CANCER RESEARCH 75TH ANNIVERSARY

765 Tobacco Causes Human Cancers—A Concept Founded on Epidemiology and an Insightful Experiment Now Requires Translation Worldwide
Lawrence A. Loeb

REVIEW

769 Oxygen-Enhanced MRI Is a Major Advance in Tumor Hypoxia Imaging
Mark W. Dewhirst and Samuel R. Birer

INTEGRATED SYSTEMS AND TECHNOLOGIES

773 Comprehensive Ex Vivo Transposon Mutagenesis Identifies Genes That Promote Growth Factor Independence and Leukemogenesis
Précis: This study presents a broadly applicable approach for identifying and classifying functionally relevant genes in hematopoietic malignancies and offers new insights into the drivers of leukemogenesis.

787 Oxygen-Enhanced MRI Accurately Identifies, Quantifies, and Maps Tumor Hypoxia in Preclinical Cancer Models
James P.B. O’Connor, Jessica K.R. Boul, Yann Jamin, Muhammad Babur, Katherine G. Finegan, Kaye J. Williams, Ross A. Little, Alan Jackson, Geoff J.M. Parker, Andrew R. Reynolds, John C. Waterton, and Simon P. Robinson
Précis: These findings validate a novel MRI method for imaging tumor hypoxia that fulfills an unmet clinical need and can be readily translated into clinical studies.

MICROENVIRONMENT AND IMMUNOLOGY

805 Macrophage Infiltration and Alternative Activation during Wound Healing Promote MEK1-Induced Skin Carcinogenesis
Précis: These findings shed new light on the role of macrophages during the early stages of tumor formation, demonstrating that their accumulation during wound healing and their gross consumption of arginine is a foreboding sign of tumor development.

818 Hypoxia-Induced Epithelial-to-Mesenchymal Transition in Hepatocellular Carcinoma Induces an Immunosuppressive Tumor Microenvironment to Promote Metastasis
Long-Yun Ye, Wei Chen, Xue-Li Bai, Xing-Yuan Xu, Qi Zhang, Xue-Feng Xia, Xu Sun, Guo-Gang Li, Qi-Da Hu, Qi-Han Fu, and Ting-Bo Liang
Précis: These findings illuminate a signaling network that integrates hypoxic and innate immune responses in the tumor microenvironment, coordinating the creation of an immunosuppressive, prometastatic state that drives liver cancer progression.

MOLECULAR AND CELLULAR PATHOBIOLOGY

831 JARID1D Is a Suppressor and Prognostic Marker of Prostate Cancer Invasion and Metastasis
Na Li, Shilpa S. Dhar, Tsai-Yu Chen, Pu-Yeh Kan, Yongkun Wei, Jae-Hwan Kim, Chia-Hsin Chan, Hui-Kuan Lin, Mien-Chie Hung, and Min Gyu Lee
Précis: This study provides mechanistic insights into the tumor suppressive role of the Y chromosome, in which epigenetic modification by a histone demethylase attenuates prostate cancer cell invasion, with potential implications for prognosis and treatment of metastatic disease.
Mesenchymal Tumorigenesis Driven by TSC2 Haploinsufficiency Requires HMGA2 and Is Independent of mTOR Pathway Activation
Jeanine D’Ammiento, Takayuki Shiomi, Sarah Marks, Patrick Geraghty, DeviPriya Sankarasharma, and Kiran Chada
Précis: These findings identify a common transcriptional pathway controlled by the TSC tumor suppressor gene family, where inactivations can drive the formation of a variety of mesenchymal tumors.

NADPH Oxidase 1 Activity and ROS Generation Are Regulated by Grb2/Cbl-Mediated Proteasomal Degradation of NoxO1 in Colon Cancer Cells
Jung Hee Joo, Hyunjin Oh, Myungjin Kim, Eun Jung An, Rae-Ewon Kim, So-Young Lee, Dong Hoon Kang, Sang Won Kang, Cheol Keun Park, Hoguen Kim, Su-Jae Lee, Daekee Lee, Jae Hong Seol, and Yun Soo Rae
Précis: These findings provide new mechanistic insights into the regulation of ROS production in colon cancer cells and offer new opportunities to investigate the therapeutic modulation of intracellular ROS levels in tumor cells.

IL6 Trans-signaling Promotes KRAS-Driven Lung Carcinogenesis
Cavin D. Brooks, Louise M’Cleod, Sultan Alhayyani, Alistair Miller, Prudence A. Russell, Walter Ferlin, Stefan Rose-John, Saleela Ruwanpura, and Brendan J. Jenkins
Précis: This study provides mechanistic insight into the cytokine signaling pathways that potentiate KRAS-driven lung adenocarcinoma, highlighting IL6 trans-signaling as a potential therapeutic targeting strategy.

