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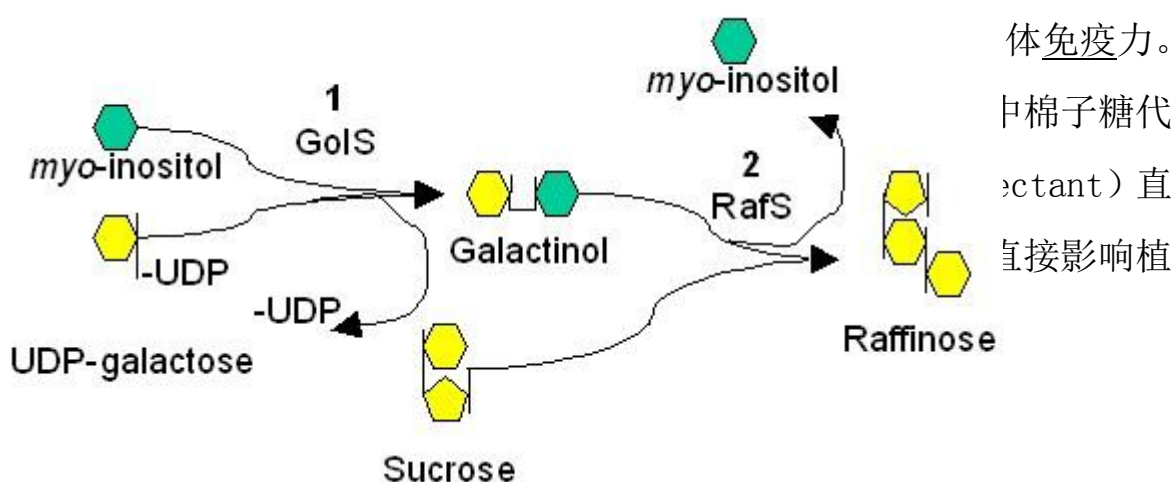
## 一、个人简介

赵天永, 男, 教授, 博士生导师, 无党派人员。2011年到西北农林科技大学生命科学院生化与分子生物学系工作。

## 二、研究方向

方向 1: 玉米抗旱分子生物学。

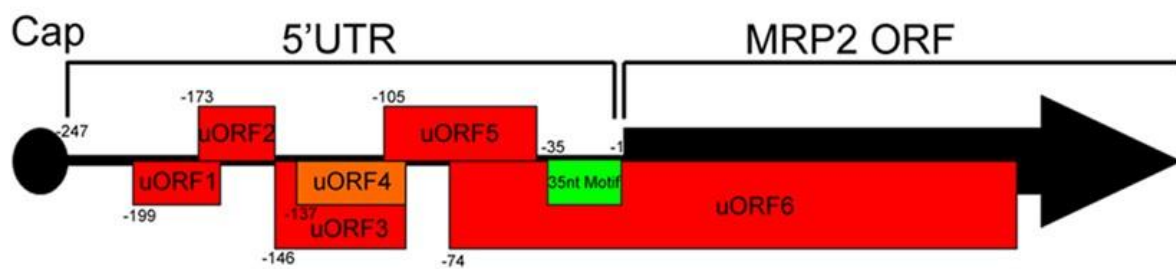
植物细胞中的棉子糖 (Raffinose) 是自然界中最知名的一种三糖, 由半乳糖、果糖和葡萄糖结合而成, 其在植物中的含量仅次于蔗糖。棉子糖虽然不能被肠道吸收, 却是人体肠道中有益菌的营养源和有效的增殖因



玉米中棉子糖相关工作尚未见报道。肌醇半乳糖苷合成酶 (Galactinol Synthase, 简称 GolS) 和棉子糖合成酶 (Raffinose Synthase, 简称 RafS) 是棉子糖合成的两个关键酶。而碱性半乳糖苷酶 ( $\alpha$ -Alkaline Galactosidase, 简称 AGAL) 能够水解棉子糖。本项目组已经克隆了玉米肌醇半乳糖苷合成酶和碱性半乳糖苷酶每个基因家族的各三个成员 (ZmGolS1-3 和 ZmAGAL1-3) 的 cDNA 并研究了它们在玉米种子萌发和不同发育阶段的表达及对逆境胁迫的响应 (Zhao, 2003; Zhao, 2004a; 2004b;

