LMU | GRK2062

WHAT'S GOING ON

NEWSLETTER #5 2016

If the Research Training Group Molecular Principles of Synthetic Biology

FOCUS ON RESEARCH

Figure 1. *Ligand binding to the riboswitch results in expression of the reportergene luciferase in* Bacillus subtilis.

Dr. Sabine Schneider

Structured regulatory RNAs

Structured RNA elements are an important and quite unexplored drug target. Since its discovery, RNA was thought to act merely as intermediate infrastructural component (rRNA, tRNA) and messenger (mRNA) between genes and proteins. However, during the last decades, RNAs have proved to be tremendously versatile molecules. They play a pivotal role in numerous cellular key processes, such as metabolite sensing, catalytic regulation of gene expression, development and differentiation. Thus, RNA functions are almost as multifaceted, as those of proteins and they acquire intricate three-dimensional structures, thanks to which they carry out these tasks. Structured RNA elements in the 5'UTR of mRNAs regulate the translation through enabling or preventing interactions with proteins of the transcription and/or translational machinery. For example bacteria utilise so called riboswitches to link the bioavailability of metabolites to the expression of genes responsible for their biosynthesis or transport. Riboswitches consist of an aptamer domain and an expression platform. More than 20 families of riboswitches have been identified to date based on the types of metabolites they recognise. In all riboswitches ligand binding to the aptamer domain induces a conformational change resulting in regulation of transcription or translation. Since riboswitches are almost unique to bacteria and they are involved in the control of essential metabolic pathways, they have been acknowledged as alternative drug targets for the development of novel antibacterial agents.

In my group we have established a reverse reporter system in *Bacillus subtilis* that allows us investigate the activity of potential riboswitches of pathogenic bacteria and use it as a screening system to identify novel riboswitch binding molecules in libraries. Moreover this could also aid to engineer artificial cell regulatory systems using these characterised riboswitches.

GRK2062 PUBLICATION

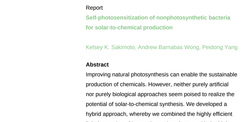
Chemical Science, 2016

Resolving the α-glycosidic linkage of arginine-rhamnosylated translation elongation factor P triggers generation of the first Arg^{Rha} specific antibody

Xiang Li, Ralph Kraftzyk, Jakub Maczeek, Yu-Lei Li, Yan Zou, Bernd Simon, Xing Pan, Qiu-Ye Wu, Fang Yan, Shan Li, Janosch Hennig, Kirsten Jung, Jürgen Lassak and Hong-Gang Hu

Abstract

A previously discovered posttranslational modification strategy - *arginine rhamnosylation* - is essential for elongation factor P (EF-P) dependent rescue of polyproline stalled ribosomes in clinically relevant species such as *Pseudomonas aeruginosa* and *Neisseria meningitidis*. However, almost nothing is known about this new type of *N*-linked glycosylation. In the present study we used NMR spectroscopy to show for the first time that the α anomer of rhamnose is attached to Arg32 of EF-P, demonstrating that the corresponding glycosyltransferase EarP inverts the sugar of its cognate substrate dTDP-β-L-rhamnose. Based on this finding we could realise the synthesis of an α-rhamnosylated arginine containing peptide antigen in order to raise the first anti-rhamnosyl arginine specific antibody (anti-Arg^{Rha}). Using ELISA and Western Blot analyses we demonstrated both its high affinity and specificity without any cross-reactivity to other *N*-glycosylated proteins. Having the anti-Arg^{Rha} at hand we were able to visualize endogenously produced rhamnosylated EF-P. Thus, we enter the antibody to be not only important to monitor EF-P rhamnosylation in diverse bacteria but also to identify further rhamnosyl arginine containing proteins. As EF-P rhamnosylation is essential for pathogenicity, our antibody might also be a powerful tool in drug discovery.



Full text: http://dx.doi.org/10.1039/C5SC02889F

EVENTS

Berufsbilder für Biologinnen

On November 18, 2016 starting at 2 pm there will be a mini-symposium with female biologists talking about their career path and requirements of their current position.
Of course the symposium will be open for everybody.

Speakers:
Prof. Dr. Susanne Gebhard, University of Bath
Nina Köhler, Bayr. Landesamt für Lebensmittelsicherheit und Gesundheit
Dr. Kerstin Lassak, law office V.O. Patents & Trademarks
Dr. Martina Rauschmeier, Roche Pharma AG
Location: B00.019, LMU Biocenter

Please note that the event will be held in German as working in these occupational fields mean to speak fluently German.

Upcoming Transferable Skills Courses

Adobe Illustrator
Andreas Binder will hold this course on the 13th and 14th of October 2016 in room G00.037 at LMU Biocenter. The workshop will cover both basic and more advanced functions of the software, which will be helpful to generate scientific posters, figures and presentations (more details). There is only one spot left.
Registration: grk2062@bio.lmu.de.

JOURNAL CLUB

Science 351 (6268), 74-77

Report
Self-photosensitization of nonphotosynthetic bacteria for solar-to-chemical production

Kelsey K. Sakimoto, Andrew Barnabas Wong, Peidong Yang

Abstract

Improving natural photosynthesis can enable the sustainable production of chemicals. However, neither purely artificial nor purely biological approaches seem poised to realize the potential of solar-to-chemical synthesis. We developed a hybrid approach, whereby we combined the highly efficient light harvesting of inorganic semiconductors with the high specificity, low cost, and self-replication and -repair of biocatalysts. We induced the self-photosensitization of a nonphotosynthetic bacterium, *Moorella thermoacetica*, with cadmium sulfide nanoparticles, enabling the photosynthesis of acetic acid from carbon dioxide. Biologically precipitated cadmium sulfide nanoparticles served as the light harvester to sustain cellular metabolism. This self-augmented biological system selectively produced acetic acid continuously over several days of light-dark cycles at relatively high quantum yields, demonstrating a self-replicating route toward solar-to-chemical carbon dioxide reduction.

Full text: http://dx.doi.org/10.1126/science.aad3317

MISCELLANEOUS

Newly established graduate network in Munich

The **Life Science Graduate Network (LSGN)** is a new-born organization that aims to connect the life-science graduate schools in Munich. On **October 12th, there will be a big Get-to-know event** for all PhD students from different life science graduate schools. The event will take place in the foyer at the main entrance of the LMU Biozentrum in Martinsried (Großhadernerr Str. 2) between 19:00-23:30. LSGN is just born, and to define its role it needs you! What would you expect from this network? Beverages, snacks and music will help fine-tuning the atmosphere. **Don't miss this!**

Live streamed only conference: Unlocking the potential of synthetic biology to enhance human health

September 27 - 29, 2016
This live streamed conference will discuss how the design and construction of new biological parts, devices, and systems, plus the re-design of existing, natural biological systems will be used for enhancing human health. Invited speakers from around the world will give talks, who you might not otherwise have access to.
Website

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