Preview Highlights

Experimental Biology ’97  
April 6–9, 1997  
New Orleans, Louisiana

This year’s annual meeting of professional research scientists consists of being developed and sponsored by The American Physiological Society; American Society for Investigative Pathology; American Society for Nutritional Sciences/The Society for International Nutrition Research; American Association of Anatomists; The Biomedical Engineering Society; Society for Experimental Biology of Medicine; North American Society for Bioengineering, and North American Vascular Biology Organization.

The themes this year are cardiovascular biology, regulation of growth and development, epithelial cell biology, respiratory biology, metabolic processes in health and disease, signal transduction and gene regulation, and neurobiology.

A sampling of symposia sessions appears below. The Program and the Abstracts issue have more detailed information are mailed to preregistrants before the meeting.

The American Physiological Society

Symposia

The Physiology and Functional Diversity of Amiloride-Sensitive Na⁺ Channels: A New Gene Superfamily

Chair: D.J. Benos

Milestones in Thermal Physiology

Chairs: C.M. Blatteis and J.A. Boulant

Important advances in thermal physiology research since the beginning of this century were made in the wake of seminal discoveries and the development of new techniques and momentous events. Five in particular stand out: 1) The development by Atwater, Rosa, and Benedict of the so-called “respiration calorimeter,” which made possible the detailed study of the factors balancing heat production and heat loss; 2) the extensive and conflicting studies on the central nervous control of body temperature, from Ott in 1884 and continuing to this day; 3) the applied research conducted for war purposes that provided the framework for subsequent studies on the basic physiology and pathophysiology of thermoregulation; 4) the tests performed on primitive human populations in their own habitats before and after World War II to analyze the evidence for thermal adaptation, and 5) the advances in our understanding of the mechanisms of fever production since Von Liebermeister suggested in 1887 that fever may represent a regulated upward shift of the thermoregulatory set-point. This symposium will recapitulate for a new generation of physiologists some of the important steps that have brought us to our present state of knowledge in thermal physiology.

Pathophysiology of Cardiorenal Systems in Obesity

Chairs: J.E. Hall and A.L. Mark

Obesity, the most common nutritional disorder in Western societies, is a major factor in the etiology of renal and cardiovascular diseases, including hypertension. Its development involves genetic as well as environmental factors, and represents a complex syndrome in which multiple control systems are affected, which in turn affect cardiovascular regulation. There have been major advances in our understanding of the gen-netic, molecular, and integrative changes in cardiovascular, renal, and endocrine function that occur with the development of obesity in experimental animals and humans. This symposium will focus on the physiologic mechanisms by which obesity alters cardiovascular, renal, and sympathetic function and the consequences of these changes to the pathophysiology of cardiovascular disorders such as hypertension. Topics include genetic abnormalities that can lead to obesity; molecular and cellular alterations in obesity; new models of obesity including genetic and transgenic animal models, and new experimental studies in animals and humans that have elucidated the renal, neurohumoral, and circulatory mechanisms responsible for deranged blood pressure regulation in obesity. The speakers have examined the link between obesity and cardiovascular pathophysiology from different perspectives using different techniques. Because there has been considerable controversy concerning the mechanisms by which weight gain alters cardiovascular regulation, the goals of this symposium are to integrate new developments from multiple research areas.

Vascular Endothelium-Smooth Muscle Communication in the Control of Vascular Function and Growth

Chairs: A.I. Hassid and D.B. McNamara

The blood vessel can sense changes within its milieu and can integrate these signals by intercellular communication and by local production of mediators. The endothelium interacts with hemodynamic factors and blood-borne substances via specific receptor-mediated mechanisms and sends signals via cytokines, nitric oxide, growth factors, and other humoral and physical factors that regulate vascular function and growth. Likewise, vascular smooth muscle (VSM) interacts with the endothelium found with other components of the blood vessels via complex autocrine-paracrine mechanisms to maintain intravascular homeostasis. Participants discuss the recent advances in understanding the role of
the endothelium and VSM unit as a modulator of vascular function and structure, and how an interruption of normal endothelium-VSM communication causes dysfunction of the blood vessel as an interface between the circulation and the tissue and in maintaining vascular tone and transport. Questions to ask include: 1) What is the role of endothelium as a sensor for the hemodynamic forces and blood-borne signals? 2) What is the role of endothelium-derived substances in the signal pathway leading to VSM modulation? 3) What is the role of VSM in vascular remodeling via autocrine and paracrine mechanisms? 4) Does impairment of endothelium-VSM interaction lead to neointima formation and atherosclerosis. 

Graduate students, postdoctoral fellows, and established investigators in various disciplines should find this symposium interesting.

APS Public Affairs Symposium: Are We Losing Our Expertise with Whole Animal Physiology, and Does That Matter?

Chair: C.T. Hawk

Mechanisms of Transport Across the Blood-Brain Barrier

Chairs: R.A. Hawkins and S.J. Vannucci

The function of the BBB (blood-brain barrier) is to assure the brain a protected and constant environment. Until recently, the study of the BBB relied on kinetic studies of whole animals or isolated capillaries, which led to the discovery of several transport systems for essential metabolites and ions. A problem, however, is that the BBB is composed of two membranes, each with very different properties. In the last few years, new techniques were developed and applied to the BBB, including molecular biology; specific antibodies that react with known transporters; the ability to isolate, separate, and measure transport in the luminal and abluminal membranes, and the development of specific molecules that either bind tenaciously or covalently to transporters. These methods are providing a new understanding of the functions of the blood-brain barrier and its mechanism of operation. This area has direct relevance to cerebral function in physiological and pathological circumstances.

