

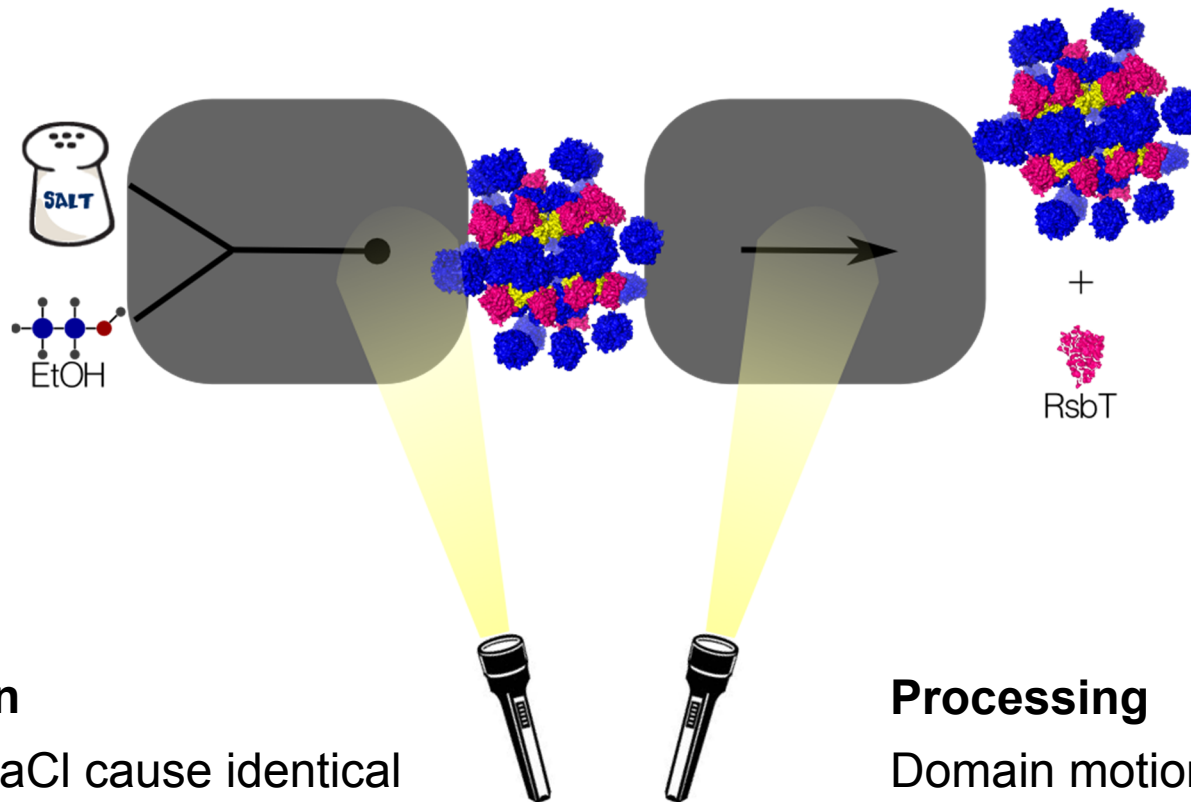
Conclusion of the Stressosome Models

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Illuminating Processes of Stressosome Activation



