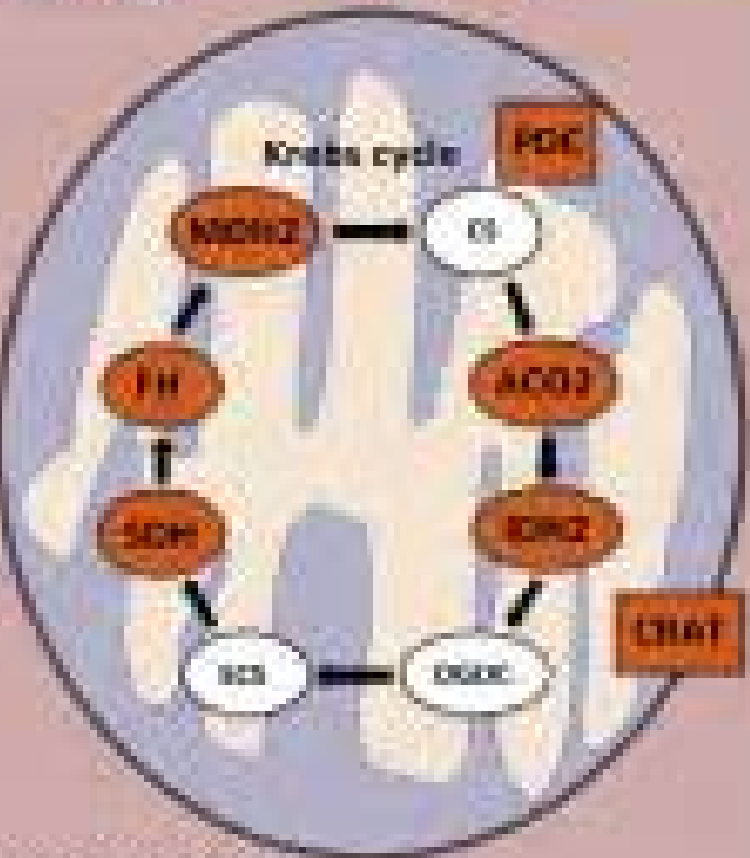
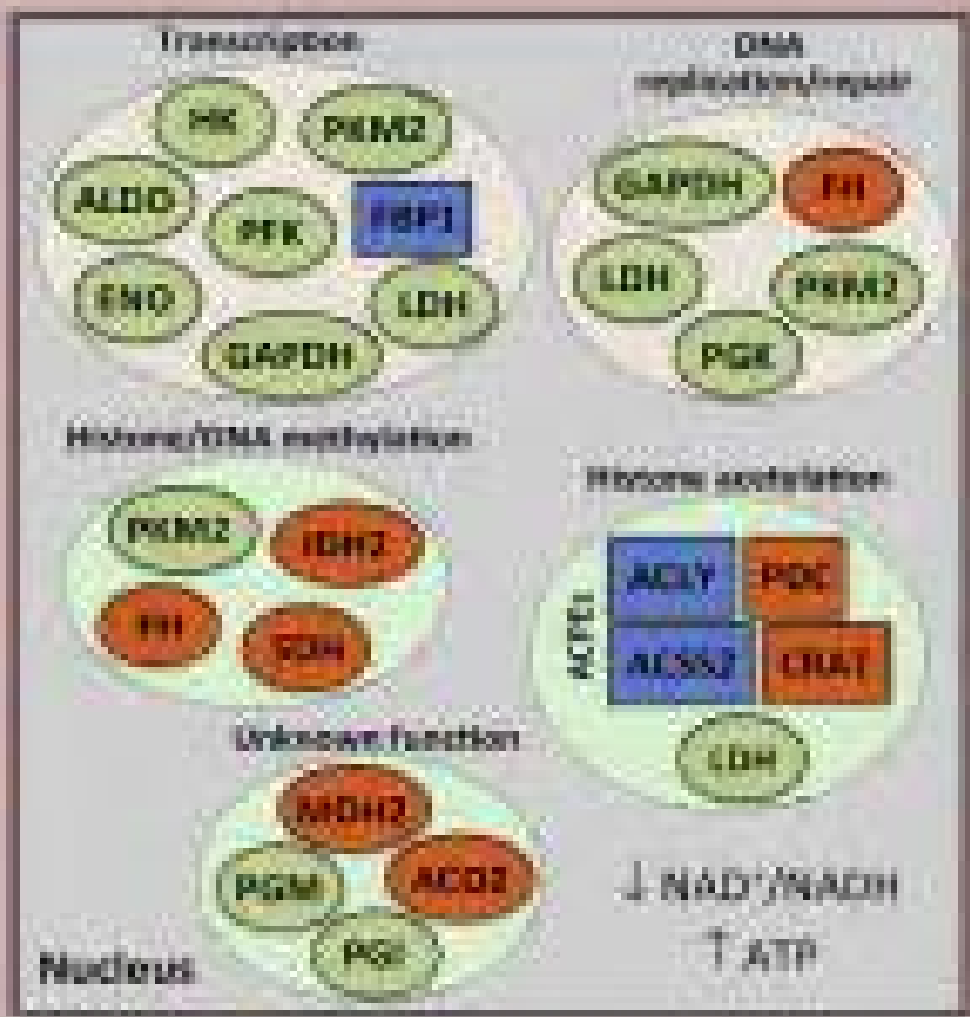