Zhao, 2006)。我们最近获得并鉴定了突变子 (mutator) 插入失活的 ZmGolS1-3 和 ZmAGAL1-3 基因的玉米突变体。本实验室的目标是系统研究玉米中控制棉子糖合成的关键酶 GolS 和 RafS 基因以及控制棉子糖水解的 AGAL 酶基因的功能, 研究它们在玉米发育过程中以及逆境胁迫条件下在各器官中的表达。同时克隆 GolS、RafS 基因启动子并鉴定在逆境条件下与其互作的转录因子。最终通过提高在逆境条件下 GolS 和 RafS 基因及其转录因子的表达量或降低 AGAL 基因的表达水平提高玉米的抗逆境能力。这一工作将阐明棉子糖合成途径在玉米耐逆中的作用与机制, 并将促进玉米抗逆境分子机理研究和玉米抗逆境育种实践。

方向 2: MRP2 基因的翻译调控。



我们的前期工作发现 MRP 2 5' UTR 上的 uORF (upstream open reading frame) 抑制下游 ORF 的翻译 (Zhang & Zhao, 2010)。而 IGF2BP1 (insulin growth factor 2 mRNA binding protein 1) 作为反式作用因子结合到 MRP2 5' UTR 上紧邻起始密码子的一个 35 核苷酸 RNA motif, 促进下游 ORF 的翻译。我们最近发现 MRP2 的 -24C>T SNP (占群体 18%) 影响相关蛋白因子与 35 核苷酸 RNA motif 的结合, 抑制下游 ORF 的翻译。我们将对相关蛋白因子与 35 核苷酸 RNA motif 及其含有 -24C>T SNP 的 RNA motif 之间的相互作用, 以及这种互作对下游 ORF 翻译的影响展开研究工作。

### 三、学习经历

1986-1990: 河北农业大学园艺系果树专业, 获学士学位。

1993-1998: 中国农业大学生物化学与分子生物学系, 硕博连读, 师从谢友菊教授和王国英教授从事玉米组织培养和遗传转化训练。获作物遗传育种专业博士学位。

2003-2011: 在 University of Kentucky 工作其间选修了<生物信息学>, <功能基因组>等研究生课程。

#### 四、工作经历

1990.7 - 1993.7: 河北科技师范学院园艺系教师, 从事果树育种课教学。

1998.10-2000.3: 美国加州大学伯克利分校植物与微生物学系博士后 (Department of Plant and Microbial Biology, U.C. Berkeley), 从事玉米基因组研究。

2000.4-2001.9: 美国肯塔基大学园艺系博士后 (Department of Horticulture, University of Kentucky), 从事玉米抗逆分子生物学研究。

2001.10-2003.8: 肯塔基大学植物病理系博士后 (Department of Plant Pathology, University of Kentucky), 从事真菌病毒学研究。

2003.9-2007.3: 肯塔基大学解剖与神经生物学系 Scientist I (Department of anatomy and neurobiology, University of Kentucky), 从事爱滋病毒侵染神经细胞的分子机理研究。

2007.4 - 2011: 肯塔基大学毒理研究中心 Scientist II (Graduate Center for Toxicology, University of Kentucky), 从事MRP2基因翻译调控研究并兼职于肯塔基大学基因芯片中心 (MicroArray Core Facility, University of Kentucky) 从事管理和技术支持工作。

#### 五、研究成果

A. SCI 论文全文:

Vandana Megaraj, Tianyong Zhao, Christian M Paumi, Phillip M. Gerk, Richard Kim and Mary Vore, 2011, Functional Analysis of Non-synonymous Single Nucleotide Polymorphisms of Multidrug Resistance Protein 2 (MRP2; ABCC2), *Pharmacogenetics and Genomics* (accepted) (IF2009=3.999).

