On the Cover: The cover image illustrates the phenotype that develops when Arabidopsis plants cannot maintain acetate homeostasis because of simultaneous mutations in two genes coding for acetate-activating enzymes, one located in plastids (ACS) and the other located in peroxisomes (ACN1). These plants are sterile, grow slower and stay green for more than 150-days, and hyperaccumulate acetate at the expense of metabolites generated from acetyl-CoA. These attributes are based on $^{13}$C-stable isotope labeling experiments, indicated by the “yellow hat” on the acetate molecule. The $^{13}$C-labeled acetate is trafficked to either the plastids by ACS catalysis or peroxisomes by ACN1 catalysis, generating different pools of acetyl-CoA derived metabolites. Although these two enzymes can compensate for each other, the double mutant plants that lack both enzymes generate the aberrant phenotype, which establishes the importance of regulating acetate metabolism in plants. Cover image credits: Xinyu Fu, Iowa State University, Ames, Iowa.

ON THE INSIDE

Peter V. Minorsky

NEWS AND VIEWS

Keep Cool and Open Up: Temperature-Induced Stomatal Opening. Charlotte Gommers

LACCASE2 Negatively Regulates Lignin Deposition of Arabidopsis Roots. Yunqing Yu

Discovering Lipid Droplet Proteins: From Seeds to Seedlings. Lynn G.L. Richardson

BREAKTHROUGH TECHNOLOGIES

Rapid Affinity Purification of Tagged Plant Mitochondria (Mito-AP) for Metabolome and Proteome Analyses. Markus Niehaus, Henryk Straube, Patrick Kühnler, Nils Rugen, Jan Hegermann, Patrick Giavalisco, Holger Eubel, Claus-Peter Witte, and Marco Herde

A focused analysis of the Arabidopsis mitochondrial proteome and key metabolites is facilitated by a rapid tag-based affinity isolation of the whole organelle from small amounts of plant material.

RESEARCH REPORT

$^{[OPEN]}$CER16 Inhibits Post-Transcriptional Gene Silencing of CER3 to Regulate Alkane Biosynthesis. Xianpeng Yang, Tao Feng, Shipeng Li, Huayan Zhao, Shuangshuang Zhao, Changle Ma, Matthew A. Jenks, and Shiyou Liu

Alkane biosynthesis in cuticular wax of Arabidopsis associated with stress responses is regulated through an RNA quality control mechanism.

RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM

$^{[OPEN]}$The Arabidopsis Protein CGL20 Is Required for Plastid 50S Ribosome Biogenesis. Bennet Reiter, Evgenia Vamvaka, Giada Marino, Tatjana Kleine, Peter Jahns, Cordelia Bolle, Dario Leister, and Thilo Rühle

A green lineage-specific protein is involved in late stages of plastid ribosome biogenesis.

$^{[OPEN]}$Identification of Chloroplast Envelope Proteins with Critical Importance for Cold Acclimation. Oliver Trentmann, Timo Mühlhaus, David Zimmer, Frederik Sommer, Michael Schroda, Ilka Haferkamp, Isabel Keller, Benjamin Pommerrenig, and Horst Ekkehard Neuhaus

Differential proteome analysis identifies envelope proteins critical for cold acclimation and frost tolerance in Arabidopsis thaliana.
Failure to Maintain Acetate Homeostasis by Acetate-Activating Enzymes Impacts Plant Development. Xinyu Fu, Hannah Yang, Febriana Pangestu, and Basil J. Nikolau

Plastidic and peroxisomal acetate-activating enzymes prevent the hyperaccumulation of acetate that otherwise causes defects in vegetative and reproductive growth.

MYB20, MYB42, MYB43, and MYB85 Regulate Phenylalanine and Lignin Biosynthesis during Secondary Cell Wall Formation. Pan Geng, Su Zhang, Jinyue Liu, Cuihuan Zhao, Jie Wu, Yingping Cao, Chuxiang Fu, Xue Han, Hang He, and Qiao Zhao

MYB proteins regulate carbon flow into the phenylpropanoid pathway for lignin biosynthesis.

CELL BIOLOGY

Autophagy Increases Zinc Bioavailability to Avoid Light-Mediated Reactive Oxygen Species Production under Zinc Deficiency. Daiki Shinozaki, Ekaterina A. Merkulova, Loreto Naya, Tetsuro Horie, Yuri Kanno, Mitsunori Seo, Yoshinori Ohsumi, Cécile Masclaux-Daubresse, and Kohki Yoshimoto

Resupply of free zinc ions via autophagic degradation suppresses photosynthesis-related Fenton-like reaction-induced chlorosis under zinc starvation in Arabidopsis thaliana.

Subdivision of Light Signaling Networks Contributes to Partitioning of C₄ Photosynthesis. Ross-W. Hendron and Steven Kelly

Cell-specific activation of photosynthetic machinery is mediated by differences in light signaling networks between photosynthetic cell types; these differences indicate that the regulatory system that facilitates C₄ photosynthesis may have evolved to reinforce differences in within-leaf light availability.