Cytoplasm

Glycolysis



Mitochondrion



Nucleus

# Metabolic Enzymes Moonlighting In The Nucleus Metabolic

**Laurence Zitvogel, Guido Kroemer**



## **Metabolic Enzymes Moonlighting In The Nucleus Metabolic:**

**One protein many functions: the non-canonical interactions of SHMT1** Sharon Spizzichino, 2025-03-31 Winner of the Competition Prize for PhD Thesis 2023 arranged by Sapienza University Press Several enzymes once characterized for specific metabolic roles are now recognized to have more than one function Some metabolic enzymes called moonlighting proteins engage in non canonical interactions with other proteins or nucleic acids Interestingly not all newly identified RNA binding proteins regulate RNA function sometimes RNA itself dictates protein function through a mechanism known as riboregulation For instance the catalytic activity of human serine hydroxymethyltransferase SHMT1 is modulated by RNA Moreover SHMT1 plays a key role in assembling the de novo thymidylate synthesis complex dTMP SC in the nucleus alongside thymidylate synthase TYMS and dihydrofolate reductase DHFR This thesis aims to explore SHMT1 s non canonical functions focusing on the molecular mechanisms behind riboregulation I will present the first 3D structure of a metabolic enzyme in complex with RNA solved using cryo electron microscopy and characterize the dTMP SC highlighting its transient formation in vitro and in the cytosol This manuscript explores how RNA regulates metabolic enzymes and transient interactions that influence function **Metabolism and Epigenetic Regulation: Implications in Cancer** Tapas Kumar Kundu, Chandrima Das, 2022-10-27 Metabolic programs of individuals are key determinants for disease susceptibility and immune response This book edited by experts in the field summarizes epigenetic signaling pathways that regulate metabolic programs associated with cancer and cancer related secondary diseases The first part of the book highlights key metabolic pathways that are implicated in cancer and provides a comprehensive overview on the carbohydrate protein lipid amino and nucleic acid metabolic pathways that are deregulated in cancer Special attention is paid to the altered tumor micro environment that is influenced by the metabolic milieu Furthermore the fundamental relationship between the cellular metabolic environment and cell death mediated autophagy is discussed The second part of the book covers our understanding of the fundamental epigenetic regulations that are implicated in controlling the metabolic programs in cancer cells Many aspects of epigenetic regulation of non coding RNAs as well as DNA RNA methylation which influencing metabolic homeostasis in cancer are discussed in detail Special emphasis is placed on the epigenetic regulation of the amino acid glucose carbohydrate metabolism and epigenetic regulation during hypoxia and its connection to cancer Last but not least the third part of the book covers small molecule modulators of histone modifying enzymes which can be used as therapeutic tools The readers learn about the cross talk between epigenetics and immunometabolism as well as the epigenetic regulation of oncometabolites to combat cancer Given its scope the book will appeal to a broad readership interested in epigenetic cancer and metabolic research **Smoldering Inflammation in Cardio-Immune-Metabolic Diseases** Gilda Varricchi, Giuseppe Rengo, Nazareno Paolocci, Felice Rivellese, 2021-05-11 **Handbook of Epigenetics** Trygve O. Tollefsbol, 2022-09-08 Handbook of Epigenetics The New Molecular and Medical Genetics Third Edition provides a

