BREAKING ADVANCES

Highlights from Recent Cancer Literature

REVIEWS

Targeting the Insulin-like Growth Factor Axis for the Development of Novel Therapeutics in Oncology
Jin Gao, Yong S. Chang, Bahija Jallal, and Jaye Viner

Transcriptional and Nontranscriptional Functions of E2F1 in Response to DNA Damage
Anup K. Biswas and David G. Johnson

PERSPECTIVE

Finding a Panacea among Combination Cancer Therapies
Ryuji Tamaguchi and Guy Perkins

CLINICAL STUDIES

Immunomonitoring Results of a Phase II/III Study of Malignant Ascites Patients Treated with the Trifunctional Antibody Catumaxomab (Anti-EpCAM × Anti-CD3)
Michael Jäger, Alexandra Schobeth, Peter Ruf, Juergen Hess, Michael Hennig, Barbara Schmalfeldt, Pauline Wimberger, Michael Strohlein, Bettina Theissen, Markus M. Heiss, and Horst Lindhofer

INTEGRATED SYSTEMS AND TECHNOLOGIES

A Novel Method of Transcriptional Response Analysis to Facilitate Drug Repositioning for Cancer Therapy
Guangxi Jin, Changhe Fu, Hong Zhao, Kemi Cui, Jenny Chang, and Stephen T.C. Wong

Précis: By developing a systematic approach to characterize off-target effects of drugs, this study may help speed the repositioning of existing approved and generic drugs for alternate uses in cancer treatment, addressing a huge but largely ignored opportunity in cancer research with obvious benefits to health care cost management.

MICROENVIRONMENT AND IMMUNOLOGY

Defective NF-κB Signaling in Metastatic Head and Neck Cancer Cells Leads to Enhanced Apoptosis by Double-Stranded RNA
Naoki Umemura, Jianzhong Zhu, Yvonne K. Mburu, Adriana Forero, Paishun N. Hsieh, Ravikumar Muthuswamy, Pawel Kalinski, Robert L. Ferris, and Saumendra N. Sarkar

Précis: This study reveals that metastatic cells have a specific sensitivity to a certain class of Toll-receptor ligands, suggesting ways to exploit these ligands to improve targeted tumor therapy.

ATM-Mediated DNA Damage Signals Mediate Immune Escape through Integrin-αvβ3–Dependent Mechanisms
Masahisa Jinushi, Shigeki Chiba, Muhammad Baghdadi, Ichiro Kinoshita, Hiroshi Dosaka-Akita, Koyu Ito, Hironori Yoshiyama, Hideo Yagita, Yoshimitsu Uede, and Akinori Takaoka

Précis: Constitutive DNA damage signals in cancer cells may promote immune escape by upregulating cell surface expression of integrin αvβ3, which may target dendritic cell functions needed for effective immune control.
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**MOLECULAR AND CELLULAR PATHOBIOLOGY**

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**Précis:** Key pathways involved in cancer-associated inflammation and Notch signaling appear to contribute to an autocrine cell network in ovarian cancer, with implications for new therapeutic approaches.

**Activated STAT5 Promotes Long-Lived Cytotoxic CD8+ T Cells That Induce Regression of Autochthonous Melanoma**

Magali Grange, Michel Buferne, Grégory Verdeil, Lee Leserman, Anne-Marie Schmitt-Verhulst, and Nathalie Auphan-Anezin

**Précis:** Activation of the transcription factor STAT5 in cytolytic T cells improves their antitumor potency, including by improving recall responses suppressed by the tumor microenvironment, suggesting new strategies to improve the durability of adoptive T-cell immunotherapy.

**GLI1 Inhibition Promotes Epithelial-to-Mesenchymal Transition in Pancreatic Cancer Cells**


**Précis:** Strategies to restore the signals mediated by a key effector transcription factor in the Hedgehog pathway may abolish the malignant character of pancreatic cancer cells by restoring their ability to undergo epithelial differentiation.

**CXCR4 Activation Defines a New Subgroup of Sonic Hedgehog-Driven Medulloblastoma**

Rajarshi Sengupta, Adrian Dubuc, Stacey Ward, Lihua Yang, Paul Northcott, B. Mark Woerner, Kirsten Kroll, Jingjin Luo, Michael D. Taylor, Robert J. Wechsler-Reya, and Joshua B. Rubin

**Précis:** In defining a molecular subgroup of deadly pediatric brain tumors, this study provides a rationale to clinically evaluate a new combination of 2 experimental targeted drugs that might dramatically improve treatment.