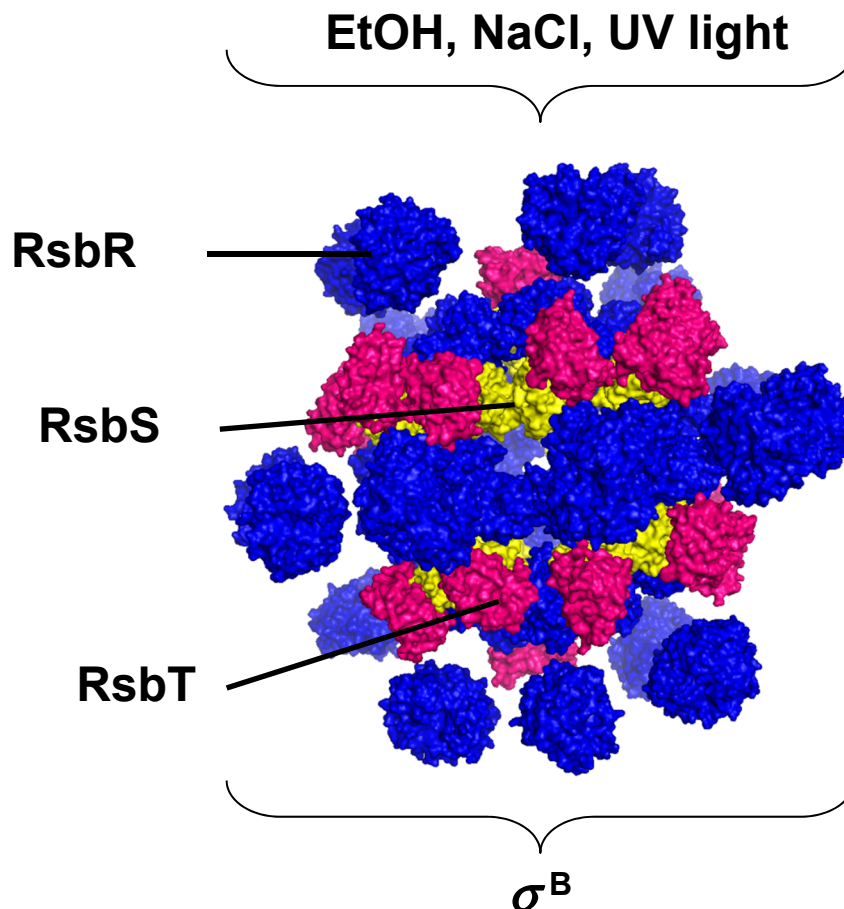
Activation

EtOH & NaCl cause identical stressosome response.

Processing

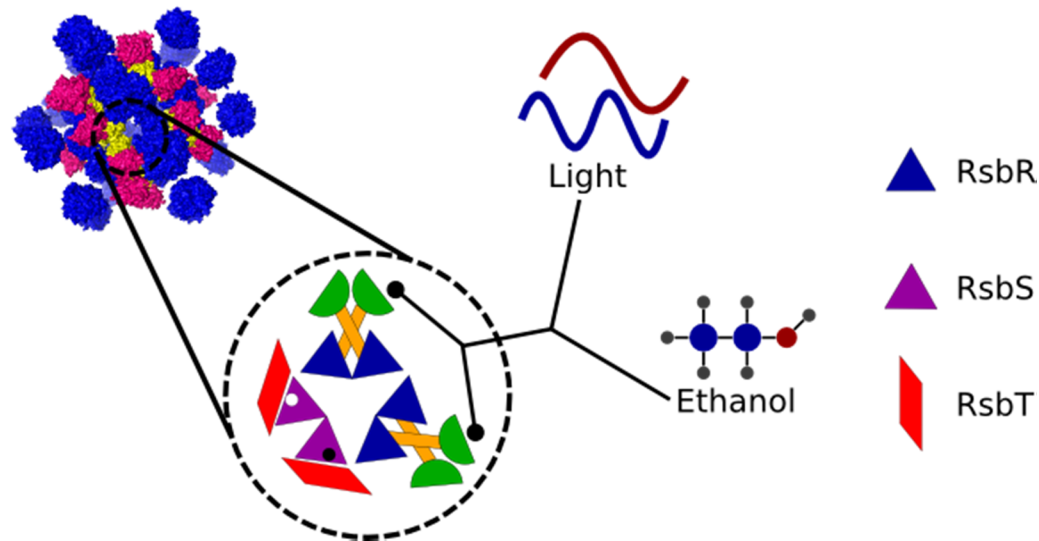
Domain motions between RsbR and RsbT transmit the activation signal.

Structure and Function of the Stressosome



- Responsive to various stimuli
- Icosahedron with 3 proteins
- Cytoplasmic RsbT activates σ^B

