UNIVERSITY OF RHODE ISLAND
Department of Chemistry
VIRTUAL SEMINAR

2:00 P.M., Friday, April 24, 2020
Please email dugan@uri.edu for link

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"Making Energetic Materials Safer"

HOST

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Making Energetic Materials Safer

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Canine (K9) units and scientists are often exposed to energetic materials when working to prevent terrorist attacks and mitigate the proliferation of explosives. However, access to energetic materials is limited, especially for highly hazardous, non-military explosives like triacetone triperoxide (TATP). There is a great need for explosives training aids that provide safer handling and longer shelf-life for spread access among these communities.

Energetic materials are extremely hazardous to handle; therefore, encapsulation is proposed as a safer way of handling explosives. Explosive training aids, where energetic materials, such as TATP, erythritol tetranitrate (ETN) and trinitrotoluene (TNT), are encapsulated in a polymer matrix have been developed and tested by K9 units. To facilitate handling, a successful training aid needs to be insensitive to heat, impact or friction. The energetic material has to be released from the polymer shell on command, for example heating the training aids to a specific temperature and time in order to release the core vapor. The released vapor from the training aids must be the pure explosive, clean from any other odor, to prevent the dogs or instruments from detecting a contaminant instead of the real threat compound.

Even though TATP is a prominent explosive, the metabolic pathways and potential toxicity of TATP are still unknown. Microsomal incubations revealed the metabolism of TATP, starting with the formation of the hydroxylated metabolite, TATP-OH, which is further conjugated to glucuronic acid to form TATP-glucuronide. Recombinant enzyme incubations determined which enzymes catalyzed the hydroxylation and glucuronidation pathways of TATP metabolism. Enzyme kinetics established in vitro intrinsic clearance (Clint) and helped estimate in vivo intrinsic clearance (Cl) of TATP.