comprehensive analysis of epigenetics from basic biology to clinical application This new edition has been fully revised to cover the latest and evolving topics in epigenetics with chapters updated and new chapters added on topics such as single cell epigenetics DNA methylation clocks in age related diseases transposable elements and epigenetics X chromosome inactivation and the epigenetics of drug addiction among other topics Throughout this edition greater emphasis falls on epigenomic analyses and incorporating multi omics approaches rather than gene specific analyses In addition this edition has also been enhanced with step by step instructions in research methods as well as easy to digest disease case studies and clinical trials that provide context and applied examples of recent advances in disease understanding and epigenetic therapeutics These features empower researchers to reproduce the approaches and studies discussed and aid clinical translation Live links across chapters tie in relevant external datasets and resources Provides a timely and comprehensive collection of fully up to date coverage of epigenetics Covers basic epigenetic biology research methods and technology disease relationships and clinical medicine Written at a verbal and technical level that can be understood by scientists and students alike with chapter summaries and conclusions included throughout Discusses exciting new topics in epigenetics such as DNA methylation clocks in age related diseases transposable elements and epigenetics X chromosome inactivation and the epigenetics of drug addiction Includes step by step instructions in research protocols to aid reproducibility as well as easy to digest disease case studies and clinical trials providing context and applied examples of recent clinical translation

**Translational Toxicology and Therapeutics** Michael D. Waters, Claude L. Hughes, 2018-01-04 Written by leading research scientists this book integrates current knowledge of toxicology and human health through coverage of environmental toxicants genetic epigenetic mechanisms and carcinogenicity Provides information on lifestyle choices that can reduce cancer risk Offers a systematic approach to identify mutagenic developmental and reproductive toxicants Helps readers develop new animal models and tests to assess toxic impacts of mutation and cancer on human health Explains specific cellular and molecular targets of known toxicants operating through genetic and epigenetic mechanisms

**Glycolysis** Rita Ferreira, Pedro Fontes Oliveira, Rita Nogueira-Ferreira, 2023-10-13 Glycolysis Tissue Specific Metabolic Regulation in Physio Pathological Conditions provides an integrated overview of glycolysis spanning basic biochemistry pathophysiology and therapeutic applications The book also instructs in methods available to study the involvement of the glycolytic events in healthy biology and disease pathology It begins with an overview of fundamental glycobiology followed by chapters dedicated to glycolysis physiology in organs and systems pathologic conditions related to glycolytic alterations glycolysis as a therapeutic target and in drug discovery efforts and methodological approaches to advance new glycolysis research Disease areas considered range from cancer to heart failure diabetes inborn glycolytic pathway defects hematologic malignancies osteoporosis neurodegenerative diseases and viral Infections Omics and computational modeling interactive study methods and glycolysis flux measurement are described in detail with step by step descriptions of experimental