Information Transmission

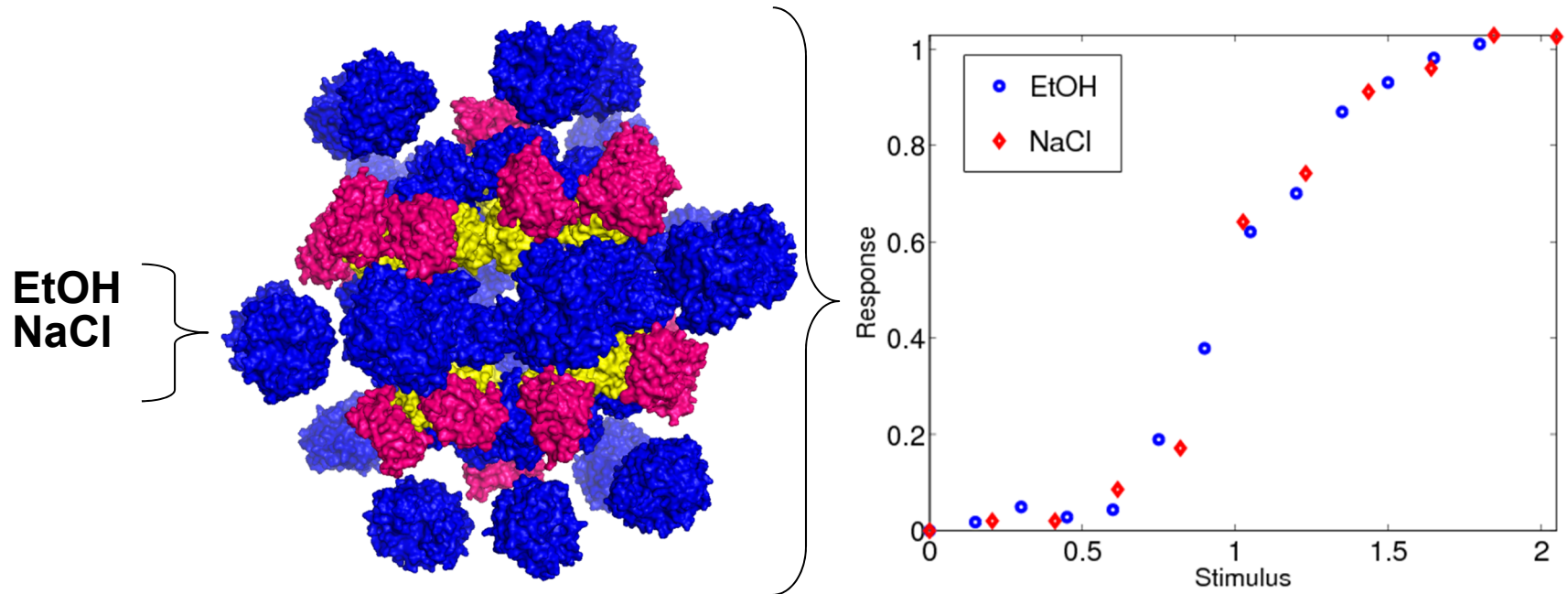


- Signal reception: RsbR N-terminus
- Stimulus conversion: phosphorylations and interactions
- Information transmission: domain motions
- Effect: dissociation of RsbT

Open Questions

1. How are different stimuli perceived?
 - Dose-Response measurements for different stimuli to test the effect of protein interactions.
2. How is the signal transmitted from the sensor to the effector?
 - Geometric models of the icosahedral structure to find general rules of motion.

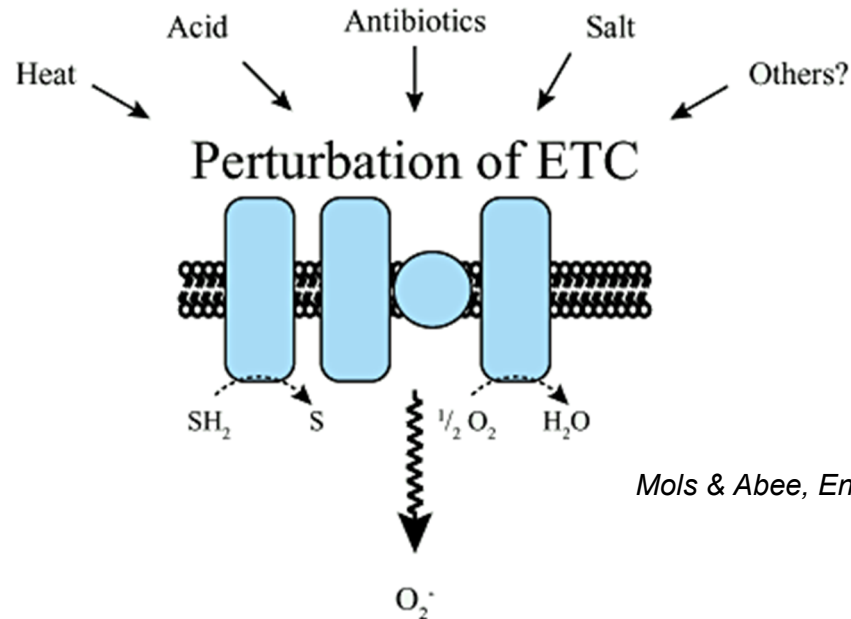
Explaining Identical Dose-Response



➤ EtOH & NaCl are processed identically, because:

1. they cause identical modifications of the sensor.
2. they induce a common secondary signal transducer.