Antony Athipozhy, Liping Huang, Wooton-Kee CR, Tianyong Zhao, Jungsuwadee P, Stromberg AJ, Mary Vore. 2011, Differential gene expression in liver and small intestine from lactating rats compared to age-matched virgin controls detects increased mRNA of cholesterol biosynthetic genes. BMC Genomics. 12(1):95 (Epub ahead of press). (IF2009=3.759)

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Tianyong Zhao, Mary H. Adams, Shi-Ping Zou, Nazira EL-Hage, Kurt F. Hauser, Pamela E. Knapp, 2007, Silencing the PTEN gene is protective against neuronal death induced by HIV-1 tat. *Journal of Neurovirology*. 13:1-10. (IF2009=2.336)

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Tianyong Zhao, J. Willis Corum III, Jeffrey Mullen, Robert B. Meeley, Timothy Helentjaris, David Martin, Bruce Downie, 2006, An alkaline  $\alpha$ -galactosidase transcript is present in maize seeds and cultured embryo cells, and accumulates during stress. *Seed Science Research*. 16:107-121. (IF2009=1.608)

Feiyu Tang, Yazhong Tao, Tianyong Zhao and Guoying Wang, 2006, In vitro production of haploid and doubled haploid plants from pollinated ovaries of maize (*Zea mays*). *Plant cell, tissue and organ culture*. 84(2): 233-237. (IF2009=1.271)

Tianyong Zhao, Richard Thacker, J. Willis Corum III, John C. Snyder, Robert B. Meeley, Ralph Obendorf, Bruce Downie, 2004,

Expression of the maize GALACTINOL SYNTHASE gene family. I)  
Expression of two different genes during seed development and  
germination. *Physiol. Plant.* 121(4):634-646. (IF2009=2.708)

Tianyong Zhao, David Martin, Robert B. Meeley, Bruce Downie,  
2004, Expression of the maize GALACTINOL SYNTHASE gene family. II)  
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influences accumulation of transcript in developing seeds and  
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processing of a Maize GALACTINOL SYNTHASE transcript is caused by  
heat stress. *Plant Science.* 165:245-256. (IF2009=2.05)

赵天永, 王国英, 谢友菊等, 1998, 玉米愈伤组织对草丁膦的抗性  
及氨基酸对这种抗性的影响. *植物学报* 40(11):1010-1014. (IF2009=1.395)

#### B. SCI 论文摘要

Tianyong Zhao, Baoxiang Yan and Mary Vore, 2009, A 35 nt RNA motif  
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protein 2 (MRP2, ABCC2) stimulates translation of downstream open  
reading frames (ORFs) and functions as an internal ribosomal entry  
site (IRES). *Hepatology.* 50(4):890A. (IF2009=10.840)

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Detection of differential gene expression in SREBP responsive genes  
in the liver of lactating rats using exon arrays. *Hepatology.*  
50(4):894A. (IF2009=10.840)

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Tianyong Zhao, M.S. Ghandour & Pamela. E. Knapp, 2006, Jimpy oligodendrocytes: Partial correction of the mutant phenotype by silencing the jimpy proteolipid protein gene. Journal of Neurochemistry. 96: 54. (IF2009=3.999)

Zou, SP, Adams, MH, Tianyong Zhao, El-Hage, N, Hauser, KF, Bruce-Keller, AJ, Knapp, PE, 2005, Transcription factor activity in astrocytes: interactions between HIV-1 Tat and opiates. Journal of Neurochemistry. 94: 36. (IF2009=3.999)

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Tianyong Zhao, W.M. Havens, S.A. Ghabrial., 2003, Overexpression of the cellular RNA-binding protein Hv-p68 enhances virus replication and fungal growth in mycovirus-infected *Helminthosporium victoriae* isolates. Phytopathology. 93(6):S95. (IF2009=2.223)

### C. 非 SCI 论文全文

张志宏, 吴禄平, 代红艳, 王国英, 赵天永, 毕晓颖, 杜国栋, 2001, 草莓主栽品种再生和转化研究. 园艺学报 28(3):189-193

赵天永, 黄忠, 王国英, 谢友菊等, 1997, 影响玉米基因枪转化效率的几个因素. 农业生物技术学报 5 (1) 35-39

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赵天永, 王国英, 1995, 果树的遗传转化研究 (文献综述). 园艺学研究进展 2:342-347

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#### D. 出版著作章节

1. 赵天永, 1997, 基因工程实验技术 p1-18 中国科学技术出版社, 王国英主编.

