Synthesis of Carbon and Hydrogen Isotopomers of L-Tyrosine

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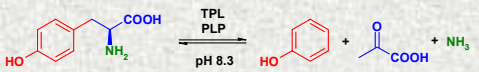
Summary

[3-^{14}C]-L-tyrosine was obtained via intermediate [3-^{14}C]-L-phenylalanine, and its subsequent oxidation using enzyme L-phenylalanine monooxygenase. Isotopomers of L-tyrosine specifically labeled with deuterium and tritium were synthesized using novel enzymatic methods. Cheap commercial radiochemicals were used, i.e. Ba^{14}CO$_3$, deuteriated and tritiated water as label sources.

Introduction

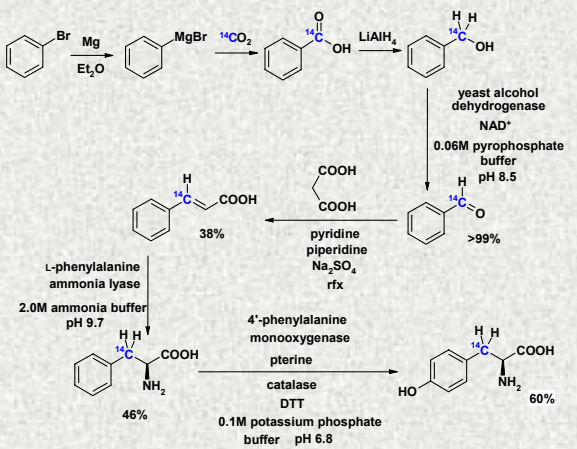
The enzyme *tyrosine phenol-lyase* (*TPL, E.C 4.1.99.2.*) catalyzes reversible decomposition of L-tyrosine to phenol, pyruvate and ammonia [1].



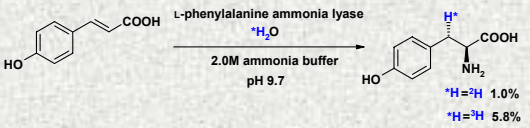
The mechanism of TPL action has already been studied, mostly using spectroscopy methods [2-5]. Our goal was to study the mentioned mechanism using the hydrogen and carbon kinetic isotope effects (KIE). This approach has not been attempted in a full extent yet; however, there is some isotopic data published [6-8].

Specifically labeled isotopomers of L-tyrosine are necessary to perform our research. We have already performed syntheses of 1- and 2- carbon-14 labeled L-tyrosines [9], as well as 2',6'-H_2, 3S-, 3R-, and 2-tritiated analogues [10]. Here we present new methods of their synthesis developed in our group.

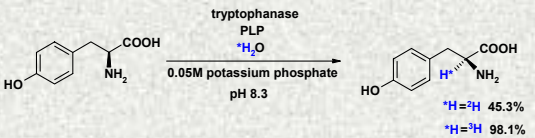
Synthesis of [3-^{14}C]-L-tyrosine



Synthesis of 3S-hydrogen labeled L-tyrosine



Synthesis of 2-hydrogen labeled L-tyrosine



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