Adipose Tissue And Adipokines In Health And Disea

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ALEXIA PORTER

Novel Insights into Adipose Cell Functions Bentham Science Publishers
My work focused on understanding adipocyte function and regulation because of the importance to diabetes. In addition to being a fat storage depot, adipose tissue is an endocrine tissue. Adiponectin and leptin are two adipokines that control insulin sensitivity and energy balance. In spite of their importance, there are still questions about their secretion. I hypothesized that leptin and adiponectin follow different secretory routes. I found adiponectin localized in Golgi and the trans Golgi Network, while leptin mostly localized in ER during basal metabolisms. Common requirements for their secretion were the presence of class III Arf proteins and an intact Golgi apparatus, since BFA treatment inhibited secretion of both adiponectin and leptin. I found that trafficking of adiponectin is dependent on GGA1 coated vesicles. Endosomal inactivation significantly reduced adiponectin, but not leptin, secretion in both 3T3L1 and isolated rat adipocytes. Also, adiponectin, but not leptin, secretion was reduced in cells expressing non-functional form of Rab11 and Rab5 proteins. However, secretion of leptin, but not adiponectin was inhibited in cells expressing mutants of Protein Kinase D1. These results suggest that leptin and adiponectin secretion involve distinct intracellular compartments and pathways. Insulin resistance is associated with macrophage infiltration into adipose tissue and elevated levels of IL-6, TNF-alpha and IL-1beta Therefore, the second part of my dissertation tested the hypothesis that the interaction of macrophages and adipocytes causes insulin resistance. To test this hypothesis, I co-cultured macrophages and adipocytes. I found that mouse elicited peritoneal macrophages significantly decreased insulin-stimulated GLUT4 translocation to the plasma membrane in a contact-independent manner. IL-6 was the most inhibitory cytokine in reducing GLUT4 translocation, GLUT4 expression, Akt phsphorylation and reducing adipocyte differentiation compared to TNF-alpha and IL-1beta. These data suggest that IL-6 is the most effective cytokine secreted by macrophages involved in insulin resistance. Lastly, I tested the impact of adipocytes on macrophage differentiation in vitro and in vivo. I found that C2D macrophages isolated from the peritoneal cavity had increased IL-6 transcript levels after co-culture with 3T3L1 adipocytes in vitro. After i.p. injection, C2D macrophages isolated from WAT increased expression of mature macrophage surface markers and transcript levels of proinflammatory cytokines compared to C2D cells in vitro. However, macrophages isolated from BAT expressed low levels of cytokines and macrophage surface markers.
Understanding Adipokine Secretion and Adipocyte-macrophage Cellular Interactions, in Search for the Molecular Basis of Insulin Sensitivity and Resistance Karger Medical and Scientific Publishers
This timely and most comprehensive reference available on the topic covers all the different aspects vital in the fight against the global obesity epidemic. Following a look at adipose tissue development and morphology, the authors go on to examine its metabolic and endocrine functions and its role in disease. The final section deals with comparative and evolutionary aspects of the tissue. The result is an essential resource for cell and molecular biologists, physiologists, biochemists, pharmacologists, and those working in the pharmaceutical industry.
Adipose Tissue in Health and Disease CRC Press
