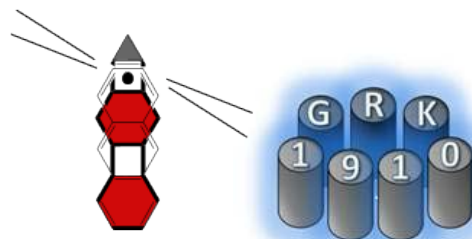


Vortrag im Rahmen des



GRK 1626/2 – Chem. Photokatalyse

GRK 1910/1 – Medicinal Chemistry of  
selective GPCR ligands

***Dr. Mélanie Hall***

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*“Development of Biocatalytic Tools for the  
Synthesis of Enantiopure Molecules”*

**29.10.2014  
17:15 Uhr, H46**

## Development of Biocatalytic Tools for the Synthesis of Enantiopure Molecules

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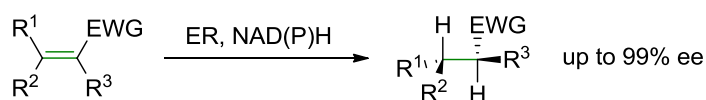
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The implementation of biocatalysis in synthetic routes towards enantiopure molecules has proven to be a viable and powerful alternative to classical ‘all’ chemical processes.<sup>[1]</sup> Based on two examples, strategies to develop biocatalytic tools to be used by chemists will be presented, while focusing on important mechanistic considerations.

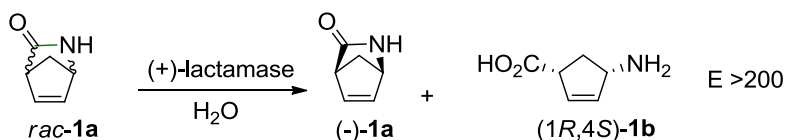
A. The asymmetric reduction of activated alkenes catalyzed by ene-reductases from the Old Yellow Enzyme (OYE) family of flavoproteins has been applied to a broad range of substrates. Diversity at the protein level allows the stereocomplementary reduction of various alkenes, including  $\alpha,\beta$ -unsaturated carbonyl and nitro compounds, nitriles and lactones. Important guidelines can be delineated from the abundant data while new features important for synthetic applications are still emerging (Scheme 1A).<sup>[2]</sup>

B. The enzyme-catalyzed hydrolysis of  $\gamma$ -lactams appears to date limited to 2-azabicyclo[2.2.1]hept-5-en-3-one (Vince lactam) and few derivatives thereof. A search for new lactamase activity built on analysis of crystal structures and amino acid sequences of known lactamases was initiated. Enantiocomplementary activities were identified and cases of perfect kinetic resolution were obtained (Scheme 1B).<sup>[3]</sup> From these data, a classification of lactamases based on amino acid sequence and protein fold is proposed.

### A Ene-reductase catalyzed reduction of activated alkenes



### B Kinetic Resolution of Vince Lactam



**Scheme 1.** Biocatalytic tools for synthesis of enantiopure molecules: A. ene-reductases; B. lactamases.

## References

- [1] J. S. Carey, D. Laffan, C. Thomson, M. T. Williams, *Org. Biomol. Chem.* **2006**, *4*, 2337; M. Hall, A. S. Bommarius, *Chem. Rev.* **2011**, *111*, 4088.
- [2] R. Stuermer, B. Hauer, M. Hall, K. Faber, *Curr. Opin. Chem. Biol.* **2007**, *11*, 203; K. Faber and M. Hall, In: *Science of Synthesis: Biocatalysis in Organic Synthesis* (Eds.: K. Faber, W.-D. Fessner, N. J. Turner), in press.
- [3] Z. Assaf, E. Eger, Z. Vitnik, W. M. F. Fabian, D. Ribitsch, G. M. Guebitz, K. Faber, and M. Hall, *ChemCatChem*, *6*, 2517.