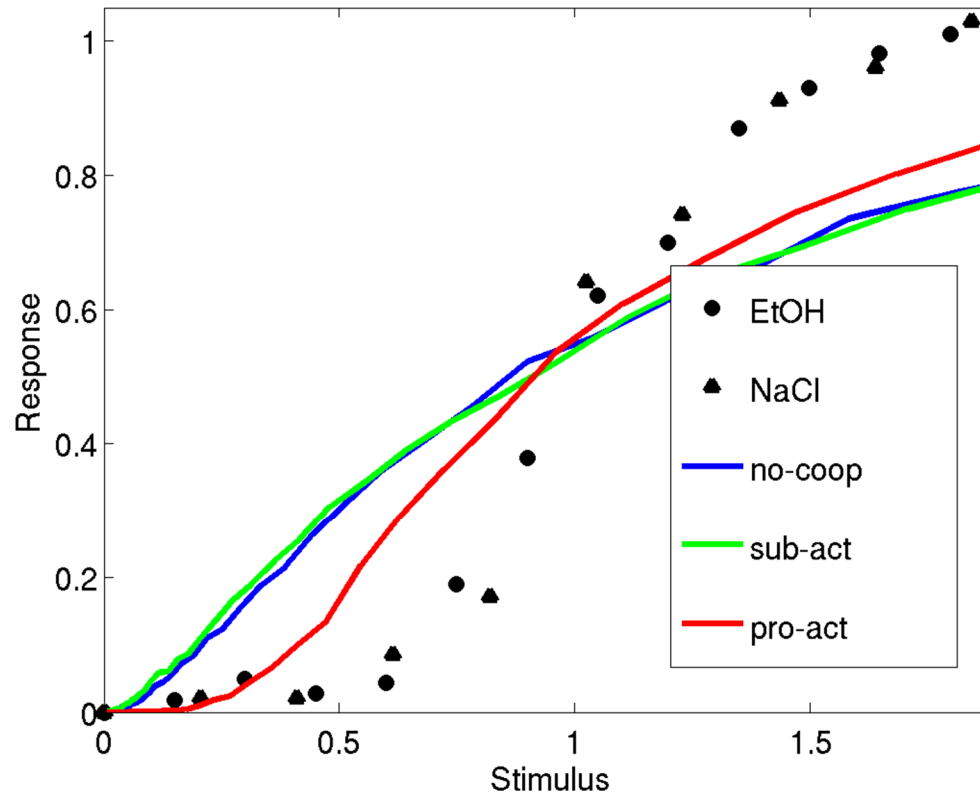
Support for a Secondary Signal Transducer



- Perturbation of the electron transport chain (ETC) generates reactive oxygen species (ROS)
- ROS have an intimate relation with the general stress response:
 - ROS are important inducers of the general stress response.
 - Majority of response proteins protect against or repair oxidative stress.

Höper et al., *J. Bacteriol.* 187, 2810 (2005); Reder et al., *J. Bacteriol.* 194, 3601 (2012)

In silico Reproduction of Dose-Response Curve

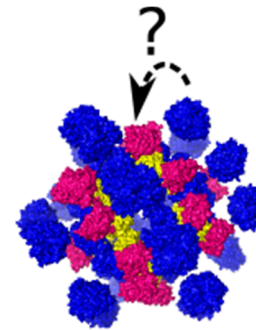
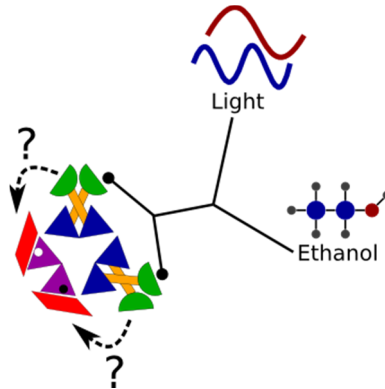


➤ Sigmoidal Dose-Response Curve reproduced if:

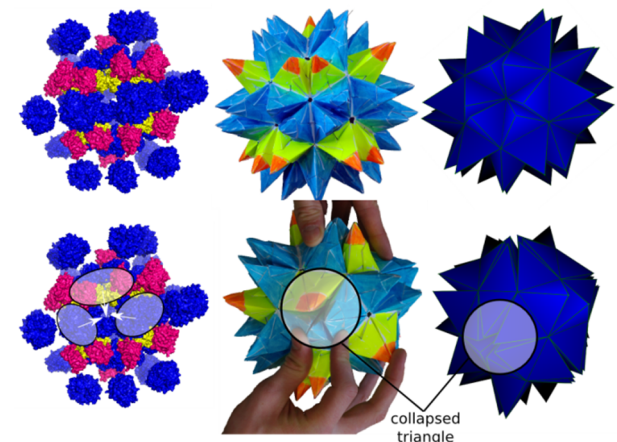
RsbR-P stimulates RsbT kinase activity.