**Metastasis Suppressor NM23-H1 Promotes Repair of UV-Induced DNA Damage and Suppresses UV-Induced Melanomagenesis**

Stuart G. Jarrett, Marian Novak, Sandrine Dabernat, Jean-Yves Daniel, Isabel Mellon, Qingbei Zhang, Nathan Harris, Michael J. Ciesielski, Robert A. Fenstermaker, Diane Kovacic, Andrzej Slominski, and David M. Kaetzel

**Précis:** Identification of a DNA repair-promoting function defined for the metastasis suppressor NM23 may shed light on how it can suppress formation of UV-induced melanoma.
Contrasting Behavior of the p18^INK4c and p16^INK4a Tumor Suppressors in Both Replicative and Oncogene-Induced Senescence

Sladjana Gagrica, Sharon Brookes, Gordon Peters, and Montse Sanchez-Cespedes

Précis: The closely related CDK inhibitors p16^INK4a and p18^INK4c are tumor suppressors that behave differently during replicative senescence and oncogene-induced senescence, suggesting that their inactivation in human cancer is driven by different selective pressures.

Autocrine CSF-1 and CSF-1 Receptor Coexpression Promotes Renal Cell Carcinoma Growth

Julia Menke, Jörg Kriegsmann, Carl Christoph Schimanski, Melvin M. Schwartz, Andreas Schwarting, and Vicki R. Kelley

Précis: Strategies to target a supportive macrophage pathway in breast cancer might also be effective in more aggressive renal cancers that master the kidney microenvironment to directly adopt this autocrine loop.

Use of Multifunctional Sigma-2 Receptor Ligand Conjugates to Trigger Cancer-Selective Cell Death Signaling


Précis: Findings provide proof of principle for a modular drug platform using ligands to the sigma-2 receptor, which is highly expressed on many types of human cancer cells, as a target to selectively deliver proapoptotic drugs.

Intermittent Administration of MEK Inhibitor GDC-0973 plus PI3K Inhibitor GDC-0941 Triggers Robust Apoptosis and Tumor Growth Inhibition

Klaus P. Hoeldich, Mark Merchant, Christine Orr, Jocelyn Chan, Doug Den Otter, Leanne Berry, Ian Kasman, Hartmut Koeppen, Ken Rice, Nai-Ying Yang, Stefan Engst, Stuart Johnston, Lori S. Friedman, and Marcia Belvin

Précis: Continuous suppression of pathway signaling is apparently not required for the combinatorial efficacy of a MEK inhibitor plus a PI3K inhibitor, contrary to what might have been expected.

Global Characterization of the SRC-1 Transcriptional Targets ADAM22 as an ER-Independent Mediator of Endocrine-Resistant Breast Cancer

Daminian McCartan, Jarlath C. Bolger, Allis Fagan, Christopher Byrne, Yuan Hao, Li Qin, Marie McIlroy, Jianming Xu, Arnold D. Hill, Peadar O Gaora, and Leonie S. Young

Précis: Findings suggest new insights into how breast tumors switch from hormone-sensitive to hormone-resistant states, also revealing a novel prognostic and therapeutic target that may improve treatment of hormone-resistant tumors.

Global Characterization of the SRC-1 Transcriptional Targets ADAM22 as an ER-Independent Mediator of Endocrine-Resistant Breast Cancer

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Précis: Findings suggest new insights into how breast tumors switch from hormone-sensitive to hormone-resistant states, also revealing a novel prognostic and therapeutic target that may improve treatment of hormone-resistant tumors.

144 | Opposing Effects of Pigment Epithelium-Derived Factor on Breast Cancer Cell versus Neuronal Survival: Implication for Brain Metastasis and Metastasis-Induced Brain Damage

Daniel P. Fitzgerald, Preeti Subramanian, Monika Deshpande, Christian Graves, Ira Gordon, Yongzhen Qian, Yeva Snitkovsky, David J. Liewehr, Seth M. Steinberg, José D. Paltán-Ortiz, Mary M. Herman, Kevin Camphausen, Diane Palmieri, S. Patricia Becerra, and Patricia S. Steeg

Précis: A cytokine previously linked to tumor angiogenesis is discovered to suppress metastasis to the brain, where it also helps preserve neuronal survival, thereby acting through 2 unrecognized mechanisms to blunt metastatic spread and its consequences in the brain.

A Combined Array-Based Comparative Genomic Hybridization and Functional Library Screening Approach Identifies mir-30d As an Oncomir in Cancer

Ning Li, Sippy Kaur, Joel Greshock, Heini Lassus, Xiaomin Zhong, Yanling Wang, Arto Leminen, Zhongjun Shao, Xiaowen Hu, Shun Liang, Dionysios Katsaros, Qihong Huang, Ralf Büttzow, Barbara L. Weber, George Coukos, and Lin Zhang

Précis: Identification of oncogenic microRNAs by the approach validated in this study may help complete characterization of this class of potentially important theranostic markers.