Recent Insights into the Urinary Concentrating Mechanisms: From cDNA Cloning to Modeling Renal Function

Chairs: M.A. Hediger and M.A. Knepper

Participants will review recent insights into the urinary concentrating process and integrate knowledge obtained from both molecular and physiological approaches. There has been considerable progress in cloning proteins (e.g., water channels, NaCl transporters, vasopressin receptors, and various ion channels) that play important roles in urinary concentration. Today's challenge is to take these molecular tools and apply them to physiologic experiments in order to determine what role these proteins play in urine concentration and water excretion. Participants will point out in molecular terms how the kidney concentrates urine. Specifically, speakers will discuss water channels (aquaporins) and recent work on the regulation of these proteins, including insights into membrane trafficking and regulation by endo/exocytosis; the molecular genetics of vasopressin receptors and their involvement in the orchestration of the antidiuretic response, and the importance of NaK2Cl cotransporters and ROMK potassium channels in establishing and maintaining the corticopapillary osmolarity gradient. Participants will also address the structure, function, and regulation of expression of kidney urea transporters, evaluate their role in urine concentrating ability, and present models describing the urinary concentrating process based on the physiological and molecular data.

Regulating Epithelia from their APICAL Side: Novel New Mechanisms for Autocrine and Paracrine Signaling

Chair: K. Karnaky, Jr.

In the traditional view, epithelia are regulated by hormones and neurotransmitters acting on receptors located on their basolateral surfaces. By contrast, a growing literature is documenting mediator regulation of epithelia from their apical surface. At the forefront of this developing area is the realization that the implications for disease may be profound. For example, cystic fibrosis can now be viewed in part as a defect in apical membrane signaling events. Several connective tissue cells, which can reach the luminal space by diapedesis, could release apically acting secretagogues such as histamine, prostaglandin D2, and 5'-adenosine monophosphate. More than a dozen mediators, including adenosine, atrial natriuretic peptide, c-type natriuretic peptide, angiotensin II, ATP, UTP, bradykinin, endothelin, guanylin, gonadotropin, histamine, parathyroid hormone, prostaglandin D2, and vasopressin, stimulate apically. Functions of apical receptors may include host defense and luminal monitoring, creation of fluid pathways and environments for secreted molecules and cells, feedback regulation, signal amplification in apical membrane microdomains, multifunctionality of a signal mediator, communication between upstream with downstream cells, fine tuning, and, in development, signaling in four dimensions. The key unifying concept is local control. Many, perhaps most, epithelia produce locally acting mediators and exhibit apical membrane receptors. Significantly, the luminal location of these receptors makes them potential prime targets for pharmacotherapy for various diseases.

Heat Shock Proteins and Myocardial Protection

Chairs: R.C. Kukreja and J.M. Downey

Myocardial ischemic syndromes pose a major medical problem and a significant economic health care concern. Reperfusion, although used clinically as essential to the survival of acutely ischemic heart muscle, carries with it the risk of "reperfusion injury." The salvage of additional myocardium is therefore highly desirable. Recent studies show that sublethal ischemia or hyperthermia activates a powerful endogenous protective mechanism that significantly improves myocardial salvage after prolonged ischemia. Studies have now shown a direct correlation between the amount of heat shock proteins produced and the degree of myocardial protection after heat shock treatment in experimental animals. A closer examination of this group of proteins and their involvement in cardioprotection during myocardial infarction is important in understanding the myocyte's ability to protect itself against ischemic injury. An international panel of leading experts will discuss the controversies in this growing field and the potential of treating ischemic heart disease with heat shock proteins in the patients.

Molecular and Physiological Regulation of Intracellular Lipid Transport in the Intestine

Chairs: C.M. Mansbach and D. Hui

This symposium will deal with cell biological and molecular biological techniques as they apply to intestinal lipid processing. The absorption, metabolism,
and transport of dietary lipids is a complex but major function of enterocytes. Much progress has been made in understanding these processes by using technological advances as detailed in the symposium. Gene knockout mice have been used to define the importance of cholesterol esterase in cholesterol absorption; molecular biological techniques have been used to explore the role of the microsomal triglyceride transport protein in triglyceride transport and in apolipoprotein B editing with respect to the production of the chylomycin-associated edited version of the lipoprotein, apolipoprotein B48; cell biological techniques have been applied to the study of the movement of triglyceride between intracellular movement of triglycerides, and enzymological studies of triglyceride synthesis have also been investigated.

Challenges Facing Undergraduate and Medical Physiology Teachers: Are They the Same?

Chair: D.R. Richardson

One role of a physiology instructor is to create a learning environment in which students can achieve the instructor's expected level of mastery. However, even when students are able to provide appropriate answers to examination questions, suggesting mastery, they may not understand important concepts that form the basis for the instructor's questions. Hence, in reality, the learning environment that appeared to be successful falls short of the desired goal. "Course directors," panelists, and attendees will interact in this forum to address several critical challenges that face physiology instructors of all postsecondary student populations (community college, 4-year undergraduate, graduate, professional).