This volume describes the state-of-knowledge in the study of the relationships between mechanical loading states in tissues and common pathophysiologies related to increase in mass of adipose tissues and/or hyperglycemia which eventually lead to obesity, diabetes, insulin resistance, hyperlipidemia, metabolic inflammations, certain types of cancer and other related diseases. There appears to be an interaction between the loading states in tissues and cells and these chronic conditions, as well as with factors such as age, gender and genetics of the individual. Bioengineering has made key contributions to this research field in providing technologies for cell biomechanics experimentation, microscopy and image processing, tissue engineering and multi-scale, multi-physics computational modeling. Topics at the frontier of this field of study include: the continuous monitoring of cell growth, proliferation and differentiation in response to mechanical factors such as stiffness of the extracellular matrix (ECM) and mechanical loads transferred through the ECM; mechanically-activated signaling pathways and molecular mechanisms; effects of different loading regimes and mechanical environments on differentiation fates of mesenchymal stem cells (MSCs) into myogenic and osteogenic versus adipogenic lineages; the interactions between nutrition and mechanotransduction; cell morphology, focal adhesion patterns and cytoskeletal remodeling changes in adipogenesis; activation of receptors related to diabetes by mechanical forces; brown and white adipose plasticity and its regulation by mechanical factors.
Regulation of Human Adipose Tissue Gene Expression in Relation to Obesity and Insulin Resistance CRC Press
Without a doubt, the epidemic of obesity is one of the most serious health problems that affect millions of people worldwide and increases the risk of premature death. Studies indicate that chronic, low-grade inflammation is a major contributor of the obesity-associated pathogenesis, and therapeutic measures that target this process have been envisioned to be promising anti-obesity therapies. Adipokines - biologically active molecules secreted from adipose tissue - have been described as potential candidates for therapy given their capability to regulate numerous physiological responses, both at local and systemic levels. However, the mechanism by which adipokines regulate inflammatory processes, specifically in the vascular compartment of adipose tissue, is poorly understood.
Obesity and Cancer ScholarlyEditions
Adipokines (also called adipocytokines) are a group of peptides secreted by adipose tissue. They have diverse roles, from functions in the individual cell to the whole body. This volume examines a wide range of specific adipokines as well as their general cellular aspects, including thermal stress and adipokine expression, central nervous system roles for adiponectin in neuroendocrine and autonomic function, and astroglial leptin receptors. It discusses related diseases and conditions such as nonalcoholic fatty liver disease, metabolic syndrome, heart and rheumatic diseases, and allergies and sleep disorders.
Physiology and Physiopathology of Adipose Tissue Springer
Once viewed solely as fat storage cells, adipocytes and their adipokines have now been proven to be central for human health. Understanding that overweight and obesity may increase the risk for various diseases requires detailed characterization of adipokine function. Weight gain, weight regain, and fasting affect adipocyte health and accordingly their secretome. Different adipose tissue deposits exist and they vary in cellular composition and function. The evidence is strong of a role of adipokines in cancer, reproductive function, neurological diseases, cardiovascular diseases ,and rheumatoid arthritis. Adipokines are considered useful biomarkers for adipose tissue and metabolic health, and may be used as diagnostic tools in rheumatoid arthritis, cancer, or sepsis. This book contains 10 original articles and 9 review articles focusing on these bioactive peptides. Several articles deal with chemerin, an adipokine discovered more than 20 years ago. Data so far have resulted in promising insights related to its biological function. We are only beginning to understand the multiple roles of chemerin, the mechanisms regulating its activity, and the signaling pathways used by this chemokine. Adipokine receptor agonists and antagonists may result in the formulation of novel drugs and ultimately may lead to new therapeutic targets to be used in clinical practice.
Adipose Tissue in the Cardiovascular Homeostasis and Disease John Wiley & Sons
