## BREAKING ADVANCES

### 4873

**Highlights from Recent Cancer Literature**

## REVIEWS

### 4875

**Intratumor Heterogeneity: Evolution through Space and Time**
Charles Swanton

### 4883

**Microenvironmental Regulation of Epithelial–Mesenchymal Transitions in Cancer**
Dingcheng Gao, Linda T. Vahdat, Stephen Wong, Jenny C. Chang, and Vivek Mittal

### 4890

**The Growing Arsenal of ATP-Competitive and Allosteric Inhibitors of BCR-ABL**
Oliver Hantschel, Florian Grebien, and Giulio Superti-Furga

## COMMENTARY

### 4896

**Biomarkers of HPV Infection in Oropharyngeal Carcinomas: Can We Find Simplicity in the Puzzle of Complexity?**
Eduardo M. Mendez

## INTEGRATED SYSTEMS AND TECHNOLOGIES

### 4899

**Interstitial Fluid Pressure and Associated Lymph Node Metastasis Revealed in Tumors by Dynamic Contrast-Enhanced MRI**
Tord Hompland, Christine Ellingsen, Kirsti Marie Øvrebo, and Einar K. Rofstad

**Précis:** Seminal findings describe a new noninvasive tool to image the internal fluid pressure in tumors, revealing a metric that might be used to predict the metastatic potential of any solid tumor.

## MICROENVIRONMENT AND IMMUNOLOGY

### 4909

**Roles for Endothelin Receptor B and BCL2A1 in Spontaneous CNS Metastasis of Melanoma**
William Cruz-Muñoz, Maria L. Jaramillo, Shan Man, Ping Xu, Myriam Banville, Catherine Collins, Andre Nantel, Giulio Francia, Sherif S. Morgan, Lee D. Cramer, Maureen D. O'Connor-McCourt, and Robert S. Kerbel

**Précis:** A model to evaluate genes relevant to brain metastasis by malignant melanoma provides important new insights into this little-understood process.

### 4920

**Rab27a Supports Exosome-Dependent and -Independent Mechanisms That Modify the Tumor Microenvironment and Can Promote Tumor Progression**
Angélique Bobrie, Sophie Krumeich, Fabien Reyal, Chiara Recchi, Luis F. Moita, Miguel C. Seabra, Matias Ostrowski, and Clotilde Théry

**Précis:** This important study offers what may be the first evidence of a role for in vivo secreted cancer cell-exosomes in primary tumor growth and metastasis.

### 4931

**Soluble CD200 Is Critical to Engraft Chronic Lymphocytic Leukemia Cells in Immunocompromised Mice**
Karrie K. Wong, Fred Brenneman, Alden Chesney, David E. Spaner, and Reginald M. Gorczynski

**Précis:** This study characterizes a novel soluble isoform of the immunosuppressive molecule CD200, which, when overexpressed on cancer cells, may mediate immune escape.

## MOLECULAR AND CELLULAR PATHOBIOLOGY

### 4944

**Functional Genomics Identifies Drivers of Medulloblastoma Dissemination**
Michael Mumert, Adrian Dubuc, Xiaochong Wu, Paul A. Northcott, Steven S. Chin, Carolyn A. Pedone, Michael D. Taylor, and Daniel W. Fults

**Précis:** An understanding of the genetic determinants of metastatic dissemination of medulloblastoma will make it possible to eliminate highly neurotoxic treatments, such as cranioptinal radiation, which are currently indispensable for long-term survival.
Frequent PVT1 Rearrangement and Novel Chimeric Genes PVT1-NBEA and PVT1-WWOX Occur in Multiple Myeloma with 8q24 Abnormality

Precise: Not only MYC but also PVT1 has a pivotal role in the pathophysiology of multiple myeloma and possibly in other tumors with 8q24 abnormalities where MYC resides.

Chemotherapeutic Sensitivity of Testicular Germ Cell Tumors Under Hypoxic Conditions Is Negatively Regulated by SENP1-Controlled Sumoylation of OCT4
Yu-Chih Wu, Thai-Yen Ling, Shing-Hwa Lu, Hung-Chih Kuo, Hong-Nerng Ho, Shauh-Der Yeh, Chia-Ning Shen, and Yen-Hua Huang

Precise: This study reveals a rational strategy to degrade the chemoresistance of testicular tumors that have a poor prognosis.

RNF8 Regulates Assembly of RAD51 at DNA Double-Strand Breaks in the Absence of BRCA1 and 53BP1
Shinichiro Nakada, Rikako Miyamoto Yonamine, and Koichi Matsuo

Precise: By defining a major new component of DNA repair through homologous recombination, this study also suggests a new strategy to attack BRCA1-deficient breast cancers that are resistant to traditional chemotherapy as well as to experimental PARP1 inhibitors.