Glucagon-Like Peptide-1 and the Control of Insulin-Glucose Homeostasis

Chair: S. Mojsov and E.M. Plisetskaya

The maintenance of steady levels of glucose in response to a meal is controlled by a complex network of metabolic factors. Insulin is instrumental in modulating circulating glucose levels and is part of a feedback loop that keeps both glucose and insulin levels constant in a basal state. In addition to insulin, this network includes such diverse components as amino acids, catecholamines, neurotransmitters, and metabolic hormones. Each of these compounds can influence glucose metabolism by stimulating secretion of insulin from the pancreatic beta cells. Recently, it was discovered that a new peptide secreted in the gut in response to nutrients, called glucagon-like peptide-1 (GLP-1), is one of the most potent insulin secretagogues described to date. The amino acid sequence of GLP-1 is completely conserved in all mammalian species. Furthermore, the sequence of mammalian GLP-1 shows over 60% homology to the sequences of GLP-1's isolated from different species of fish, suggesting that GLP-1 plays an important physiological role in lower vertebrates as well. Clinical studies with GLP-1 extended the initial observations and established the unique ability of GLP-1 among gastrointestinal peptides to influence the islet cell functions. Ongoing clinical trials by several pharmaceutical companies are evaluating the use of GLP-1-based therapeutic agents for treatment of imbalance in glucose metabolism manifested in patients with type II diabetes mellitus. In addition to its pancreatic effect, the most recent studies have implicated GLP-1 in the regulation of food intake. This symposium will integrate clinical and basic research related to different aspects of GLP-1 physiology.

Oxygen Sensing Mechanisms in Mammalian Cells

Chair: N.R. Prabhakar and S. Lahiri

Adequate supply of oxygen is essential for the survival of mammalian cells. Hypoxia (a decrease in oxygen availability) results in acute and long-term physiological consequences and adaptations. Systems response to acute hypoxia include reflexes arising from peripheral chemoreceptors, especially the carotid bodies, as well as direct effects of low oxygen on blood vessels, e.g., pulmonary vasculature. Mechanisms underlying acute effects of hypoxia involve modulation of certain ionic channels and release of specific neurotransmitters. Chronic hypoxia, on the other hand, induces phenotypic remodeling in the basic components of the cardiorespiratory systems involving induction of specific genes. This symposium will present current views on how mammalian cells sense oxygen for eliciting acute and chronic effects of hypoxia. Also discussed will be the role of ion channels in hypoxia-induced pulmonary vasoconstriction; the mechanisms of oxygen sensing in pulmonary vasculature; how hypoxia affects the release of transmitters; the newly appreciated roles of nitric oxide and carbon monoxide in carotid body oxygen chemoreception, and the possible mechanisms by which hypoxia triggers the expression of different genes that are associated with systems response to low po2. How calcium and cyclic nucleotide pathways are involved in the gene regulation by hypoxia will also be considered.

Cellular and Molecular Basis of Capillary Permeability

Chair: J.E. Schnitzer

Participants will discuss several new discoveries illuminating key mechanisms responsible for regulating and determining capillary permeability. Special focus will be on the endothelium at the cellular and molecular level, with emphasis on signaling and binding events occurring at the cell surface and how they influence capillary permeability. Several recent findings are contrary to the 'old-school' dogma about capillary permeability and transport across cellular barriers in general. For instance, through cellular and molecular studies, it has become clear that the endothelium is not a passive filter, but a dynamic cellular barrier with multiple specific pathways mediating and regulating transcapillary transport. Specific receptors for the transport of select macromolecules across endothelium have been discovered along with transmembrane channel proteins for water transport. Research defining the molecular components of intercellular junctions along with specific modulators that influence the 'tightness' of the junctions is progressing rapidly. The purification of endothelial noncoated plasmalemmal vesicles or caveolae from the plasma membrane has been demonstrated. It seems that multiple cellular signaling pathways affect not only the assembly and sealing of tight junctions but also transport via caveolae. Specific regulators of their function in transport have been identified. In disease, physical, cellular, and molecular factors alter transport drastically. The implications for applied research are obvious, especially in the area of drug delivery.

Role of Integrins in Acute Renal Failure

Chair: E.E. Simon

The most important class of extracellular matrix, integrins, are important after acute renal injury at several steps. This involvement is a consequence of their interaction with the matrix, their
involvement in cell–cell interaction, and because of their signaling role. This symposium is a general introduction to the role of integrins in cell function via integrin signaling. As a result of alterations in integrin-matrix interaction by themselves or secondary to cytoskeletal injury, tubule cells shed in the urine. These shed cells may also interact with cells downstream, resulting in tubule obstruction. Such potential has been shown by both in vitro and in vivo studies. This interaction may be abrogated by RGD peptides. After tubule cell shedding, the gap is covered by a combination of cell spreading and cell proliferation. This process is likely similar to repair in other organs such as the gut, where in vitro cell migration has been shown to be integrin-dependent and influenced by cytokines. The subsequent proliferation and redifferentiation of tubule epithelial cells is likely also integrin-dependent, as these processes are influenced by integrins in other tissues. The role of leukocytes in the process of ischemic acute renal failure has been controversial, but recent studies have suggested an important role of leukocyte integrins in acute injury and the potential for abrogation of injury by anti-ICAM (the ligand for leukocyte 2 integrins) antibodies.

The Myocyte Cytoskeleton and Relation to Contractile Protein Synthesis and Function

Chairs: F.G. Spinale and T.K. Borg

The cytoskeleton within muscle has an integral role in maintaining the myofilament array and other subcellular structures in normal spatial arrangement within the myocyte during the contraction and relaxation process. Ongoing research has demonstrated that the cytoskeleton provides a scaffolding structure for protein assembly and sarcomere formation. Novel cytoskeletal proteins have been identified along the sarcolemma that directly participate in transducing sarcomere shortening into overall cell shortening. This program will present current findings on how changes in the expression and function of specific myocyte cytoskeletal components can directly influence muscle performance. In addition to state-of-the-art lectures on specific cytoskeletal proteins and contractile protein assembly, this session will integrate these basic studies with pathological processes such as cardiac failure and muscular dystrophy.