#### E. 参加学术会议情况

Tianyong Zhao, Yanbin Zhang, Baoxiang Yan, Sunnie R. Thompson, and Mary Vore, September, 2010, An RNA motif in 5' untranslated region (5' UTR) of Multidrug Resistance Protein 2 functions both as an Internal Ribosome Entry Site and a cap-dependent enhancer of translation, Translational Control (workshop), Cold Spring Harbor Lab, Long Island, New York (Poster).

Tianyong Zhao, Yanbin Zhang, Baoxiang Yan and Mary Vore, February, 2010, An RNA motif in 5' untranslated region (5' UTR) of Multidrug Resistance Protein 2 functions as an Internal Ribosome Entry Site, Protein Translation and Cancer meeting, San Diego, CA (Poster).

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resistance protein 2 (MRP2, ABCC2) stimulates translation of downstream open reading frames (ORFs) and functions as an internal ribosomal entry site (IRES). AASLD annual meeting. Boston, MA (Poster).

Antony T., Liping Huang, Tianyong Zhao, Clavia Wooton-Kee, Paiboon Jungsuwadee, Arnold Stromberg and Mary Vore, 2009, Detection of differential gene expression in SREBP responsive genes in the liver of lactating rats using exon arrays. AASLD annual meeting. Boston, MA (Poster).

Tianyong Zhao, Baoxiang Yan and Mary Vore, 2009, A 35 base pair (bp) RNA motif in the 5' -untranslated region (5' UTR) of Multidrug Resistance Protein 2 (MRP2; ABCC2) stimulates translation of a downstream open reading frame (ORF) and functions as an internal ribosomal entry site (IRES). The 6th Annual North American ABC Genetics Workshop, at NCI-Frederick, MD (oral presentation).

Athipposzhy, A.T., L.P. Huang, Tianyong Zhao, C.R. Wooton-Kee, P. Jungsuwadee, A. J. Stromberg, and M. Vore. 2009. Utilizing a mixed model approach to compare the lactating rat transcriptome against age-matched control virgins. BMC BIOINFORMATICS annual meeting, Knoxville, TN (Poster).

Tianyong Zhao, Mary Vore, 2008, Multidrug associated protein 1 localizes in Junction of cultured HL1 cells and mediated doxorubicin induced stress signal transmission between cells. Baltimore, MD, ABC meeting. (oral presentation).

Knapp, P., Tianyong Zhao, O. Taleb, and M. Ghandour. 2006. Correction of the abnormal phenotype of jimpy oligodendrocytes by silencing the mutant proteolipid protein. NEUROCHEMISTRY annual meeting. Portland, OR (oral presentation).

Tianyong Zhao, M.S. Ghandour & Pamela. E. Knapp, 2006, Jimpy oligodendrocytes: Partial correction of the mutant phenotype by silencing the jimpy proteolipid protein gene. Neurochemistry annual meeting, Portland, OR. (Poster)

Zou, SP, Adams, MH, Tianyong Zhao, El-Hage, N, Hauser, KF, Bruce-Keller, AJ, Knapp, PE, 2005, Transcription factor activity in astrocytes: interactions between HIV-1 Tat and opiates. Neurochemistry annual meeting, Madison, Wisconsin (Poster)

Tianyong Zhao, Shi-Ping Zou, Yelena V. Alimova, Kurt .F. Hauser, M.S. Ghandour & Pamela. E. Knapp, 2004, siRNA Induced PTEN Gene Silencing can be transmitted but can not be amplified in Mammalian CNS cells. American Society of Cell Biology annual meeting, Washington, D.C. (Poster)

