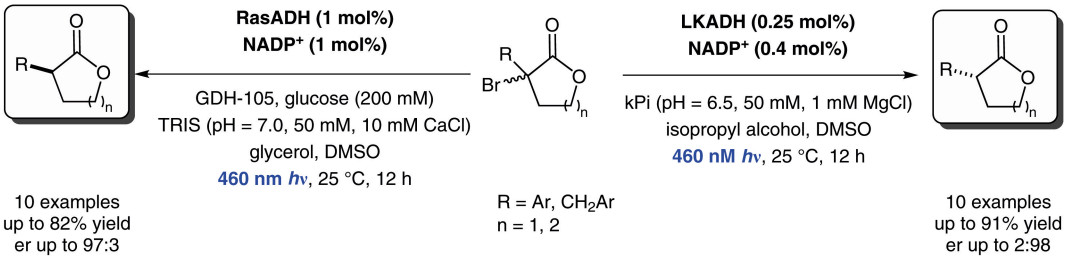
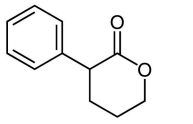
M. A. EMMANUEL, N. R. GREENBERG, D. G. OBLINSKY, T. K. HYSTER* (PRINCETON UNIVERSITY, USA)

Accessing Non-Natural Reactivity by Irradiating Nicotinamide-Dependent Enzymes with Light
Nature **2017**, *540*, 414–417.

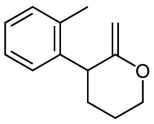
Nonnatural Reactivity of Cofactor-Dependent Enzymes upon Light Irradiation



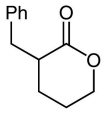
Selected examples:



RasADH: 51% yield
er = 92.5:7.5
LKADH: 81% yield
er = 2:98

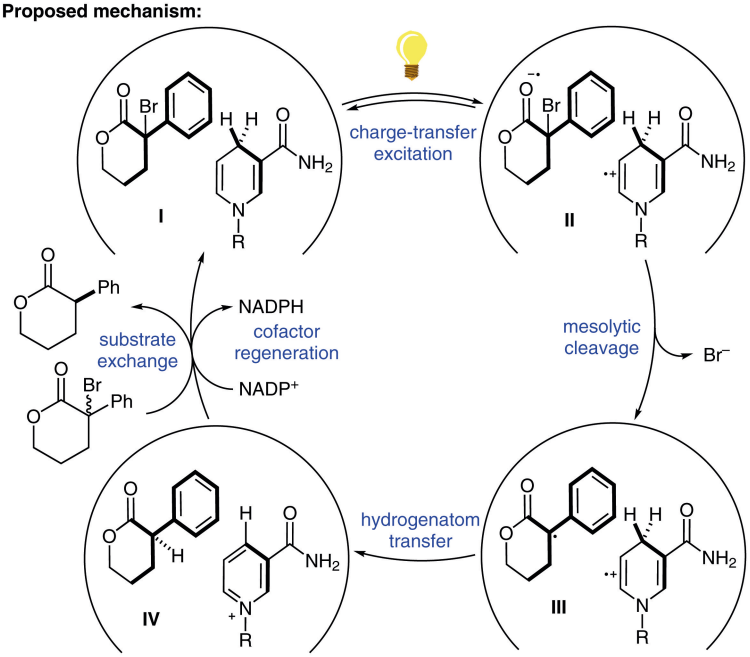


RasADH: 81% yield
er = 81:19
LKADH: 80% yield
er = 6:94



RasADH: 29% yield
er = 80:20
LKADH: 80% yield
er = 4:96

Proposed mechanism:



Significance: An asymmetric light-mediated reductive debromination of racemic α-bromolactones is reported by the Hyster group. The combination of a ketoreductase derived from either *Lactobacillus kefiri* (LKADH) or *Ralstonia* (RasADH), $NADP^+$, and blue LED light furnished the desired lactones in high yields (≤91%) and good to excellent enantioselectivities (er ≤ 98:2).

SYNFACTS Contributors: Benjamin List, Grigory A. Shevchenko
Synfacts 2017, 13(03), 0309 Published online: 15.02.2017
DOI: 10.1055/s-0036-1590002; **Reg-No.:** B00117SF

Comment: A great challenge in biocatalysis is the discovery and development of novel reaction pathways and catalytic functions. The authors demonstrate that a nicotinamide-dependent ketoreductase can change its natural function from carbonyl reduction to that of a radical initiator and chiral source of hydrogen, simply by irradiation of the cofactor with light. This strategy leads to novel and selective radical-mediated reactions.

Category
Organo- and Biocatalysis

Key words
ketoreductase
photoexcitation
nicotinamide-dependent enzymes
debromination
lactones