Lung Vascular Injury and Remodeling During Development

Chairs: K. Stenmark and M. Rabinovitch

Rapid progress continues to be made in understanding the mechanisms that control pulmonary vascular development. This symposium will offer insights into the cell and molecular mechanisms that contribute to vascular development with the hopes of providing the basis for an understanding of how the immature blood vessel responds to injury. Specific topics that will be examined are the effect of hemodynamic forces and blood flow on gene and protein expression in the developing vessel; the role of apoptosis in normal vascular development and in vascular injury; the role of integrins and other cell surface proteins in normal vascular development; the molecular mechanisms regulating the expression of elastin, a crucial protein in vascular development, and the role of elastases in vascular growth and response to injury. A specific examination of the changes in vascular wall cell gene expression will be examined in the setting of neonatal lung injury.

Lipid-induced Satiety and the Roles of the Gastrointestinal Tract

Chairs: P. Tso and T.H. Moran

The control of satiety by nutrients has been of great interest to physiologists for decades. Several studies have demonstrated that the ingestion of fat has a potent inhibitory effect on food intake. Both pre- and postabsorptive mechanisms have been proposed for the inhibitory effects of fat. A number of peptides produced by the enteroendocrine cells as well as the enteroocytes, which are released in response to intestinal lipid, have recently been implicated as playing a role in 'satiety' after the ingestion of a meal. These include cholecystokinin, enterostatin, glucagon-like peptide-1, and apolipoprotein A-IV. However, their potential roles in mediating lipid-induced satiety and whether or not they interact with each other in eliciting this response are not well understood. This symposium will present current knowledge of the physiological and biochemical mechanisms for lipid-induced satiety, the physiological control of the secretion of these gastrointestinal peptides, their local gastrointestinal effects, and how these may be related to their role as potential 'satiety signals'.

Metabolic Engineering: Regulated Gene Expression to Study Metabolic Regulation

Chairs: M. Watford and F. Bosch

Participants will highlight how controlled expression of key genes in cells and experimental animals has produced new opportunities for the study of metabolic regulation and for the therapy of diseases such as diabetes mellitus. Participants will discuss how overexpression of glucocorticoid enzymes leads to NIDDM and how the regulated expression of other genes may be used to treat this disorder; the role of tissue-specific glucose transporters in the regulation of whole body glucose homeostasis; the usefulness of specific mutations in enzyme structure to change metabolism using the TCA cycle as a model, and the engineering of the pancreatic B cell with the aim of producing surrogate islets for patients with IDDM. The program will demonstrate the significant advances that such techniques have allowed in our understanding whole body glucose metabolism.

Novel Signal Transduction Mechanisms in the Vascular

Chairs: S.W. Watts and C.A. Davison

Recent advances have revealed the role of new second messengers in signal transduction. For example, the sphingolipid-derived ceramides have been described as possible second messengers in apoptosis. Recently, pathways such as these have begun to be investigated in the vasculature. Vascular smooth muscle is involved in multiple disease processes such as hypertension, atherosclerosis, and diabetes. Frequently, receptor signal transduction pathways are dramatically altered in these disease states, so understanding normal signaling pathways is crucial to determining their role in a disease state. This symposium will not focus on one signal pathway; rather, participants will present multiple pathways in order to bring researchers up to date on signaling mechanisms in the vasculature and to foster discussion as to their possible alterations in disease states.

Neurobiology of Thermoregulation: Role of Stress

Chairs: S. Wood and M. Kluger

Both abnormally high and abnormally low body temperatures may become regulated under stressful conditions. This symposium will discuss why and how body temperature regulation is adjusted and, specifically, what are the interactions between stress and temperature control. Discussion will cross disciplines ranging from
cell biology to immunology, neurobiology, and organ systems. Topics will include an overview of thermoregulation, with emphasis on circadian rhythms; the role of neuromodulators and messengers in pyrogen-induced fevers; the effect and mechanism of physiological stresses on regulated hypothermia in vertebtrates; how non-disease-related stress (toxins and alcohol) cause beneficial reduction of regulated body temperature; the resetting of set-points and physiological controls in the respiratory system, and data at the cellular level and models of temperature control.

The NO Signal Transduction System in the Lung: From Molecular Biology to Bedside Therapy

Chairs: W.M. Zapol and K.D. Bloch

The lung matches perfusion to ventilation in order to efficiently exchange respiratory gases both at rest and during exercise. The exact mechanisms responsible for the regulation of vascular and bronchial smooth muscular tone in the adult are incompletely understood. At birth, there is an immediate and marked increase of pulmonary vascular conductance, yet the precise regulation of this vasodilation is unknown. Recently, a novel and potent regulator of smooth muscle tone, the nitric oxide-cyclic guanosine monophosphate signal transduction system, was discovered. In addition to controlling smooth muscle tone, this system regulates neurotransmission over the NANC system and has immune modulatory functions. Since the lung contains each of the three known isoforms of nitric oxide synthase (NOS), and chemical inhibitors of NOS are not specific, our understanding of the role of each isoform has been incomplete. Symposium participants will discuss advances in our understanding of this signal transduction system—advances made possible by the recent availability of knockout mice for each of the three major isoforms of NOS. Speakers will also describe studies in animals and humans with long-term respiratory supplementation of inhaled nitric oxide, a novel therapy that permits selective pulmonary vasodilation in adults with ARDS and children suffering from persistent pulmonary hypertension of the newborn and other forms of pulmonary hypertension.

Mechanisms of Water Flow Across Biological Membranes

Chairs: M.L. Zeidel and H.W. Harris, Jr.

