

MS07-P07 | BEETLE LUCIFERASES AND THEIR COLOR EMISSION

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The different colors of light emitted by bioluminescent beetles ranging from yellow–green to red are related to slightly different enzymes (luciferases) that catalyze the same two–stage chemical reaction, conversion of luciferin to oxyluciferin in presence of ATP and oxygen. However, luciferases with known crystal structures emit only green light with several mutations resulted in red emission (λ_{max} 610 nm) that is still far from the emission of the only red-emitting beetle luciferases (623 nm) from *Phrixothrix hirtus* (RE_{ph}). To shed light on the mechanism of color “tuning” in beetle luciferases, we determined the crystal structure of RE_{ph} in addition to a blue-shifted green-emitting luciferase from the firefly *Amydetes vivianii* (GB_{Av}). The structure of RE_{ph} was found to be an oligomer with monomers with a/b structural fold, similar to other known luciferase structures. The active site is located between the large N-terminal and small C-terminal domains, where it opens or closes by motion of the latter. Multiple mutations were introduced in two loops to evaluate their roles in the emission color. First, loop^{346–361} at the bottom of the active site was found to have an effect on the energy of the emitted light. However, loop^{346–361} contains amino acids that affected emission of the RE_{ph} and GB_{Av} luciferases.