Liebal et al., Submitted for publication (2012)

Domain Motions can Transmit the Activation Signal

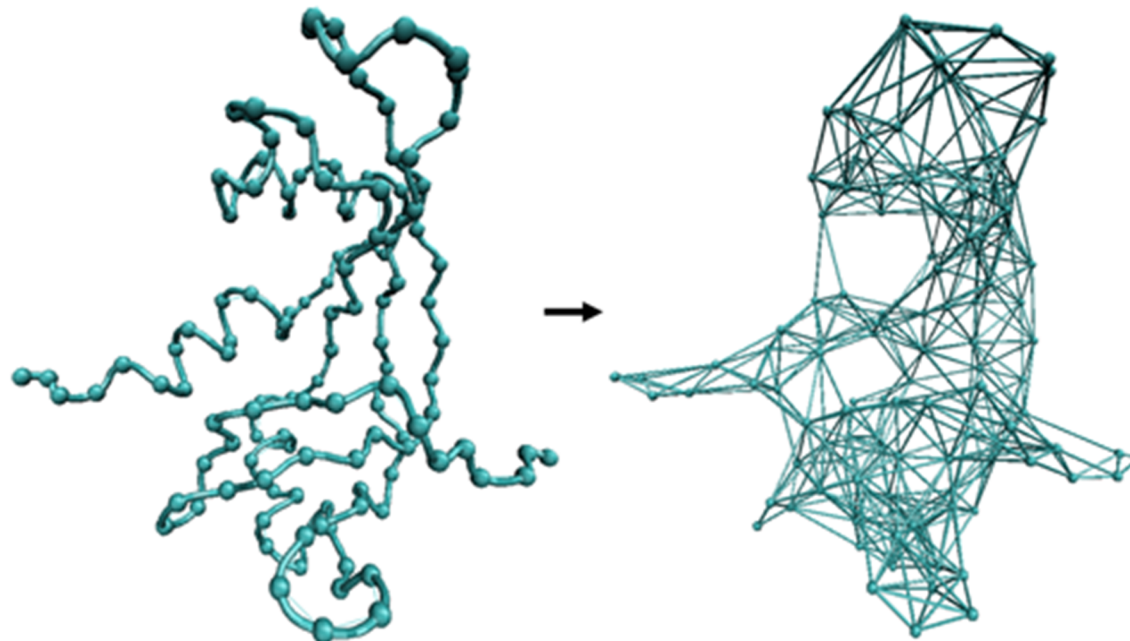


- No direct contact between signal receiver RsbR and effector RsbT.
 - How is the information transmitted?
- Geometric models of icosahedra show a concerted motion of domains.
- Collapse of a triangle of dimers possible with geometric distances preserved.
- YtvA performs scissor-like motions upon light stimulation.

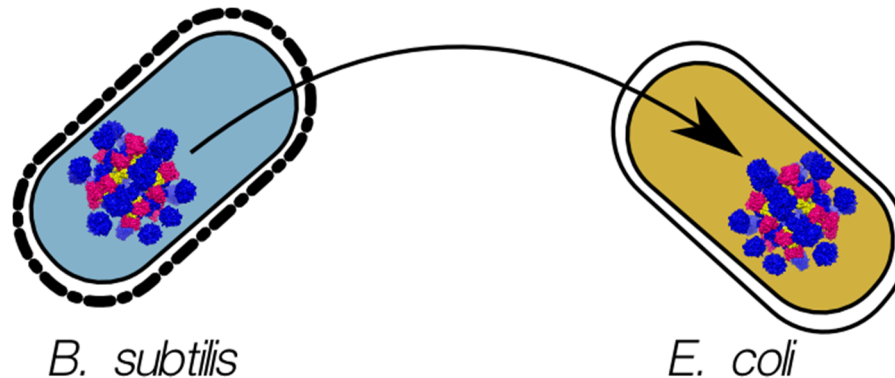


Outlook: Molecular dynamic Modelling of Domain Motions

- Constructing an elastic network model of the stressosome.
- Approximating structure and interactions by a low resolution grid.
- Analysing possible motions of domains.
- Cooperation with Rebecca Wade in Heidelberg, SysmoLAB.



Vision: Light-Controlled Expression in *E. coli*



- Stressosome controlled σ^B was transplanted to *E. coli*.
Scott et al., Biochem. Biophys. Res. Commun. 257, 106 (1999)
- Fully light-sensitive stressosome was constructed in *B. subtilis*.
van der Steen, J. et al. J Bacteriol, 2012, 194, 1708
- Light-sensitive YtvA was used for light induced expression in *E. coli*.
Ohlendorf, R. et al. J Mol Biol, 2012, 416, 534

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concepts and simulation



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methods and analysis



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