Effects of Anticancer Drugs on Chromosome Instability and New Clinical Implications for Tumor-Suppressing Therapies
Hee-Young Lee, Nicholas C.O. Lee, Natalay Kouprina, Jung-Hyun Kim, Alex Kaganisky, Susan Bates, Jane B. Trepel, Yves Pommier, Dan Sackett, and Vladimir Larionov
Précis: This report defines increased chromosomal instability (CIN) as a newly identified outcome of many currently used anticancer drugs, with implications for the development of new therapeutic strategies and target leverage the CIN phenotype in cancer cells.

Multinucleation and Mesenchymal-to-Epithelial Transition Alleviate Resistance to Combined Cabazitaxel and Antiandrogen Therapy in Advanced Prostate Cancer
Sarah K. Martin, Hong Pa, Justin C. Penticuff, Zheng Cao, Craig Horbinski, and Natasha Kyprianou
Précis: Efficacious antitumor responses triggered by abaxitaxel second-line chemotherapy for metastatic prostate cancer administered in combination with antiandrogens rely greatly on the status and responsiveness of the androgen receptor, with potential implications for patient stratification.

miR-34a Silences c-SRC to Attenuate Tumor Growth in Triple-Negative Breast Cancer
Précis: These findings provide preclinical evidence that miR-34a suppresses triple-negative breast cancer, supporting investigation to develop it as a targeted therapeutic strategy currently lacking in this disease.

Injury-Driven Stiffening of the Dermis Expedites Skin Carcinoma Progression
Venugopal R. Mittapalli, Josef Maudl, Stefanie Löffel, Dimitra Kiritsi, Johannes S. Kern, Winfried Römer, Alexander Nyström, and Leena Bruckner-Tuderman
Précis: This study shows how a genetic skin disorder rapidly progresses to an aggressive skin cancer, identifying promising therapeutic targets within the compromised dermal microenvironment that may limit carcinogenesis.
SSBP1 Suppresses TGFβ-Driven Epithelial-to-Mesenchymal Transition and Metastasis in Triple-Negative Breast Cancer by Regulating Mitochondrial Retrograde Signaling

Hong-Lin Jiang, He-Fen Sun, Shui-Ping Gao, Liang-Dong Li, Sheng Huang, Xin Hu, Sheng Liu, Jiong Wu, Zhi-Ming Shao, and Wei Jin

Précis: These findings define an aberrant signaling process in mitochondria and show how it contributes to driving metastasis in triple-negative breast cancer, a particularly aggressive type of this disease.

Targeting the WASF3–CYFIP1 Complex Using Stapled Peptides Suppresses Cancer Cell Invasion

Yong Teng, Abdulaziz Bahassan, Dayong Dong, Laura E. Hanold, Xiaoou Ren, Eileen J. Kennedy, and John K. Cowell

Précis: Targeting a protein-protein interaction central to the metastatic process highlights a peptide-based approach that might help eradicate advanced cancer.

Oncogenic Fusion Gene CD74-NRG1 Confers Cancer Stem Cell–like Properties in Lung Cancer through a IGF2 Autocrine/Paracrine Circuit

Takahiko Murayama, Takashi Nakaoku, Masato Enari, Tatsunori Nishimura, Kana Tominaga, Asuka Nakata, Atsuo Tojo, Sumio Sugano, Takashi Kohno, and Noriko Gotoh

Précis: A recently identified oncogenic fusion gene in lung adenocarcinoma is shown to drive and maintain cancer stem cell-like phenotypes, with implications for targeting the fusion gene product to eradicate drug-refractory tumor cells.

Correction: Tumor Angiogenesis Mediated by Myeloid Cells Is Negatively Regulated by CEACAM1

Correction: Pimonidazole adduct formation immunofluorescence was used to validate these findings. Oxygen-enhanced MRI can be performed readily on conventional clinical scanners, so the technique has potential for rapid clinical translation. For details, see article by O’Connor and colleagues on page 767.

ABOUT THE COVER

The longitudinal relaxation rate of protons is increased when subjects switch from breathing air to inhaling 100% oxygen. This effect when detected by MRI scanning is termed oxygen-enhanced MRI. It was found that this technique—in combination with measurements of perfusion—was capable of in vivo mapping of tumor hypoxia, distinguishing tumor subregions with low oxygen tension from well-oxygenated tumor tissue. Pimonidazole adduct formation immunofluorescence was used to validate these findings. Oxygen-enhanced MRI can be performed readily on conventional clinical scanners, so the technique has potential for rapid clinical translation. For details, see article by O’Connor and colleagues on page 767.