Organic and Biomolecular Chemistry 2014 vol.12 N28, pages 5151-5157

Polyamine modification by acrolein exclusively produces 1,5-diazacyclooctanes: A previously unrecognized mechanism for acrolein-mediated oxidative stress

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Abstract

Acrolein, a toxic unsaturated aldehyde generated as a result of oxidative stress, readily reacts with a variety of nucleophilic biomolecules. Polyamines, which produced acrolein in the presence of amine oxidase, were then found to react with acrolein to produce 1,5-diazacyclooctane, a previously unrecognized but significant downstream product of oxidative stress. Although diazacyclooctane formation effectively neutralized acrolein toxicity, the diazacyclooctane hydrogel produced through a sequential diazacyclooctane polymerization reaction was highly cytotoxic. This study suggests that diazacyclooctane formation is involved in the mechanism underlying acrolein-mediated oxidative stress.

http://dx.doi.org/10.1039/c4ob00761a