Ureide Permease 5 (AtUPS5) Connects Cell Compartments Involved in Ureide Metabolism. Ignacio Lescano, María Florencia Bogino, Carolina Martini, Tomás María Tessi, Claudio Alejandro González, Karin Schumacher, and Marcelo Desimone

Two isoforms of Arabidopsis thaliana UREIDE PERMEASE 5 connect cell compartments involved in ureide metabolism and mediate allantoin export from root cells for long distance transport.


Several previously unknown low-abundant lipid droplet proteins are identified in Arabidopsis thaliana seeds and seedlings by quantitative proteomics combined with two cell biological approaches.

GENES, DEVELOPMENT AND EVOLUTION

A SAC Phosphoinositide Phosphatase Controls Rice Development via Hydrolyzing PI4P and PI(4,5)P₂. Tao Guo, Hua-Chang Chen, Zi-Qi Lu, Min Diao, Ke Chen, Nai-Qian Dong, Jun-Xiang Shan, Wang-Wei Ye, Shanjin Huang, and Hong-Xuan Lin

Endoplasmic reticulum-localized phosphoinositide phosphatase hydrolyzes phosphatidylinositol 4-phosphate and phosphatidylinositol 4,5-bisphosphate to regulate cell elongation in rice.

Analysis of Soybean Long Non-Coding RNAs Reveals a Subset of Small Peptide-Coding Transcripts. Xiao Lin, Wengui Lin, Yee-Shan Ku, Fuk-Ling Wong, Man-Wah Li, Hon-Ming Lam, Sai-Ming Ngai, and Ting-Fung Chan

A subset of soybean long non-coding RNA candidates encode small peptides of fewer than 100 amino acids, enabling further investigations into their functional roles.


Characterization of two loci influencing flowering initiation and reproductive development, LATE3 and LATE4, reveals an important role for the deeply conserved Mediator complex.
SIGNALLING AND RESPONSE

The MicroRNA397b-LACCASE2 Module Regulates Root Lignification under Water and Phosphate Deficiency. Hitaishi Khandal, Amar Pal Singh, and Debasis Chattopadhyay

A negative regulator of lignin deposition in root vascular tissue is post-transcriptionally regulated during water and phosphate limitation.


High temperature-mediated stomatal opening involves cross talk with light signaling pathways.

Putative cis-Regulatory Elements Predict Iron Deficiency Responses in Arabidopsis Roots. Birte Schwarz, Christina B. Azodi, Shin-Han Shiu, and Petra Bauer

More than 100 putative cis-regulatory elements robustly predict Arabidopsis root iron deficiency responses in computational models and shed light on the mechanisms of transcriptional regulation.

TaANR1-TaBG1 and TaWabi5-TaNRT2s/NARs Link ABA Metabolism and Nitrate Acquisition in Wheat Roots. Meng Wang, Pengli Zhang, Qian Liu, Guangjie Li, Dongwei Di, Guangmin Xia, Herbert J. Kronzucker, Shuang Fang, Jinfang Chu, and Weiming Shi

Nitrate enhances ABA accumulation through the transcriptional activation of TaBG1 by TaANR1, and this enhancement in turn affects nitrate uptake through the activation of TaNRT2s/NARs by TaWabi5.

Promotion of BR Biosynthesis by miR444 Is Required for Ammonium-Triggered Inhibition of Root Growth. Xiaoming Jiao, Huacai Wang, Jijun Yan, Xiaoyu Kong, Yawen Liu, Jinfang Chu, Xiaoying Chen, Rongxiang Fang, and Yongsheng Yan

miR444 promotes phytohormone brassinosteroid biosynthesis, conferring ammonium-triggered root elongation inhibition in rice.

ZmEHD1 Is Required for Kernel Development and Vegetative Growth through Regulating Auxin Homeostasis. Yafei Wang, Wenwen Liu, Hongqiu Wang, Qingguo Du, Zhiyuan Fu, Wen-Xue Li, and Jihua Tang

ZmEHD1 regulates auxin homeostasis by mediating clathrin-mediated endocytosis and is crucial for maize normal development.

AtMOB1 Genes Regulate Jasmonate Accumulation and Plant Development. Zhiai Guo, Xiaozenh Yue, Xiaona Cui, Lizhen Song, and Youfa Cheng

A core component of the Hippo pathway plays important roles in regulating jasmonate accumulation and plant development in Arabidopsis.

Low-Phosphate Chromatin Dynamics Predict a Cell Wall Remodeling Network in Rice Shoots. Maryam Foroozani, Sara Zahrarafard, Dong-Ha Oh, Guannan Wang, Maheshi Dassanayake, and Aaron P. Smith

Combined chromatin structural data reveals specific chromatin-state transitions that correlate with subsets of functionally distinct rice genes differentially expressed under phosphate starvation.

Full-Length Transcript-Based Proteogenomics of Rice Improves Its Genome and Proteome Annotation. Mo-Xian Chen, Fu-Yuan Zhu, Bei Gao, Kai-Long Ma, Youjun Zhang, Alisdair R. Fernie, Xi Chen, Lei Dai, Neng-Hui Ye, Xue Zhang, Yuan Tian, Di Zhang, Shi Xiao, Jianhua Zhang, and Ying-Gao Liu

A full-length transcriptome-based proteogenomic data set reveals the complexity of rice gene arrangement and the transcriptome's coding ability.

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