Obesity is a global trend and major risk factor for serious diseases including type 2 diabetes. The pathogenic effects related to common obesity are largely attributed to dysregulated secretion of adipokines followed by insulin resistance in peripheral tissues. White adipose tissue serves as a dynamic endocrine organ as well as a major energy reservoir. Adipokines influence various metabolic processes; however, precise physiological roles of adipokines need to be further investigated. Gene expression omnibus (GEO) profile, a public repository for microarray data, was used to identify a novel adipose-specific gene, chordin-like 1 (Chrdl1). Further analysis showed that Chrdl1 encodes a new adipokine. Chrdl1 expression increases during adipogenesis. This pattern, combined with an increased lipid accumulation and adipocyte differentiation in Chrdl1-overexpressing 3T3-L1 cells suggests that Chrdl1 is a pro-adipogenic adipokine. Adipose tissue is also of great significance in the production of food animals. Reduction of adipose tissue mass will lead to enhancing feed efficiency. The net decrease in adiposity is achieved by up-regulation of lipolysis. The initial step of lipolysis is catalyzed by adipose triglyceride lipase (ATGL) which is the rate-limiting step in this process. CGI-58 and G0S2 are known to be an activator and an inhibitor of ATGL-mediated lipolysis, respectively. In the current study, porcine G0S2 was abundantly expressed in adipose tissue, and its expression was increased during adipogenesis, suggesting that G0S2 expression is related to adipocyte development (pro-adipogenic) as well as inhibition of ATGL (anti-lipolytic).
Adipose Tissue and Adipokines in Health and Disease BoD – Books on Demand
The past decade has seen an exponential increase in our knowledge and understanding of adipose tissue biology. This has coincided with the continued rise in obesity across all generations. Clearly despite substantial advances in research into adipose tissue this still has had limited impact on the on-going obesity epidemic across a majority of countries in the world. This book brings together many leading experts in the field to provide an up to date and comprehensive review of the key aspects of adipose tissue. It therefore includes chapters on evolution, development and inflammation together with a detailed review of brown and beige adipose tissue biology and their potential significance in preventing or combating obesity. These chapters are complemented by those on genetics and gender influences, together with nutrition through the life cycle. Ultimately the book provides an overview of the complexities of adipose tissue biology and the continuing challenge to combat obesity in the 21st century.
Adipose Tissue and Cancer Springer Nature
This book presents a comprehensive survey of adipose tissue, its physiological functions, and its role in disease. The volume spans the entire range of adipose tissue studies, from basic anatomical and physiological research to epidemiology and clinical studies. Groundbreaking recent studies are incorporated into traditional models of adipose tissue properties. A description of the role of macrophages in obesity and metabolism in included.
Adipokines 2.0 Springer Science & Business Media
This book highlights the concordance between signaling pathways that are involved in obesity and cancer cross-talks. It describes the role of cytokines, chemokines, growth factors, insulin, and adipokines in the development of obesity-associated cancers. The book reviews the role of inflammatory signaling pathways such as estrogen-mediated signaling, mTOR and AMP-activated protein kinase pathway and the involvement of adaptive and innate immunity, oxidative stress, gene polymorphism, dietary phytochemicals, and miRNAs in obesity and cancer. In addition, it covers the latest research on the drugs and natural therapeutic agents that target obesity-induced cancers and discusses various in vivo models for studying obesity and obesity-associated cancer. Lastly, it analyses the role of genetic polymorphisms in the obesity-related genes that influence cancer development. The book is a useful resource for researchers in the field of cancer, pharmacology, food chemistry, and clinical biochemistry.
Studies on the Expression and Secretion of Adipokines in Canine White Adipose Tissue BoD – Books on Demand