The movement of water across biological membranes is a fundamental process of physiology. Although water is relatively impermeable across most membranes, specific barrier epithelia such as those of the distal nephron and bladder maintain apical membranes with exceptionally low water permeabilities. By contrast, many cell membranes contain water channels that greatly increase their water permeabilities. The discovery and characterization of the aquaporin water channel proteins has markedly enhanced our understanding of the mechanisms by which water permeates membranes, as well as the role of water permeation in several disease states. Participants will discuss our current understanding of how apical membranes of barrier epithelia are constructed so as to limit water permeability; how the structure of aquaporins permits them to function as highly selective water pores; the localization of the various aquaporins in health and disease, providing inferences as to their role in physiology and pathophysiological states; the molecular mechanisms governing trafficking of aquaporin II into and out of the apical membrane of the collecting duct cell; the role of aquaporins in the renal reabsorption of solutes, as well as in concentrating and diluting the urine, and the structure-function relationships of aquaporin II, by examining the effects of mutations in the molecule (which cause the human disease congenital nephrogenic diabetes insipidus) on its function.

Molecular Mechanisms of Cell–Cell Interactions under Dynamic Flow Conditions

Chairs: L.V. McIntire and J.M. Ross

Over the last 10 years, it has become clear that the local mechanical environment can be crucial in determining the molecular mechanisms required for both transient and firm adhesion in cell–cell and cell-surface interactions. This is true for platelets, leukocytes, bacteria, and tumor cells. This symposium will present examples from each of these areas, with the goal of providing a state-of-the-art update and developing a unified picture for these interactions. The varying roles of integrins, selectins, and other adhesion receptor family members under different fluid mechanical conditions in both bulk phase and mural adhesion and aggregation will be explored.

Mathematical Approaches to Cellular Engineering

Chairs: D. Odde and D. Hammer

Participants will highlight the quantitative approaches being used in conjunction with experiments in order to understand and control cellular systems. The ability to elucidate fundamental mechanism of cellular behavior and to apply this knowledge for bioengineering purposes requires a wide range of mathematical analysis techniques. Thus, this area represents a critical and expanding foundation of biological and bioengineering research. Presenters will address multiple levels of cellular behavior, ranging from intracellular transport, reaction, and cytoskeletal dynamics to cell motility and adhesion. Mathematical approaches to be described include deterministic models, probabilistic analysis, and stochastic simulations. Although these will be presented in terms of specific experimental systems, their more general applicability to a wide variety of other systems will also be discussed. The broad selection of biological phenomena presented will also serve to emphasize the potential offered by these types of quantitative approaches. This session will provide a focal point for discussion between life scientists and bioengineers interested in applying mathematical tools to address fundamental questions in experimental biology; it will promote the kinds of multidisciplinary efforts increasingly being emphasized in the biological and bioengineering community.

Estrogen Replacement Therapy: Benefits, Risks, and Future Outlook

Chairs: M.T.R. Subbiah and B. Sherwin

The use of estrogen replacement therapy is at an all-time high. Establishment of the Women’s Health Initiative has generated enormous interest on the effects of estrogen therapy. Even though these are well-documented benefits (heart, cognitive function, and bone), considerable risk (cancer) also exists. Despite the interest, little is known regarding the benefits of individual estrogens (especially the equine estrogens, which are present in the most popular brand of conjugated estrogen preparation) and their metabolism and relationship to biological activity. Participants will discuss the pros and cons of estrogen therapy (and potential mechanisms) in relation to heart disease, cognitive function, and cancer. The future of developing “estrogen of choice” will also be addressed.
Cellular Interactions with Tissue Analogos and Biomaterials

_Chairs: P.V. Moghe and F. Berthiaume_

This session will highlight studies in life sciences and bioengineering that reflect current directions in fundamental tissue engineering and biomaterials research. These studies relate to the analysis, design, and development of tissue analogs and biomaterials that have been inspired by the parallel revolutions in extracellular matrix research in experimental biology. The ultimate applications of tissue and biomaterials engineering are directed toward long-term maintenance of physiological cellular activities in the context of artificial organs/tissues, cell-based therapies (e.g., transplantable bio-artificial tissues and extracorporeal organ-support systems), and superior tissue culture systems. In that direction, the central theme of this session is the analysis and control of cellular functions (e.g., anchorage, growth, motility, signaling) via physicochemical changes in cell substrate properties. Proposed presentations will encompass a broad range of determinants of cell/tissue function, ranging from purely biochemical to the mechanical. Cell-substrate interactions will be a main topic, although the intriguing means of controlling cell–cell interactions via substrate micropatterning will also be represented.

The session should stimulate dialogue between the life sciences and bioengineering community, and inspire approaches to engineer cellular responses using novel paradigms.

Current State of Functional Genomics

_Chair: A.W. Cowley_

Point-Counterpoint

Environmental and Exercise Physiology Issues

_Chairs: C.M. Tipton and C.V. Gisolfi_

This inaugural session by the EEP Section is offered as a forum for investigators to present contrasting views on the scientific merit and importance of existing physiological concepts. The first of two topics pertains to the significance of the 'crossover' concept for glucose utilization by trained populations during progressive exercise. One view is that glucose production and utilization by trained population is lower than nontrained subjects during submaximal exercise; but when the exercise intensity is increased to maximal conditions, the glucose response pattern of the trained subjects is changed so that it 'crosses over' the profile obtained from nontrained individuals. There is evidence, however, that trained subjects do not show a crossover effect. The second topic concerns the relative importance of an expanded plasma volume for heat acclimation and for exercise performance in the heat. One view holds that an expanded plasma volume is an essential consideration, whereas another is that other factors have more importance and significance.