Novel Transcriptional Targets of the SRY-HMG Box Transcription Factor SOX4 Link Its Expression to the Development of Small Cell Lung Cancer

Sandra D. Castillo, Ander Mathieu, Niccolo Mariani, Julian Carretero, Fernando Lopez-Rios, Robin Lovell-Badge, and Montse Sanchez-Cespedes

Précis: Small-cell lung cancer, a type of lung cancer with neuroendocrine characteristics, is found to be driven by a family of transcription factors involved in neuronal development that exert oncogenic effects in this setting.
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<td>Dongping Wei, Hua Li, Jie Yu, Jonathan T. Sebolt, Lili Zhao, Theodore S. Lawrence, Peter G. Smith, Meredith A. Morgan, and Yi Sun</td>
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<td>EZH2 Mediates Epigenetic Silencing of Neuroblastoma Suppressor Genes CASZ1, CLU, RUNX3, and NGFR</td>
<td>Chunxi Wang, Zhihui Liu, Chan-Wook Woo, Zhijie Li, Lifeng Wang, Jun S. Wei, Victor E. Marquez, Susan E. Bates, Qihuang Jin, Javed Khan, Kai Ge, and Carol J. Thiele</td>
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TUMOR AND STEM CELL BIOLOGY

- **EZH2 Mediates Epigenetic Silencing of Neuroblastoma Suppressor Genes**
  - Chunxi Wang, Zhihui Liu, Chan-Wook Woo, Zhijie Li, Lifeng Wang, Jun S. Wei, Victor E. Marquez, Susan E. Bates, Qihuang Jin, Javed Khan, Kai Ge, and Carol J. Thiele

**Precis:** A small-molecule inhibitor of an E3 ubiquitin ligase known to be broadly significant in cancer pathophysiology is found to be an effective radiosensitizer, prompting clinical attention to pivot ongoing phase I trials of this inhibitor toward radiosensitization studies where its activity may be particularly beneficial.
The White Adipose Tissue Used in Lipotransfer Procedures Is a Rich Reservoir of CD34⁺ Progenitors Able to Promote Cancer Progression
Ines Martin-Padura, Giuliana Gregato, Paola Marighetti, Patrizia Mancuso, Angelica Calleri, Chiara Corsini, Giancarlo Pruneri, Michela Manzotti, Vinu Lohsiriwat, Mario Rietjens, Jean-Yves Petit, and Francesco Bertolini

Précis: This study suggests that there might be risks involved in autologous transfer of white adipose tissue, a surgical procedure employed in certain breast cancer patients, due to the large numbers of a stem cell population that has strongly prometastatic properties in that tissue.

Curcumin Analogue CDF Inhibits Pancreatic Tumor Growth by Switching on Suppressor microRNAs and Attenuating EZH2 Expression

Précis: A synthetic derivative of curcumin, the chief bioactive component of the spice turmeric used for thousands of years in Indian Ayurvedic medicine, is found to de-repress expression of microRNAs that inhibit a master epigenetic driver of cancer cell proliferation and invasion.

Mesenchymal Stromal Cell Mutations and Wound Healing Contribute to the Etiology of Desmoid Tumors
Adelaide M. Carothers, Hira Rizvi, Rian M. Hasson, Yvonne I. Heit, Jennifer S. Davids, Monica M. Bertagnolli, and Nancy L. Cho

Précis: Findings implicate mesenchymal stromal cells in the etiology of desmoid tumors, often associated with familial colon cancer syndromes, and they suggest novel strategies for systemic treatment of this disease.

Metabolomic NMR Fingerprinting to Identify and Predict Survival of Patients with Metastatic Colorectal Cancer
Ivano Bertini, Stefano Cacciatore, Benny V. Jensen, Jakob V. Schou, Julia S. Johansen, Mogens Krushöffer, Claudio Luchinat, Dorte L. Nielsen, and Paola Turano

Précis: The metabolomic signature derived from patients with metastatic colorectal cancer predicts overall survival and provides insight into potential new biomarkers that can be used to predict disease progression and personalize treatment.

ERK1/2 Regulation of CD44 Modulates Oral Cancer Aggressiveness
Nancy P. Judd, Ashley E. Winkler, Oihana Murillo-Sauca, Joshua J. Brozman, Jonathan H. Law, James S. Lewis, Jr, Gavin P. Dunn, Jack D. Bui, John B. Sunwoo, and Ravindra Uppaluri

Précis: A pivotal regulator of stem cell function is a crucial downstream effector in the ERK1/2 pathway that mediates the growth of oral squamous carcinomas, which are rising rapidly in incidence in developed countries.

Correction: LY303511 Enhances TRAIL Sensitivity of SHEP-1 Neuroblastoma Cells via Hydrogen Peroxide–Mediated Mitogen-Activated Protein Kinase Activation and Up-regulation of Death Receptors

Correction: The metabolomic signature derived from patients with metastatic colorectal cancer predicts overall survival and provides insight into potential new biomarkers that can be used to predict disease progression and personalize treatment.
Brain metastases of breast and other cancers are increasing in incidence and limiting the gains made by systemic therapy. Here, brain-tropic human metastatic breast cancer cells overexpressing pigment epithelium–derived factor rapidly became apoptotic when implanted into a mouse brain. Red, human mitochondria (tumor cells); green, cleaved caspase-3 stain (apoptosis); blue, DAPI. For details, see the article by Fitzgerald and colleagues on page 144 of this issue.