Cardiac Inflammation after Local Irradiation Is Influenced by the Kallikrein-Kinin System
Vijayalakshmi Sridharan, Preeti Tripathi, Sunil K. Sharma, Eduardo G. Moros, Peter M. Corry, Benjamin J. Lieblong, Elena Kaschina, Thomas Unger, Christa Thone-Reineke, Martin Hauer-Jensen, and Marjan Boerma

Precise: These results enhance understanding of the causes of radiation-induced heart disease, a severe side effect that can occur with certain forms of radiotherapy of chest tumors, with possible implications for its prevention or management.

Viral RNA Patterns and High Viral Load Reliably Define Oropharynx Carcinomas with Active HPV16 Involvement
Dana Holzinger, Markus Schmitt, Gerhard Dyckhoff, Axel Benner, Michael Pawlita, and Franz X. Bosch

Precise: Identifying biomarkers that define the subset of oropharyngeal cancers driven by an increasing incidence of HPV16 infection could help improve treatment and clinical outcomes.

Biomarkers of HPV in Head and Neck Squamous Cell Carcinoma

Precise: Determining only the HPV16 DNA status or p16 immunostaining is not an effective prognostic biomarker for head and neck cancers on the rise, but combining these markers with E6/E7 antibody status has high predictive clinical value.

FLT-PET Is Superior to FDG-PET for Very Early Response Prediction in NPM-ALK-Positive Lymphoma Treated with Targeted Therapy
Zhoulie Li, Nicolas Graf, Ken Herrmann, Alexandra Junger, Michaela Aichler, Annette Feuchtinger, Anja Baumgart, Axel Walch, Christian Peschel, Markus Schweiger, Andreas Buck, Ulrich Keller, and Tobias Dechow

Precise: A novel method of PET imaging can predict responses to treatment with a targeted inhibitor early enough in the course of treatment that it may be possible to generate faster predictions of treatment efficacy, thereby determining whether or not a patient should remain on the treatment.

RKI-1447 Is a Potent Inhibitor of the Rho-Associated ROCK Kinases with Anti-Invasive and Antitumor Activities in Breast Cancer
Ronil A. Patel, Kara D. Forinash, Roberta Pirreddu, Ying Sun, Nan Sun, Mathew P. Martin, Ernst Schombrunn, Nicholas J. Lawrence, and Said M. Sebti

Precise: ROCK kinases are intimately involved in tumor migration and invasion, and the discovery of a drug-like ROCK inhibitor offers significant potential as a novel anti-invasive and antitumor agent.
Inactivation of the HIF-1α/PDK3 Signaling Axis Drives Melanoma toward Mitochondrial Oxidative Metabolism and Potentiates the Therapeutic Activity of Pro-Oxidants
Jérôme Kluza, Paola Corazza-Rozas, Yasmine Touil, Manel Jendoubi, Cyril Maire, Pierre Guerreschi, Aurélie Jonneaux, Caroline Ballot, Stéphane Balayssac, Samuel Valable, Aurélien Corroyer-Dulmont, Myriam Bernaudin, Myriam Malet-Martíno, Elisabeth Martin de Lassalle, Patrice Mabsoudou, Pierre Formstecher, Renata Polakowska, Laurent Mortier, and Philippe Marchetti

Precis: These findings offer preclinical validation of a bioenergetic pathway that can be exploited immediately to improve therapeutic intervention in metastatic melanoma.

Hedgehog Signaling Is a Novel Therapeutic Target in Tamoxifen-Resistant Breast Cancer Aberrantly Activated by PI3K/AKT Pathway
Bhuvaneswari Ramaswamy, Yuanzhi Lu, Kun-yu Teng, Gerard Nuovo, Xiaobai Li, Charles L. Shapiro, and Sarmila Majumder

Precis: Pharmacologic blockade of Hedgehog signaling may offer a general strategy to target breast cancer cells that have become resistant to hormone-ablative therapy.

MEN1 Gene Replacement Therapy Reduces Proliferation Rates in a Mouse Model of Pituitary Adenomas
Gerard V. Walls, Manuel C. Lemos, Mahsa Javid, Miriam Bazan-Peregrino, Jeshmi Jeyabalan, Anne C. Reed, Brian Harding, Damion J. Tyler, Daniel J. Stuckey, Sian Piret, Paul T. Christie, Olaf Ansorge, Kieran Clarke, Len Seymour, and Rajesh V. Thakker

Precis: These findings offer a preclinical proof-of-concept for gene replacement therapy of pituitary adenomas with a relevant tumor-suppressor gene that is often mutated in this setting.