Refresher Course

Teaching Respiratory Physiology

_Chair: S.E. DiCarlo_

This course will promote the exchange of ideas, materials, and factual information that will facilitate the teaching of respiratory physiology. In 1996, the Education Committee reinstated refresher courses in physiology as a part of the annual Experimental Biology meetings with a course for teaching gastrointestinal physiology. The refresher course is a continuation of efforts to provide yearly updates and teaching strategies for teaching physiology. Poster presentations, demonstrations (e.g., computer simulations, videos), exhibits (e.g., books, lecture outlines, syllabi, problem-based learning cases), and didactic presentations will comprise the course. Innovative approaches for helping students learn respiratory physiology will be discussed.

American Society for Investigative Pathology

Symposia

President’s Symposium: Stromal-Epithelial Interactions, Hormone Action, and Cancer

_Chair: D.G. Kaufman_

The relationship between epithelial cells and stromal cells and the differentiation of the constituent cells characterize particular organs and tissues. We recognize alterations of these cellular relationships as well as changes in the differentiation of the cells and association with tissue matrix as features that characterize many pathologic processes of these organs or structures. Rather than just providing a supportive structure for organs and tissues, recent studies have shown that the stromal components may also serve an important functional role. This symposium considers some of these recent observations that reveal the major roles of stromal-epithelial interactions in defining the functioning of organs and tissues as well as their structure. Particular attention is given to three organs—endometrium, breast, and prostate—in which the stroma serves a crucial role in regulating epithelial cell growth and differentiation. Also to be considered is how stromal cells are involved in the effects of hormones such as estrogen, progesterone, and testosterone in the epithelial cells of organs, and how these effects may be mediated by paracrine growth factors. The occurrence of environmental hormones as well as endogenous hormones appear to have important roles in the development of cancers of these three organs. This session will offer insights and synthesis of the roles of hormones in cancer development in these tissues and the manifestations of altered relationships between epithelial cells and stromal cells that generally typify the evolving neoplasms.

Gene Targeting: Disease Models

_Chairs: M. Prystowsky and J. Locker_

In contemporary biology, the transgenic and knock-out mouse have provided critical experiments for studying the function of single genes in the intact organism. Transgenic animals are generally used for studying the effects of abnormal genes, whereas knockouts are especially suitable for study of development. Rather than direct studies of gene effects, speakers describe new animal models that have been created by laboratory gene manipulation. By the addition of new gene functions or modification of endoge-
nous genes, these mouse strains have been designed to be models of human disease. Such model systems allow experiments that define the pathogenesis of the disease process and provide test systems for drugs and other therapeutic strategies. The speakers have been chosen to show three completely different systems provided by this contemporary approach to experimental pathology: hypertension, neurodegeneration, and immunodeficiency.

Neutrophil Interactions with Mucosal Surfaces

Chair: J.L. Madara

At mucosal surfaces, neutrophils that have emigrated from the microvasculature subsequently interact with matrix components and then with the epithelial surface. Since this mucosal surface largely dictates organ function at such sites, these processes are key to events that determine organ dysfunction in acute inflammation. This symposium will outline the pathobiology of such matrix-neutrophil and epithelial-neutrophil interactions and consider novel strategies for down-regulating such events.

Oxidative Mechanisms of Cell Signaling and Repair in Disease

Chair: B.T. Mossman and A.B. Kane

Oxidative stress can initiate a number of cell signaling cascades that trigger subsequent changes in gene expression, cellular responses, and disease. Key pathways involved in early response gene transactivation and regulation of inflammatory gene products include the mitogen-activated protein kinase (MAPK) cascade and nuclear factor-κB (NF-κB). Lectures will focus on activation of these pathways, the cellular targets affected, and repair processes to combat injury by reactive oxygen and nitrogen species.

Trends in Experimental Pathology: Novel Cell Imaging Techniques for Detection of Cell Injury in the Study of Disease

Chair: C.G. Plopper and D.J. Taatjes

Despite recognition that disease processes result from action of a disease agent at the cellular level, the fundamental events involved and the mechanisms by which disease agents produce cellular injury are poorly defined. This is especially true for disease processes, as they occur in cells in situ and contribute greatly to misunderstandings of these events as they relate to cell death by necrosis and apoptosis. Participants will address novel approaches for evaluating cell function and its perturbation by disease processes. New strategies for defining events as they occur to cells in their microenvironment with an orientation to quantitative approaches will be emphasized.

Extracellular Matrix and Vascular Remodeling

Chair: M. Rabinovitch

This symposium will address how changes in the extracellular matrix orchestrate multiple cell functions relate to cell cycle motility and synthetic properties. Speakers will discuss how events at the cell surface are integrated and orchestrated by alterations in the cytoskeleton and how subsequent nuclear signals direct multiple genes that affect diverse cell functions.

The Biology of Prion Disease

Chair: S.R. VandenBerg

The human prion diseases collectively comprise a unique category of CNS degenerative diseases that occur in sporadic, familial, or 'acquired' modes with a distinctive spectrum of clinicopathologic manifestations. The wide distribution of mammalian species that are similarly affected by prion-associated neuronal degeneration emphasizes the fundamental nature of the neuronal target (or targets) for this disease and has profound economic implications, as demonstrated by 'mad cow disease'. Unraveling the enigma of prion diseases, as a unique family of putative protein pathogens, will open new vistas on how epigenetic modifications of protein structure/conformation affect surface and intracellular membrane protein trafficking in neuronal biology. The focus of this symposium will be twofold: 1) an update of mechanisms by which prions, as pathologic and infectious proteins, propagate by cell-mediated conformational changes in prion protein (PrP) configuration and form spontaneously in dominantly inherited prion diseases, and 2) further elucidation of the cellular pathophysiologic processes that cause cell dysfunction and degeneration in prion diseases.