protocols set up and analysis Features chapter contributions from international leaders in the field Spans fundamental aspects of glycolysis patho physiology and drug discovery Includes step by step instruction in a range of research protocols ranging from Omics to interactive analysis and measuring glycolysis flux Cryptic Enzymes and Moonlighting Proteins Helen Irving,Chris Gehring,Aloysius Wong,2025-04-24 Cryptic Enzymes and Moonlighting Proteins a new volume in the Foundations and Frontiers in Enzymology series offers a thorough overview of cryptic enzymes and moonlighting proteins in signaling cascades In early chapters leading international contributors discuss evolutionary considerations for moonlighting proteins moonlighting interactions in the extracellular matrix eukaryotic moonlighting proteins modulating moonlighting kinases moonlighting proteins in neurobiology signaling metabolic enzymes moonlighting as RNA binding and regulatory proteins Later methods driven chapters discuss practical aspects of identifying hidden moonlighting domains in proteins computational approaches and bioinformatic tools for the identification of cryptic enzymes establishing cryptic enzyme interactomes and assessing contributions of moonlighting proteins to signal cascades The book also explores recent advances in research and brings together an array of information across different fields to enable better targeting of these exciting proteins and their interactomes With a clear focus on the role of moonlighting and cryptic enzymes in signal transduction users will find examples of cryptic enzymes across species as well as those in human healthy biology and pathogenesis Covers recent advances in our understanding of cryptic moonlighting proteins in signal cascades highlighting and examining key themes across disciplines Empowers researchers to better target cryptic enzymes and moonlighting proteins and their interactomes Features chapter contributions from international leaders in the field *Recent Advances in Polyphenol Research, Volume 6* Heidi Halbwirth,Karl Stich,Véronique Cheynier,Stéphane Quideau,2019-04-08 Plant polyphenols are secondary metabolites that constitute one of the most common and widespread groups of natural products They are crucial constituents of a large and diverse range of biological functions and processes and provide many benefits to both plants and humans Many polyphenols from their structurally simplest representatives to their oligo polymeric versions are notably known as phytoestrogens plant pigments potent antioxidants and protein interacting agents This sixth volume of the highly regarded Recent Advances in Polyphenol Research series is edited by Heidi Halbwirth Karl Stich V ronique Cheynier and St phane Quideau and is a continuance of the series tradition of compiling a cornucopia of cutting edge chapters written by some of the leading experts in their respective fields of polyphenol sciences Highlighted herein are some of the most recent and pertinent developments in polyphenol research covering such major areas as Chemistry and physicochemistry Biosynthesis genetics metabolic engineering Roles in plants and ecosystems Food nutrition health Applied polyphenols This book is a distillation of the most current information and as such will surely prove an invaluable source for chemists biochemists plant scientists pharmacognosists and pharmacologists biologists ecologists food scientists and nutritionists

JIMD Reports, Volume 39 Eva Morava,Matthias Baumgartner,Marc Patterson,Shamima Rahman,Johannes

Zschocke, Verena Peters, 2018-05-15 JIMD Reports publishes case and short research reports in the area of inherited metabolic disorders Case reports highlight some unusual or previously unrecorded feature relevant to the disorder or serve as an important reminder of clinical or biochemical features of a Mendelian disorder Brain Glycogen Metabolism Mauro DiNuzzo, Arne Schousboe, 2019-10-31 This book aims to provide a state of the art summary of what is currently known about brain glycogen metabolism detailing the recent advances in our understanding of why glycogen is so critical for normal brain function The role of glycogen in cellular neurophysiology remains largely unclear and its specific contribution to the energy demand of brain cells is still elusive Glycogen is the sole cerebral glucose reserve and is emerging as a fundamental component of brain energy metabolism Pharmacological or genetic manipulation of glycogen metabolism in the brain impairs memory formation and increases susceptibility to epileptic seizures and cortical spreading depression Glycogen is also directly implicated in abnormal neuronal excitability and mental retardation that characterize brain disorders like Lafora disease and Pompe disease **Structural and Dynamic Aspects of Protein Function and Allostery** George Lisi, Ivan Rivalta, Vincenzo Venditti, 2022-03-28 Textbook of Pancreatic Cancer Kjetil Søreide, Stefan Stättner, 2021-02-04 This textbook provides a practically applicable resource for understanding the surgical oncology management of pancreatic cancer It discusses relevant aspects of anatomy and pathophysiology along with the latest diagnostic techniques Insightful descriptions are then provided detailing how to perform critical surgical procedures when treating these patients Relevant perioperative management strategies and emerging themes in cancer biology critical to understanding and treating the disease are also described The need for cross discipline collaboration to facilitate and enhance innovation within the discipline is reinforced throughout the text Each chapter presents the relevant current clinical standards along with areas of controversy in both research and clinical practice within pearls and pitfalls sections Textbook of Pancreatic Cancer Principles and Practice of Surgical Oncology is a detailed work covering the basic material important to trainees as well as advanced curriculum for established specialists in the field from a multi disciplinary perspective Therefore it is crucial resource for all practicing and trainee professionals who encounter these patients in their day to day clinical practice *Molecular Nutrition: Carbohydrates* Vinood B. Patel, 2019-10-16 Molecular Nutrition Carbohydrates presents the nutritional and molecular aspects of carbohydrates As part of the Molecular Nutrition includes sections covering carbohydrate metabolism carbohydrates in the diet insulin resistance dietary sugars cardiometabolic risk lipoproteins low carbohydrate diets antioxidants refined dietary sugars fats glucose transporters glucose sensing the role of phosphorylation carbohydrate responsive binding protein cyclic AMP peroxisome proliferator activated receptors SIRT1 insulinotropic polypeptide GIP and GIP receptor GIPR genes rRNA and transcription and more In addition the book addresses emerging fields of molecular biology and presents important discoveries relating to diet and nutritional health Summarizes molecular nutrition in health as related to carbohydrates Addresses emerging fields of molecular biology and presents important discoveries relating to

