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Multi-enzymatic cascade for Sustainable Biosynthesis of Tryptamine and Tryptamine Analogues and Future Scalability Towards a Closed-Loop Semi-Automated Process

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PURPOSE OF THE ABSTRACT

Tryptamine is a biogenic amine that is formed from the catabolism of tryptophan. Despite its well-known hallucinogenic properties, recent research has demonstrated potential applications of tryptamine and its analogues, 5-methoxytryptamine and 5-hydroxytryptamine, in the treatment of depression and Post Traumatic Stress Disorder (PTSD). [1] Moreover, these analogues serve as precursors for two other widely used neurotransmitters, 5-hydroxytryptamine, commonly known as Serotonin, and N-acetyl-5-methoxytryptamine, better known as melatonin, which are utilized as food supplements and nutraceuticals.[2] This study focuses on the continuous production of acetylated tryptamine products at a scale of 50 mM using cost-effective starting materials such as Serine and Indole or its 5-substituted analogues. The initial building blocks are modified through a three-step cascade reaction involving the enzymes tryptophanase (EcTnaA)[3], decarboxylase (RgTDC) [4] and acyltransferase (MsAcT) [5], with yields up to a 100% demonstrating the feasibility of this approach for the production of acetylated tryptamine compounds.

FIGURES

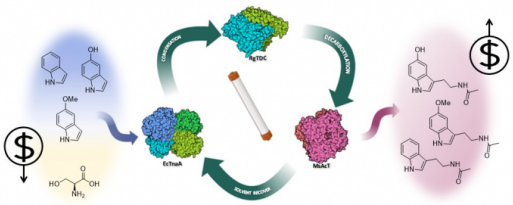

FIGURE 1

three steps closed-loop process for the synthesis of tryptamine analogues

The biosynthesis of tryptamine analogues from serine and indole analogues goes through 3 enzymatic steps: an E. coli tryptophanase (EctnaA) condenses the first two building blocks. The obtained tryptophan (or its derivatives) is the substrate for a decarb

FIGURE 2

KEYWORDS

flow-biocatalyses | tryptamine | sustainability | enzyme immobilisation

BIBLIOGRAPHY

[1] Elsouri, et al , Cureus 2022, 14 (5), e25235.

[2] Arnao B.; Hern□ndez-Ruiz, Josefa, Molecules 2018, 23 (1)

[3] Ku, Shao Yang; et al, Acta crystallographica. Section D, Biological crystallography 62 (Pt 7), 2006, pp. 814-823

[4] Williams, B et al. ,Cell host & microbe, 2014, 16 (4), pp. 495-503.

[5] Contente, M. L ; Pinto, A. ; Molinari, F; Paradisi, F., Adv. Synth. Catal. 2018, 360 (24), pp. 4814-4819.