Over the last two decades, the understanding of adipose tissue has undergone radical change. The perception has evolved from an inert energy storage tissue to that of an active endocrine organ. Adipose tissue releases a cluster of active molecules named adipokines. The severity of obesity-related diseases does not necessarily correlate with the extent of body fat accumulation but is closely related to body fat distribution, particularly to visceral localization. There is a distinction between the metabolic function of central obesity (visceral abdominal) and peripheral obesity (subcutaneous) in the production of adipokines. Visceral fat accumulation, linked with levels of some adipokines, induces chronic inflammation and metabolic disorders, including glucose intolerance, hyperlipidaemia, and arterial hypertension. Together, these conditions contribute to a diagnosis of metabolic syndrome, directly associated with the onset of cardiovascular disease. If it is well known that adipokines contribute to the inflammatory profile and appetite regulation, this review is novel in synthesising the current state of knowledge of the role of visceral adipose tissue and its secretion of adipokines in cardiovascular risk.

Adipose Tissue Springer Science & Business Media

Often, obesity is implicated as a complicating factor for other pathologies, ranging from heart disease or pulmonary issues, to hypertension and even cancer. There are some conditions, though, that are caused directly by obesity, and lead to serious, irreversible consequences. Over-nutrition leads to excess energy stores, or fat accumulation. Accumulation of white adipose tissue, namely visceral adipose tissue, leads to chronic low-grade inflammation through a complex cascade of dysfunction. There is a domino effect that takes place within the adipose tissue, and consistent over-nutrition will lead to intrinsic self-preserving mechanisms. The marriage of resident immune cells to adipocytes (fat cells) within white adipose tissue is a dynamic but not fully understood relationship. The resident macrophages that function as part of white adipose tissue are a key to manipulating the tissue, and their actions are some of the driving factors of either pro- or anti-inflammatory signaling. The mechanisms for chronic, low-grade inflammation originating in visceral white adipose tissue is caused by the adipocytes, which release inflammatory adipokines to act on local leukocytes to enhance inflammatory signaling. Inflammatory signaling leads to insulin resistance, mainly because cells under stress do not need to take in glucose. Chronic, low-grade inflammation leads cells to eventually become insulin resistant, and this leads to type-2 diabetes. Although major changes in weight can reverse the chronic, low-grade inflammation, there are often permanent damages that happen systemically that cannot be reversed, like type-2 diabetes. Obese states cause constant systemic signal dysfunction, including disruption of brain chemistry related to metabolism. To simply stop eating is not a solution since the ability for the brain to accept certain signals is also affected by the signaling cascades of white adipose tissue. It is hypothesized that, when combatting this inflammation, the manipulation of white adipose tissue will be most effective. Because the changes that occur within the visceral white adipose tissue cause the dysfunction, the cells responsible for these changes may be the key to controlling those damaging effects. If some of the pathology caused by obesity can be treated therapeutically, then three methods should be explored as treatment options; browning of white adipose tissue, manipulation of resident adipose tissue macrophages, and manipulation of certain adipokines. Brown adipose tissue is more metabolically favorable than white adipose tissue, resident macrophages can cause pro- or anti-inflammatory cascades, and anti-inflammatory adipokines released by white adipose tissue will also cause metabolically favorable conditions. All of these measures are being separately explored worldwide as obesity research continues, and offer promising roles in the potential treatment for the pathophysiology caused by obesity.

Functions of Adipose Tissue and Adipokines in Health and Disease Frontiers Media SA

Adipose tissue, a kind of connective tissue, plays different and significant roles in the human body. Its function includes protection against environmental factors, storage of lipids and triacylglycerol, and the process of thermogenesis. It is also involved in the secretion of highly active biomolecules such as steroid hormones, prostaglandins, as well as proteins called “adipokines.” On the other hand, disturbances in functions of adipose tissue may cause several pathologies such as obesity and insulin resistance. Obesity is a worldwide health problem, whereas diabetes mellitus due to insulin resistance is defined by the World Health Organization as “a progressive worldwide epidemic.” Especially dangerous is visceral accumulation of adipose tissue.This book describes a series of up-to-date topics about physiological and pathological processes in adipose tissue.

Characterization of Adipokine-induced Responses for Inflammation and Leukocyte Interaction in Endothelial Cells Springer Science & Business Media

Obesity is associated with insulin resistance (IR) and type 2 diabetes mellitus. Among possible mechanisms leading to IR are increased plasma levels of free fatty acids and altered levels of adipokines secreted from adipose tissue (AT). In the first part of the work, we studied obese patients during different nutritional and physical activity interventions. Phenotypic data were related to the expression of AT genes potentially involved in the regulation of insulin sensitivity (IS) and/or low-grade inflammation. We confirmed that aerobic and dynamic strength training improved IS and demonstrated that these interventions do not promote changes in subcutaneous AT gene expression or in plasma levels of adiponectin, interleukin-6, interleukin-1 beta and tumor necrosis factor-alpha, but decrease circulating leptin level. Very low calorie diet followed by low calorie diet and weight maintenance period enhanced IS in obese women and diminished retinol-binding protein 4 (RBP4) in plasma, but RBP4 mRNA levels were reduced only after very low calorie diet. Our findings indicate that the investigated adipokines, except potentially leptin, might not be mediators of changes in IS induced by lifestyle interventions. In the second part of the work, we investigated the role of peroxisome proliferator-activated receptors (PPARs) on the protein secretion by human subcutaneous AT...

