



CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : Université Clermont Auvergne
INP Clermont Auvergne

Mardi 25 novembre à 16 h

Amphi Rémi (site des Cézeaux)

Caroline E. PAUL

*Biocatalysis section, Department of Biotechnology, Delft University of Technology,
Delft, The Netherlands*

Biocatalytic approaches with cofactor tuning to produce chiral intermediates

Catalysis drives the production of most modern chemicals, yet traditional processes often rely on scarce or toxic metals, harsh conditions, and generate substantial waste. Nature has evolved fascinating catalysts, enzymes, to perform diverse chemical reactions. These offer a sustainable alternative, as enzymes operate under mild conditions with exquisite selectivity, making them highly attractive for industrial manufacture of fine chemicals and pharmaceuticals.

In particular, nicotinamide adenine dinucleotide (NAD)-dependent oxidoreductase enzymes can catalyze an impressive array of redox reactions with selectivities rarely achieved by traditional catalysts. However, their industrial use is limited by the stability, cost, and efficiency of natural cofactors. To address this, we investigate synthetic nicotinamide analogues as alternative cofactors to improve economic viability and modulate reaction performance.^[1]

In this lecture, I will present our recent advances in understanding how oxidoreductases such as alcohol dehydrogenases and ene reductases accept these cofactor analogues, and how this knowledge can be leveraged to expand their reactivity. Through repurposing enzyme mechanisms, we aim to unlock new biocatalytic routes toward valuable fine chemicals and pharmaceuticals.^[2]

References

- [1] a) A. Guarneri, W. J. H. van Berkel, C. E. Paul, *Curr. Opin. Biotechnol.* **2019**, *60*, 63-71; b) H. A. Reeve, J. Nicholson, F. Altaf, T. H. Lonsdale, J. Preissler, L. Lauterbach, O. Lenz, S. Leimkuhler, F. Hollmann, C. E. Paul, K. A. Vincent, *Chem. Commun.* **2022**, 58, 10540-10543.
- [2] a) A. E. Wolder, C. M. Heckmann, P.-L. Hagedoorn, D. J. Opperman, C. E. Paul, *ACS Catal.* **2024**, *14*, 15713-15720; b) C. M. Heckmann, D. J. Heyes, M. Pabst, E. Otten, N. S. Scrutton, C. E. Paul, *J. Am. Chem. Soc.* **2025**, *147*, 18618-18625.

Coordinateurs : Alain DEQUIDT ☎ 33 473 407 194 courriel : alain.dequidt@uca.fr

Kévin LEMOINE ☎ 33 473 407 513 courriel : kevin.lemoine@uca.fr

Institut de Chimie de Clermont-Ferrand (ICCF-UMR 6296)

Université Clermont Auvergne, 24, avenue Blaise Pascal, TSA 80026 63178 AUBIERE cedex-France