American Society for Nutritional Sciences

Symposia

Developmental Ecology of the Neonatal Intestine

Chairs: H.R. Gaskins and E.L. Lien

The gastrointestinal tract is an integrated ecosystem composed of an organized matrix of eukaryotic cells, including a fully functional immune system, and numerous microbial habitats normally colonized by a diverse array of commensal bacterial species. Nutritional modulation of the intestinal microbiota during neonatal development critically affects susceptibility to enteric disease and likely has long-term effects on immune competence and self-tolerance. However, the cellular and molecular bases of interactions between the host and its resident microbiota are poorly understood. Participants will be a multidisciplinary group with individual expertise in gastrointestinal microbiology, mucosal immunology, and infant nutrition. Current issues in gastrointestinal microbiology and mucosal immunology of the neonatal intestine will be reviewed. The goals are to reveal limitations in our knowledge and to identify possibly therapeutic strategies based on nutritional modulation of the developing intestinal ecosystem.

Nutritional Implications of Dietary Protein Restrictions in Diabetes Mellitus

Chairs: L.J. Hoffer and K.S. Nair

Recent advances in mass spectrometry and tracer modeling technology have permitted deeper understanding of amino acid and protein metabolism in human diabetes. Amino acid turnover and catabolism are increased in insulin-dependent diabetes, potentially impairing the normal adaptation to a reduced dietary protein intake. Participants will review current human metabolic evidence relating amino acid metabolism and nutrition in diabetes.
mellitus and address the possible benefit of protein restriction to prevent diabetic nephropathy versus the potential risk of protein malnutrition.

Between a Rock and a Hard Place: Dietary and Toxicological Standards for Essential Minerals

Chairs: S. Hendrich and J. Greger

Participants will describe approaches to establishing reasonable dietary and toxicological standards for essential minerals, with particular emphasis on manganese, zinc, and iron. The session will include the first discussion in the U.S. of the Nordic Nutritional Recommendations. With the interest expressed in the topic by U.S. government agencies, as well as internationally, and with the potential for significant conflict between nutritional and toxicological standards, the nutrition community must engage in a well-informed discussion of this subject. The Food & Nutrition Board held a workshop July 15–16, 1996, to discuss recommendations on upper limits for essential nutrients, making this symposium even more timely.

Role of Nutrition, Development, and Hormone Sensitivity in the Regulation of Protein Metabolism

Chairs: T.A. Davis and P.J. Reeds

Precise regulation of protein synthesis and degradation is essential for achieving net protein accretion during prenatal and postnatal life and for maintaining protein mass during the aging process. Recent evidence suggests that these processes are principally regulated by insulin, IGF-I, growth hormone, and amino acids. These regulatory factors appear to: 1) specifically affect either protein synthesis or degradation, 2) affect individual tissues differentially, 3) play different roles at different stages of the life cycle, and 4) interact with each other to precisely regulate protein turnover. Disruption of the interplay of these regulatory factors by poor nutritional status and the stress imposed by trauma and disease may compromise protein status. The provision of additional quantities of some of these factors can promote increased protein mass.

Material Body Composition, Caloric Restriction, and Exercise During Lactation

Chairs: K. Dewey and C. Lovelady

During the postpartum period, facilitating the woman’s return to her pre-pregnancy weight is key in preventing or reducing adult obesity, yet for breastfeeding women there is the concern that rapid weight loss may compromise lactation. This symposium will review the evidence from human studies, both observational and experimental, as well as research using animal models and studies designed to explore the physiological mechanisms that regulate lactation during energetic stress.

The Effects of Childhood Diet on Adult Health and Disease

Chairs: S.B. Roberts and R. McDonald

Recent studies suggest that the types and amounts of foods consumed during infancy and early childhood may have wide-ranging effects on morbidity and mortality that last through adult life. This ‘metabolic programming’ by early diet is central to our understanding of the role that nutrition can play in the prevention of adult disease and disability. Scientists from around the world will present and discuss their data on metabolic programming by early diet.

Functional Metabolism of Vitamin A in Embryonic Development

Chairs: M. H. Zile and G. Duester

A family of nuclear retinoic acid receptors mediate the effects of vitamin A on growth and development, and it is clear that this signaling pathway depends on regulated production of the ligand. This symposium will bring to the forefront current information on the generation of retinoid bioactive forms during embryonic development, so as to put the metabolic activation of the important micronutrient vitamin A in perspective with its function.

Evolution of Ideas about the Nutritional Value of Dietary Fat

Chairs: R.E. Olson and A.E. Harper

Dietary fat is one of the most emphasized nutrients in current public health education not only because of its high energy content, but also because of its importance as a factor in the pathogenesis of a number of chronic degenerative diseases. The Committee on the History of Nutrition decided to review the history of the development of the knowledge about fat as a nutrient, as a family of substances of given chemical structure, some of which are essential for health. The discovery of the plasma lipoproteins as vehicles for transporting fat in the blood was the next important development that led not only to a formulation for lipid transport in the body, but also to studies implicating some of them for the promotion or inhibition of atherosclerosis. The discovery of the prostaglandins (eicosanoids) led to new investigations of the function of these metabolites of polyunsaturated fatty acids capable of modulating the inflammatory response, endocrine activity, and platelet functions. Finally, there will be a review of public health pronouncements on the risks and benefits of dietary fat and the extent to which these recommendations have influenced public understanding of clinical nutrition and affected dietary practices.