Role of Adipokines in the Crosstalk Between Human Adipose Tissue and Skeletal Muscle Cells Springer Science & Business Media

Obesity is a disease of society and economic transition spreading at an epidemic pace throughout the world. According to the World Health Organization, obesity is defined as an increased or abnormal accumulation of body fat mass to the extent that individual’s health will be negatively affected. Overweight is thus being considered as top at risk condition in the world and it is mandatory to identify the physiopathological causes involved in adipose tissue enlargement and related metabolic and cardiovascular health disorders.This volume provides the most up to date insights into the biology of a complex endocrine organ: the adipose tissue.

Evaluation of Acylation Stimulating Protein (ASP) and Adipokines in Relationship with Determinants of Obesity and Its Consequences Frontiers Media SA

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The Mechanobiology of Obesity and Related Diseases MDPI

Recent studies have shown that cells from adipose tissue are capable of trafficking to tumors, thus enabling paracrine action of adipokines from within the tumor microenvironment. Increased tumor vascularization, immune system suppression and direct effects on malignant cell survival and proliferation have been investigated as mechanisms regulated by adipokines. The goal of this book is to discuss data pointing to the role of adipose tissue in cancer and to dissect individual mechanisms through which adipose tissue excess or restriction could influence cancer progression.

Adipokines: Advances in Research and Application: 2011 Edition Springer Science & Business Media

Once viewed solely as fat storage cells, adipocytes and their adipokines have now been proven to be central for human health. Understanding that overweight and obesity may increase the risk for various diseases requires detailed characterization of adipokine function. Weight gain, weight regain, and fasting affect adipocyte health and accordingly their secretome. Different adipose tissue deposits exist and they vary in cellular composition and function. The evidence is strong of a role of adipokines in cancer, reproductive function, neurological diseases, cardiovascular diseases ,and rheumatoid arthritis. Adipokines are considered useful biomarkers for adipose tissue and metabolic health, and may be used as diagnostic tools in rheumatoid arthritis, cancer, or sepsis. This book contains 10 original articles and 9 review articles focusing on these bioactive peptides. Several articles deal with chemerin, an adipokine discovered more than 20 years ago. Data so far have resulted in promising insights related to its biological function. We are only beginning to understand the multiple roles of chemerin, the mechanisms regulating its activity, and the signaling pathways used by this chemokine. Adipokine receptor agonists and antagonists may result in the formulation of novel drugs and ultimately may lead to new therapeutic targets to be used in clinical practice.

Roles of Adipose Tissue-derived Factors in Adipose Tissue Development and Lipid Metabolism Frontiers Media SA

Functions of Adipose Tissue and Adipokines in Health and Disease.

Growth Factors and Cytokines in Skeletal Muscle Development, Growth, Regeneration and Disease Humana

The scientific advances in the physiology and pathophysiology of adipose tissue over the last two decades have been considerable. Today, the cellular and molecular mechanisms of adipogenesis are well known. In addition, adipose tissue is now recognized as a real endocrine organ that produces hormones such as the leptin acting to regulate food intake and energy balance in the central nervous system, a finding that has completely revolutionized the paradigm of energy homeostasis. Other adipokines have now been described and these molecules are taking on increasing importance in physiology and pathophysiology. Moreover, numerous works have shown that in obesity, but also in cases of lipodystophy, adipose tissue was the site of a local low-grade inflammation that involves immune cells such as macrophages and certain populations of lymphocytes. This new information is an important step in the pathophysiology of both obesity and related metabolic and cardiovascular complications. Finally, it is a unique and original work focusing on adipose tissue, covering biology and pathology by investigating aspects of molecular and cellular biology, general, metabolic, genetic and genomic biochemistry.