

Amino acid sensor conserved from bacteria to humans

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Amino acids are the building blocks of life, and they are also recognized as signals by various receptors in bacteria, archaea, and eukaryotes. Despite their common basic structure, no universal mechanism for amino acid recognition is currently known. Here, we show that a subclass of dCache_1 (double domain found in calcium channels and chemotaxis receptors, family 1), a ubiquitous extracellular sensory domain, contains a simple motif, which recognizes the amino and carboxyl groups of amino acid ligands. We found this motif throughout the Tree of Life. In bacteria and archaea, this motif exclusively binds amino acids, including γ -aminobutyric acid (GABA), and it is present in all major receptor types. In humans, this motif is found in $\alpha 2\delta$ -subunits of voltage-gated calcium channels that are implicated in neuropathic pain and neurodevelopmental disorders and in a recently characterized CACHD1 protein. Our findings suggest that GABA-derived drugs bind to the same motif in human $\alpha 2\delta$ -subunits that binds natural GABA ligands in bacterial chemoreceptors. The exact location on the target protein and the mechanism of binding may enable future improvements of drugs targeting pain and neurobiological disorders.

Sensory Transduction in Microorganisms

Gordon Research Conference

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#	Session	Name	Affiliation	Poster Title
1	Monday/Tuesday	Agbekudzi, Alfred	Virginia Polytechnic Institute	Adaptation proteins are tethered to the carboxyl-terminal pentapeptide of <i>Sinorhizobium meliloti</i> chemoreceptors
2	Monday/Tuesday	Aronson, Mark	Boston University	Joint Theory-Experiment Investigation of c-di-GMP Accumulation as a Method for Signal Integration during <i>Bacillus subtilis</i> Biofilm Formation
3	Monday/Tuesday	Berry, Marissa	Ohio State University	Diversity of CheA domain architecture
4	Monday/Tuesday	Bhattacharyya, Souvik	The University of Texas at Austin	Iron Memory in <i>E. coli</i>
5	Monday/Tuesday	Bhattarai, Nabin	University of Texas, Austin	Aer mediates a repellent response to ROS/antibiotics in <i>E. coli</i>
6	Monday/Tuesday	Blankenchip, Chelsea	University of California San Diego	Control of bacterial immune signaling by a WYL domain transcription factor
7	Monday/Tuesday	Boon, Elizabeth	Stony Brook University	Discovery of nitric oxide-sensing hemoproteins and their roles in the regulation of bacterial biofilms
8	Monday/Tuesday	Bourret, Robert	University of North Carolina	A general method to analyze the sequence properties of protein domains in the context of parent protein architecture: A case study of CheW
9	Monday/Tuesday	Brasino, Michael	Oregon Health and Science University	Re-engineering the ComR Pheromone Receptor for Cancer Detection
10	Monday/Tuesday	Brock, Aaron	Virginia Polytechnic Institute and State University	The Role of Motility in the Thickness of <i>Borrelia burgdorferi</i> Peptidoglycan
11	Monday/Tuesday	Butcher, Ryan	Rice University	Real-time detection of response regulator phosphorylation in live bacteria

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40	Monday/Tuesday	Hatstat, A. Katherine	University of California, San Francisco	Protein design to engineer signal transduction in bacterial histidine kinases
41	Monday/Tuesday	Hazelbauer, Gerald	University of Missouri	Single-particle cryo-EM reveals the organization of a chemoreceptor transmembrane domain and provides insights into the kinase-off signaling state
42	Monday/Tuesday	Hood, Kara	Houston Methodist Research Institute	Topology of LiaF from <i>Enterococcus faecalis</i> Suggests Complex Interaction With LiaX Specific to Enterococcal Species
43	Monday/Tuesday	Hwang, YuneSahng	The University of Texas at Austin	A Second Role for the Second Messenger Cyclic-di-GMP in <i>E. coli</i> : Arresting Cell Growth by Altering Metabolic Flow
44	Monday/Tuesday	Jean-Pierre, Fabrice	Geisel School of Medicine at Dartmouth	Modeling polymicrobial interactions in the cystic fibrosis lung
45	Monday/Tuesday	Jiang, Shan	Max Planck Institute for Terrestrial Microbiology	Elucidate the mechanism of PhoQ inhibition by the small protein MgrB
46	Monday/Tuesday	Johnson, Steven	National Institutes of Health/National Cancer Institute	Structural Insights into Directional Switching of the Bacterial Flagellum
47	Monday/Tuesday	Jouline, Igor	The Ohio State University	Amino acid sensor conserved from bacteria to humans
48	Monday/Tuesday	Junkermeier, Eike H.	Humboldt-Universität zu Berlin, Germany	A novel locally c-di-GMP-controlled exopolysaccharide synthase required for bacteriophage N4 infection of <i>E. coli</i>
49	Monday/Tuesday	Kazmierczak, Barbara	Yale University	TBD
50	Monday/Tuesday	Kempfer, Megan	University of Oklahoma	A novel response regulator, RR_16880, controls sporulation in <i>Clostridioides difficile</i>
51	Monday/Tuesday	Kitts, Giordan	University of California, Santa Cruz	Characterization of a novel regulator of <i>Vibrio cholerae</i> biofilm formation and virulence.
1	Wednesday/Thursday	Klose, Karl	University of Texas San Antonio	Involvement of the <i>Vibrio cholerae</i> Histidine Kinase FlrB in post-transcriptional Flagellar Regulation