Molecular Genetics of Obesity, from Science to Application

Chair: C. Warden

This symposium will bring together speakers using molecular genetic approaches to study and treat obesity. Topics will include work intended to elucidate the basis of obesity; potential and current pharmacological advances in obesity treatment; the isolation, biological function, and diet regulation of a novel candidate thermogenic protein that is expressed in a variety of adult human tissues; current findings on the biological function of the mouse fat and tubby genes; current insights into studies of PPARγ agonists roles in adipocyte differentiation; results of a genome-wide search for obesity genes suggest evidence for novel human obesity genes; the new biology of neuropeptide receptors regulating food intake, and data on recent advances in obesity treatment.

Medical Foods vs. Foods for Special Purposes

Chairs: R. B. Shireman, B.J. Moore, and T.A. Morck

Participants will review the clinical need for medical foods and foods for special purposes, the successes and obstacles encountered by industry in the development of such foods, and the regulation of such foods. The perspectives of clinicians, research scientists, and food industry and government regulation agencies will be presented with the expectation that better information will benefit health professionals and the public.
Conferences

62nd Annual Poultry Nutrition

Nutritional and Developmental Roles of Insulin-like Growth Factors between Species

Chair: D.C. McFarland

Insulin-like growth factors (IGFs) are polypeptide compounds that affect such diverse cell mechanisms as proliferation, differentiation, and metabolism. Although the IGFs are produced by many different cell types and are believed to act largely through autocrine or paracrine mechanisms, they are also abundant in the circulation and may exert endocrine responses as well. Three renowned experts in the field of insulin-like growth factors will review current understanding of IGFs in nutrition and in the development of poultry, fish, and swine.

38th Annual Ruminant Nutrition

Molecular and Cellular Studies of Rumen Epithelial Metabolism

Chair: B. W. Jesse

Recent advances in the biological sciences have been made possible through the application of molecular and cellular biological techniques. These techniques are now being applied to the study of rumen epithelial development and function. Isolated epithelial cell systems allow determinations of metabolic functions within the ruminal epithelium in the absence of interference from the cornified cell strata, and lend themselves to experiments requiring long-term culture conditions. Molecular biological techniques can identify the genes undergoing differential expression during rumen epithelial development in the neonate or during dietary adaptation in the mature ruminant. Results of these types of experiments will be useful in future endeavors seeking to optimize rumen function.

Controversy Sessions

On the Efficacy/Safety Balance: Should We Take Antioxidant Supplements?

U.S. populations surveys show that antioxidant supplements have no effect on all cause morbidity and mortality. One side will discuss why the totality of the objective scientific evidence is favorable to everyone taking an antioxidant supplement. The other side will discuss the conclusion from the same totality of evidence that no one should take an antioxidant supplement unless his/her personal genetic predisposition to the full range of disabling and killing diseases is overall suppressed rather than expressed by the particular supplement.

Do We Facilitate the Scientific Process and Development of Dietary Guidance When New Findings from Single Studies Are Publicized?

In a recent survey, 78% of primary household shoppers believed it “very likely” or “somewhat likely” that in the next 5 years experts will have a completely different idea about which foods are healthy and which are not (Food Marketing Institute and Prevention magazine). Could this skepticism be fueled by the media’s emphasis on new and often controversial findings? This situation is reinforced when the scientific press publicizes newly published research findings. Consequently, scientific debate is frequently mediated by journalists in a public forum rather than having it kept among knowledgeable peers as part of the scientific process. Nevertheless, the media are valuable for educating the public and maintaining public interest in the important role that diet plays in overall health. This session will consider whether media coverage of new findings from single studies facilitates or hampers the scientific process and development of scientifically sound dietary guidance for the general public.

Workshops

Community-based Studies on Nutrition in the Elderly: Research Methods and Outcomes

Chairs: M.A. Johnson and C. Bales

Several teams of investigators together will discuss research strategies for community-based studies of the elderly, unique aspects of each study, key research findings and implications, and directions for the future. Results of each of these studies can be used to identify factors that contribute to successful aging as well as risk factors for poor nutrition.

Stable Isotopes in Fatty Acid Research

Chair: S. Cunnane

Stable isotopes provide an important window on metabolic processes and are of special value in human studies because they are completely safe and non-radioactive. Recent studies describe the application of stable isotope methodology to various aspects of fatty acid metabolism, especially involving polyunsaturated fatty acids. Speakers will describe the current status of stable isotope research involving fatty acid synthesis (lipogenesis), brain uptake, metabolic interconversions, and carbon recycling in various animal models and in humans, as well as the application of different analytical methods including GC-MS, MIDA, GC-C-IRMS, and NMR spectroscopy.

American Association of Anatomists

Symposia


Epithelial Cell Biology: The Biology of Wound Healing. Chair: R.D. Specian

Metabolic Processes in Health and Disease: Regulation of Cell Behavior and Metabolism by Mechanical Stress. Chair: J.J. Tomasek

Neurobiology: Cortical Neural Development. Chair: D. O’Leary

Respiratory Biology: Glutathione Regulation: Role in Lung Injury. Chair: C.G. Plopper

Minisymposia

Cardiovascular Development. Chairs: L. Lemanski and D. Fischman

Cerebellum. Chair: J. Welsh

Cytoskeleton and Adhesion in Endothelial Cells. Chairs: B. Grove and S. Alexander

Extracellular Matrix Dynamics in Health and Disease. Chair: B. Vertel

Quantitative Neurobiology and Stereological Techniques. Chair: R. Williams

Signal Transduction and Cell Migration. Chairs: M.A. Stepp and K.S. O'Shea

Vascular Biology: Growth Factors and Cytokines. Chair: R. Tomanek

Symposia/Tutorial

Integrating Problem-based Learning into Medical School. Chair: A.W. Vogl

Interactive Virtual Reality in Teaching and Research. Chair: M. Hendrix


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