPH) on the lipid profile in mice they were fed a high fat diet.	In the group supplemented with FRBPH, the concentrations were found lower LDL cholesterol levels, in addition to having lower expression of the transcription factor SREBP-2.	Zhang y col., 2016

VEGETAL PROTEIN

DESCRIPTION	RESULTS	AUTHORS
Characterized the proteins present in red lentils, obtaining different fractions such as albumins, legumes and vicilins	The legumin showed higher activity compared to the other fractions.	Boye y col., 2010
Evaluated different proteases (alcalase, savinase, protamex and corollase 7089) at different hydrolysis times, with the objective of obtaining multifunctional hydrolysates from lentil protein concentrates.	The hydrolyzate produced by the protease Savinase after 2 h of hydrolysis (S2) showed the highest ACE inhibitory activity and antioxidant activity.	García y col., 2014
Identified peptides with antioxidant and ACE inhibitory activity, released by hydrolysis of lentil protein by protease Savinase.	3 peptides (LLSGTQNQPSFLSGF, NSLTLPIRLYL, TLEPNSVFLPVLLH) showed the highest antioxidant activity (0.013-1.432μmol Trolox eq./μmol peptide) and ACE inhibitor (IC 50 = 44-120μM), in addition to gastrointestinal digestion of the peptides improved their double activity.	García y col., 2017

CONCLUSIONS

The Metabolic Syndrome (MS) is a condition that afflicts an alarming percentage of society.

The drugs used for the treatment of MS and its comorbidities have, in the long term, a series of adverse health effects.

It has been shown that bioactive peptides, whether from an animal or plant source, could be an alternative that assists in the treatment of MS and its associated comorbidities.

However, the mechanisms of action of many peptides are not yet fully elucidated, this opens up a field of opportunity for further research; *in vitro* and *in vivo* models.

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