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Dissertation Defense

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α,β-Unsaturated Aldehydes: The Underrepresented Markers of Disease

Abstract

The peroxidation of unsaturated fatty acids is a widely recognized metabolic process that creates a complex mixture of volatile organic compounds including aldehydes.[1] Elevated levels of reactive oxygen species in cancer cells promote random lipid peroxidation, which leads to an increase in a variety of aldehydes.[2,3] Increased levels of these volatile aldehydes are exhaled and are of interest as potential markers of disease.[4] A review of reported aldehydes in the exhaled breath of lung cancer patients reveals α,β-Unsaturated aldehydes, detected primarily when derivatized during exhaled breath preconcentration, are underreported in the literature.[5] Our hypothesis is that better methods for detection of exhaled α,β-unsaturated aldehydes are needed and will translate into more accurate diagnoses of disease. Two new approaches explored to detect α,β-unsaturated carbonyls from exhaled breath will be discussed.

Additionally, our interest in the cardiovascular toxicity studies of this widely investigated dialdehyde led us to examine its synthesis.[6] We also developed a new synthesis of (*E*,*E*)-muconaldehyde, an open-ring metabolite of benzene.[7] Of the syntheses reported, all require multiple steps with the best synthesis having an overall yield of 32%.[8] By our method, muconaldehyde was prepared in 71% yield using a one-pot procedure by selective DIBAL-H-mediated mono-reduction of muconic acid activated as a bis(*N*-acyl-*N*,*N'*-diisopropylurea).[7]

References

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