Volume 95 Issue 2 | p. 9 | Concentrates
Issue Date: January 9, 2017

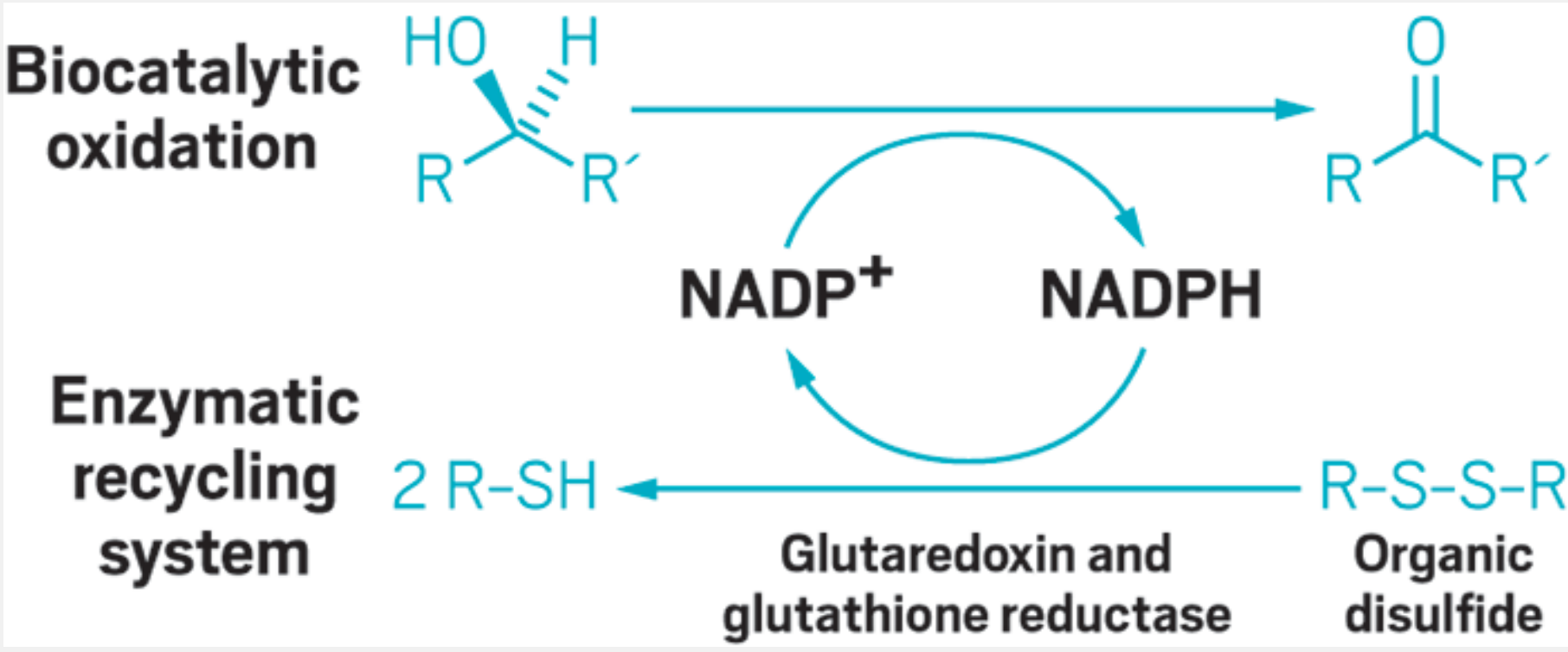
Biocatalytic cofactor recycled efficiently

Process could reduce cost of making NADP+ by more than five orders of magnitude

By ***Stu Borman***

SCIENCE & TECHNOLOGY CONCENTRATES

Oxidoreductase enzymes are used extensively as biocatalysts for industrial and academic reactions, including pharmaceutical synthesis. But they almost exclusively require expensive cofactors such as $NADP^+$, the oxidized form of the biological cofactor nicotinamide adenine dinucleotide phosphate. The reagent currently costs about $22,000 per mole. Enzymes that can recycle it from its reduced form, NADPH, have drawbacks that have limited their use, such as low activity, unwanted by-product generation, and short lifetimes. Guided by nature, which uses an $NADP^+$-producing glutathione reductase system to maintain a reducing environment within cells, researchers have now developed a similar system for regenerating $NADP^+$ from NADPH. Rudolf K. Allemann of Cardiff University and coworkers devised the system, which uses an organic-disulfide oxidizing agent and bacterial glutaredoxin and glutathione reductase to regenerate $NADP^+$ (*ACS Catal.* 2016, DOI: **10.1021/acscatal.6b03061 <http://cgi.cen.acs.org/cgi-bin/cen/trustedproxy.cgi?redirect=http://pubs.acs.org/doi/abs/10.1021/acscatal.6b03061?source=cen>**). The primary recurrent cost is for the inexpensive organic disulfides, so the process could reduce the price of $NADP^+$ to about $0.05 per mole, a more than five-order-of-magnitude improvement. The system, which “is superior to all existing methods” for regenerating $NADP^+$, “offers many advantages for commercial and academic users,” the researchers say.



A new system uses bacterial enzymes and an organic disulfide to recycle $NADP^+$ economically.

Credit: *ACS Catal.*

Chemical & Engineering News
ISSN 0009-2347