BIOTRANS
LA ROCHELLE 2023

N°1418 / PC

TOPIC(s) : Artificial enzymes and de-novo enzyme design / Industrial biocatalysis

Electrophile promiscuity of KdoS and AroS phosphoenolpyruvate (PEP) dependent aldolases in aldol addition reactions

AUTHORS

Mehmet Mervan ÇAKAR / FACULTY OF CHEMICAL ENGINEERING AND TECHNOLOGY, UNIVERSITY OF ZAGREB, SAVSKA C. 16, ZAGREB
Karel HERNÁNDEZ / CATALONIA INSTITUTE FOR ADVANCED CHEMISTRY-IQAC-CSIC, DEPT. CHEMICAL BIOLOGY AND MOLECULAR MODELLING, JORDI GIRONA 18-26, BARCELONA
Theofania Pagona ANDREADAKI / PROZOMIX LIMITED, STATION COURT, HALTWHISTLE, NORTHUMBERLAND
Simon CHARNOCK / PROZOMIX LIMITED, STATION COURT, HALTWHISTLE, NORTHUMBERLAND
Zvjezdana FINDRIK BLAŽEVIĆ / FACULTY OF CHEMICAL ENGINEERING AND TECHNOLOGY, UNIVERSITY OF ZAGREB, SAVSKA C. 16, ZAGREB
Pere CLAPÉS / CATALONIA INSTITUTE FOR ADVANCED CHEMISTRY-IQAC-CSIC, DEPT. CHEMICAL BIOLOGY AND MOLECULAR MODELLING, JORDI GIRONA 18-26, BARCELONA

PURPOSE OF THE ABSTRACT

The formation of carbon–carbon bonds is strategic reaction in organic synthesis as it allows for the construction of the carbon scaffolds of organic molecules to generate more complex compounds from simpler ones1. 2-keto-3-deoxyoetosonic acid 8-phosphate synthase (KdoS, EC 2.5.1.55) and 3-deoxy-D-arabino-heptulosonic acid 7-phosphate synthase (AroS, EC 2.5.1.54) catalyze the irreversible addition of phosphoenolpyruvate (PEP) to D-arabinose 5-phosphate (Ara5P) and D-erythrose-4-phosphate (Ery4P) to yield 3-deoxy-D-manno-octulosonate-8-phosphate (KDO-8-P) and 3-deoxy-D-arabino-heptulosonic acid 7-phosphate (DAHP), respectively.

In this communication, metagenomic libraries of KdoS and AroS were screened to identify promising candidates capable of catalyzing the promiscuous aldol addition of phosphoenolpyruvate to aliphatic aldehydes (e.g. 2-(benzyloxy)acetaldehyde, 2-phenylacetaldehyde and 3-phenylpropanal)3 (Scheme 1).

Acknowledgements: This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 956631

FIGURES

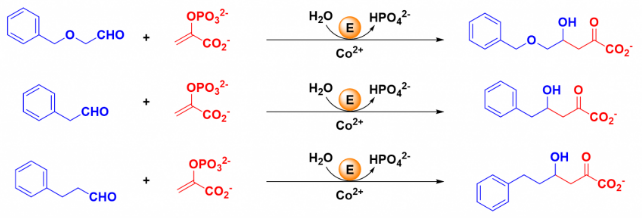

FIGURE 1

Scheme 1.

KdoS and AroS homologues from Prozomix panels catalyzed promiscuous aldol addition of phosphoenolpyruvate to aliphatic aldehydes.

FIGURE 2

KEYWORDS

PEP-Dependent Synthase | Enzyme Promiscuity | Aldol addition | Biocatalysis

BIBLIOGRAPHY

[1] Schmidt, N. G., Eger, E. & Kroutil, W. B. ACS Catal. 2016, 6, 4286-4311.

[2] Fessner, W.-D. & Walter, C. 1996, 184, 97-194.

[3] Moreno, C. J., Hernández, K., Charnok, S. J., Gittings, S., Bolte, M., Joglar, J., Bujons, J., Parella, T., Clapés, P. ACS Catal. 2021, 11, 4660-4669.