diet and nutritional health Includes key facts a mini dictionary of terms and summary points      **Oncoimmunology** Laurence Zitvogel, Guido Kroemer, 2017-12-13 In this book leading experts in cancer immunotherapy join forces to provide a comprehensive guide that sets out the main principles of oncoimmunology and examines the latest advances and their implications for clinical practice focusing in particular on drugs with FDA EMA approvals and breakthrough status The aim is to deliver a landmark educational tool that will serve as the definitive reference for MD and PhD students while also meeting the needs of established researchers and healthcare professionals Immunotherapy based approaches are now inducing long lasting clinical responses across multiple histological types of neoplasia in previously difficult to treat metastatic cancers The future challenges for oncologists are to understand and exploit the cellular and molecular components of complex immune networks to optimize combinatorial regimens to avoid immune related side effects and to plan immunomonitoring studies for biomarker discovery The editors hope that this book will guide future and established health professionals toward the effective application of cancer immunology and immunotherapy and contribute significantly to further progress in the field

**Tumor Microenvironment** Jacinta Serpa, 2020-03-04 The way a cell undergoes malignant transformation should meet their capacity of surviving in the microenvironment of the organ where the cancer will develop Metabolic adaptation is for sure one of the criteria that must be accomplished driven by metabolic plasticity that allows the adaptation of cancer cells to the availability of energy and biomass sources that will sustain cell survival and proliferation Each human organ has a particular microenvironment which depends on several cell types and in some cases also on symbiotic microorganisms These biological partners are constantly sharing organic compounds and signaling molecules that will control mitogenesis cell death and differentiation accounting for the organ's function Nevertheless cancer cells are capable of taking advantage of this metabolic and signaling microenvironmental dynamics In this book we intend to present the different components of the microenvironment driving the metabolic fitness of cancer cells The metabolic changes required for establishing a tumor in a given microenvironment and how these metabolic changes limit the response to drugs will generally be the major items addressed It is important to mention not only aspects of the microenvironment that stimulate metabolic changes and that select better adapted tumor cells but also how this regulation of cell plasticity is made Thus the signaling pathways that orchestrate and are orchestrated throughout this panoply of metabolic rearrangements will also be addressed in this book The subjects will be presented from the conceptual point of view of the cross cancer mechanisms and also particularizing some models that can be examples and enlightening within the different areas      *Rethinking Cancer* Bernhard Strauss, Marta Bertolaso, Ingemar Ernberg, Mina J. Bissell, 2025-09-09 Leading scientists argue for a new paradigm for cancer research proposing a complex systems view of cancer supported by empirical evidence Current consensus in cancer research explains cancer as a disease caused by specific mutations in certain genes Thanks to dramatic advances in genome sequencing never before have we known so much about the individual cancer cell and yet it is still unclear how to use this

knowledge for treatment success In this volume leading researchers argue for a new theory framework for understanding and treating cancer The contributors propose a complex systems view of cancer presenting conceptual building blocks for a new research paradigm supported by empirical evidence The contributors first discuss the new research framework in terms of theoretical foundations and then take up the relevance of a systems approach reviewing such topics as nonlinearity recurrence after treatment the cellular attractor concept network theory and noncoding DNA the dark matter of our genome They address the temporality of cancer progression drawing on evolutionary theory and clinical experience Finally they cover the dominant role of the tissue microenvironment in cancer analyzing topics including altered metabolic pathways the disease defining influence on metastasis and the interconnectedness of different environmental niches across levels of organization