Intravesical Delivery of Small Activating RNA Formulated into Lipid Nanoparticles Inhibits Orthotopic Bladder Tumor Growth
Moo Rim Kang, Glen Yang, Robert F. Place, Klaus Charisse, Hila Epstein-Barash, Muthiah Manoharan, and Long-Cheng Li

Precis: This article offers a preclinical proof-of-concept for cancer treatment by RNA activation (RNAa), an RNA interference-related technology that uses small dsRNAs formulated into lipid nanoparticles to stimulate the expression of endogenous tumor-suppressor genes.

RAP80 Is Critical in Maintaining Genomic Stability and Suppressing Tumor Development
Zhengyu Yin, Daniel Menendez, Michael A. Resnick, John E. French, Kyathanahalli S. Janardhan, and Anton M. Jetten

Precis: A protein that binds ubiquitylated histones and recruits BRCA1 and other DNA repair proteins to chromatin is found to exert an important function in tumor suppression.

Transition from Colitis to Cancer: High Wnt Activity Sustains the Tumor-Initiating Potential of Colon Cancer Stem Cell Precursors
Anitha K. Shenoy, Robert C. Fisher, Elizabeth A. Butterworth, Liya Pi, Lung-Ji Chang, Henry D. Appelman, Myron Chang, Edward W. Scott, and Emina H. Huang

Precis: These findings link activation of the Wnt signaling pathway to colitis-associated cancer, suggesting both a promising diagnostic marker and a therapeutic target to prevent the transition from inflammatory colitis to colon cancer.

Induction of the Stem-like Cell Regulator CD44 by Rho Kinase Inhibition Contributes to the Maintenance of Colon Cancer–Initiating Cells
Hirokazu Ohata, Tatsuya Ishiguro, Yuki Aihara, Ai Sato, Hiroaki Sakai, Shigeki Sekine, Hirokazu Taniguchi, Takayuki Akasu, Shin Fujita, Hitoshi Nakagama, and Koji Okamoto

Precis: This study offers a potentially seminal mechanistic insight into how cancer stem-like cells maintain their tumor-initiating characteristics, with immediate implications for how to therapeutically target these cells for eradication.

CD133+ Melanoma Subpopulations Contribute to Perivascular Niche Morphogenesis and Tumorigenicity through Vasculogenic Mimicry
Chio-Yuan Lai, Brian E. Schwartz, and Mei-Yu Hsu

Precis: This important study broadens the concept of how cancer stem-like cells drive tumor formation and progression by revealing that they can enable vascular mimicry—the formation of unique perivascular structures that can promote blood supply.
Adenylate Kinase-4 Is a Marker of Poor Clinical Outcomes That Promotes Metastasis of Lung Cancer by Downregulating the Transcription Factor ATF3
Yi-Hua Jan, Hong-Yuan Tsai, Chih-Jen Yang, Ming-Shyan Huang, Yi-Fang Yang, Tsung-Ching Lai, Chien-Hsin Lee, Yung-Ming Jeng, Chi-Ying Huang, Jen-Liang Su, Yung-Jen Chuang, and Michael Hsiao

Precise: These findings identify an adenylate kinase gene as a lung cancer progression marker that enhances the invasion ability of lung cancer and may represent a biomarker of metastasis.

Reciprocal Metabolic Reprogramming through Lactate Shuttle Coordinately Influences Tumor-Stroma Interplay
Tania Fiaschi, Alberto Marini, Elisa Giannoni, Maria Letizia Taddei, Paolo Gandellini, Alina De Donatis, Michele Lanciotti, Sergio Serni, Paolo Cirri, and Paola Chiarugi

Precise: This study furthers understanding of how cancer cells and cancer-associated fibroblasts support each other through coordinate control and exploitation of metabolic activity to survive nutrient-deprived conditions and license progress to more advanced stages of disease.

CORRECTION
Correction: Small-Molecule Anticancer Compounds Selectively Target the Hemopexin Domain of Matrix Metalloproteinase-9

ABOUT THE COVER
Squamous cell carcinomas of the uterine cervix were subjected to dynamic contrast-enhanced magnetic resonance imaging by using gadolinium diethylene-triamine penta-acetic acid (Gd-DTPA) as contrast agent and an axial T1-weighted spoiled gradient recalled sequence for imaging. The T1-weighted images showed a high-signal intensity rim in the tumor periphery immediately after the contrast administration, and this rim moved outwards with time. The velocity of the rim movement at the tumor surface was associated with tumor interstitial fluid pressure and incidence of lymph node metastases, and may serve as a novel general biomarker of interstitial hypertension-induced tumor aggressiveness. For details, see article by Hompland and colleagues on page 4899.

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