Tianyong Zhao, W.M. Havens, S.A. Ghabrial., 2003, Overexpression of the cellular RNA-binding protein Hv-p68 enhances virus replication and fungal growth in mycovirus-infected *Helminthosporium victoriae* isolates. American Phytopathology Society annual meeting. Charlotte, NC. (Poster)

Tianyong Zhao, Robert Meeley, Kent Bradford, Bruce Downie, 2001, Gene expression of galactinol synthase and raffinose synthase in

maize seeds and Hi-2 callus cells, American Society of Plant Biology annual meeting. Providence, Rhode Island (Poster)

Tianyong Zhao, Robert Meeley, Kent Bradford, Bruce Downie, 2001, The function of maize galactinol synthase and raffinose synthase genes, Midwest ASPB annual meeting, Knox, Illinois (Oral presentation)

Tianyong Zhao, Guoying Wang, Youju Xie, 1998, Genetic modified maize plants with potato proteinase inhibitor II gene are insect resistant. XVIIIth International Congress of Genetics. Beijing, China (Poster)

Tianyong Zhao, Guoying Wang, Zhong Huang, Yunfang Zhang, Youju Xie, 1996, The resistance of maize immature embryos and its calli to the herbicide basta and the influence of some amino acids. The 2-nd Asia-Pacific Conference on Plant Cell and Tissue Culture. Beijing, China (Poster)

#### F. 基因文库序列

Tianyong Zhao, Havens, W. and Ghabrial, S.A. 2004. GenBank ACCESSION AY497010. *Helminthosporium victoriae* alcohol oxidase. overexpression of the alcohol oxidase/RNA-binding protein Hv-p68 in viruse-free *Helminthosporium victoriae* isolates does not induce a diseased phenotype. Plant Pathology, University of Kentucky, Lexington, Kentucky 40546-0312, USA

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synthase gene families in seeds and cultured cells by ABA, environmental stress and carbohydrate. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

Tianyong Zhao, Meeley, R. B., Bradford, K. J. and Downie, B. 2002. GenBank ACCESSION AF497508. *Zea mays* GALACTINOL SYNTHASE 2. Expression and regulation of the maize galactinol- and raffinose-synthase gene families in seeds and cultured cells by ABA, environmental stress and carbohydrate. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

Tianyong Zhao, Meeley, R. B., Bradford, K. J. and Downie, B. 2002. GenBank ACCESSION AF497509. *Zea mays* GALACTINOL SYNTHASE 3. Expression and regulation of the maize galactinol- and raffinose-synthase gene families in seeds and cultured cells by ABA, environmental stress and carbohydrate. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

Tianyong Zhao, Meeley, R. B., Bradford, K. J. and Downie, B. 2002. GenBank ACCESSION AF497510. *Zea mays* RAFFINOSE SYNTHASE 1. Expression and regulation of the maize galactinol- and raffinose-synthase gene families in seeds and cultured cells by ABA, environmental stress and carbohydrate. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

Tianyong Zhao, Meeley, R. B., Bradford, K. J. and Downie, B. 2002. GenBank ACCESSION AF497511. Zea mays RAFFINOSYL SYNTHASE 2. Expression and regulation of the maize galactinol- and raffinose-synthase gene families in seeds and cultured cells by ABA, environmental stress and carbohydrate. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

Tianyong Zhao, Meeley, R. B., Bradford, K. J. and Downie, B. 2002. GenBank ACCESSION AF497512. Zea mays RAFFINOSE SYNTHASE 3. Expression and regulation of the maize galactinol- and raffinose-synthase gene families in seeds and cultured cells by ABA, environmental stress and carbohydrate. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

Tianyong Zhao, Meeley, R. B., and Downie, B. 2002. GenBank ACCESSION AY192144 Zea mays GALACTINOL SYNTHASE 3 gene fragment. Aberrant processing of a Maize GALACTINOL SYNTHASE transcript is caused by heat stress. Horticulture, University of Kentucky, Room N-322C, Agriculture Science Center North, Lexington, KY 40546-0091, USA

#### G. 专利

Bruce Downie, Tianyong Zhao, Stress-responsive genes, regulatory elements, and methods of use for same (United States Patent 20050055748 A1)

#### 六、联系方式

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