**On Epigenetics and Evolution** Carlos M. Guerrero-Bosagna, 2024-06-25 The emergence of genomic variability is a fundamental process in evolution that has been the focus of recent high profile scientific debates with a particular focus on epigenetic modifications shown to influence genomic variability Epigenetics and Evolution a new volume in the Translational Epigenetics series introduces key themes from current epigenetic evolution research with contributions from leading scientists around the world that investigate the role of epigenetic mechanisms in evolution from a variety of different angles with each contribution combining theory current research overviews and applications This book gives researchers students and clinicians a better understanding of the origin of genotypic and phenotypic variability the role of epigenetics in development and inheritance how epigenetics may affect speciation and geographic distribution and the evolution of epigenetic mechanisms in different taxa and helps them apply their learnings across new research Other modalities and subtopics explored include epigenetics in neutral evolution epigenetics and cellular physiology Paleo epigenetics Archeo epigenetics epigenetics and pathogen evolution epigenetics in unicellular organisms epigenetic evolution in plants invertebrates and vertebrates and the role of epigenetics in human evolution and its societal impact Introduces and examines the role of epigenetic modifications in regulating genomic variability and thus evolutionary biology across species Draws together key themes across epigenetic evolution in plants invertebrates and vertebrates and the role of epigenetics in human evolution Includes bulleted chapter summaries and key points lists terms and definitions and rich use of illustrations where possible to reinforce understanding and actionability of the content Features chapter contributions from international leaders in the field

*Insights and Regulation of Plant Carbon Metabolism* Maria Grazia Annunziata, Diana Santelia, Rubén Vicente, 2022-08-31

Protein Reviews M. Zouhair Atassi, 2017-10-30 The aim of the Protein Reviews is to serve as a

publication vehicle for review articles that focus on crucial current vigorous aspects of protein structure function evolution and genetics The volumes will appear online before they are published in a printed book Articles are selected according to their importance to the understanding of biological systems their relevance to the unravelling of issues associated with health and disease or their impact on scientific or technological advances and developments The chapters in volume 18 are



authored by experts in the field They deal with aspects of structure and or biological activity of selected proteins The chapters review current research of the following topics the Mechanism of channel gating and regulation of the activity of calcium activated chloride channel ANO1 Structure and function of the two component cytotoxins of Staphylococcus aureus Membrane Fusion and Infection involving the influenza virus hemagglutinin The impact of arrhythmogenic mutations through the structural determination of the L type voltage gated calcium channel Discussion of some open questions pertaining to histone post translational modifications and nucleosome organization in transcriptional regulation Regulation of the extracellular SERPINA5 protein C inhibitor penetration through cellular membranes Coding of Class I and II aminoacyl tRNA synthetases Nephroin phosphorylation in diabetes and chronic kidney injury The structure forming juncture in oxidative protein folding and the events in the ER The polyspecificity of anti lipid antibodies and its relevance to the development of autoimmunity This volume is intended for research scientists clinicians physicians and graduate students in the fields of biochemistry cell biology molecular biology immunology and genetics

**Systems Biology of Metabolic and Signaling Networks** Miguel A. Aon,Valdur Saks,Uwe Schlattner,2013-10-22 Systems Biology represents a new paradigm aiming at a whole organism level understanding of biological phenomena emphasizing interconnections and functional interrelationships rather than component parts The study of network properties and how they control and regulate behavior from the cellular to organism level constitutes a main focus of Systems Biology This book addresses from a novel perspective a major unsolved biological problem understanding how a cell works and what goes wrong in pathology The task undertaken by the authors is in equal parts conceptual and methodological integrative and analytical experimental and theoretical qualitative and quantitative didactic and comprehensive Essentially they unravel the spatio temporal unfolding of interacting mass energy and information networks at the cellular and organ levels as well as its modulation through activation or repression by signaling networks to produce a certain phenotype or patho physiological response Starting with the historical roots in thirteen chapters this work explores the Systems Biology of signaling networks cellular structures and fluxes organ and microorganism functions In doing so it establishes the basis of a 21st century approach to biological complexity

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