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Synthesis of Selenium Analogs of Anti-Mucolytic Drugs

Chronic obstructive pulmonary disease (COPD) is a collective term that describes various pulmonary diseases such as chronic bronchitis and emphysema. Some drugs that are used to treat COPD are anti-oxidant molecules containing sulfur. Sulfur-containing anti-mucolytic drugs on the market have two problems. The first is once they are oxidized, products cannot cycle back to their reduced form. Sulfur is a weak antioxidant, and the drugs are consequently ineffective once oxidized. Furthermore, sulfoxide undergoes beta-elimination and forms unwanted products in the body. By replacing sulfur with selenium, a strong anti-oxidant, anti-mucolytic drug potency could increase. In addition, by replacing the alpha-hydrogen of amino acids with a methyl group, selenium analogs can no longer beta-eliminate. The result is a molecule with potential to improve upon anti-mucolytic drugs. As a first step towards synthesizing these selenium analogs, we have undertaken the synthesis of alpha-methyl serine, which is the precursor molecule towards our target antioxidant.