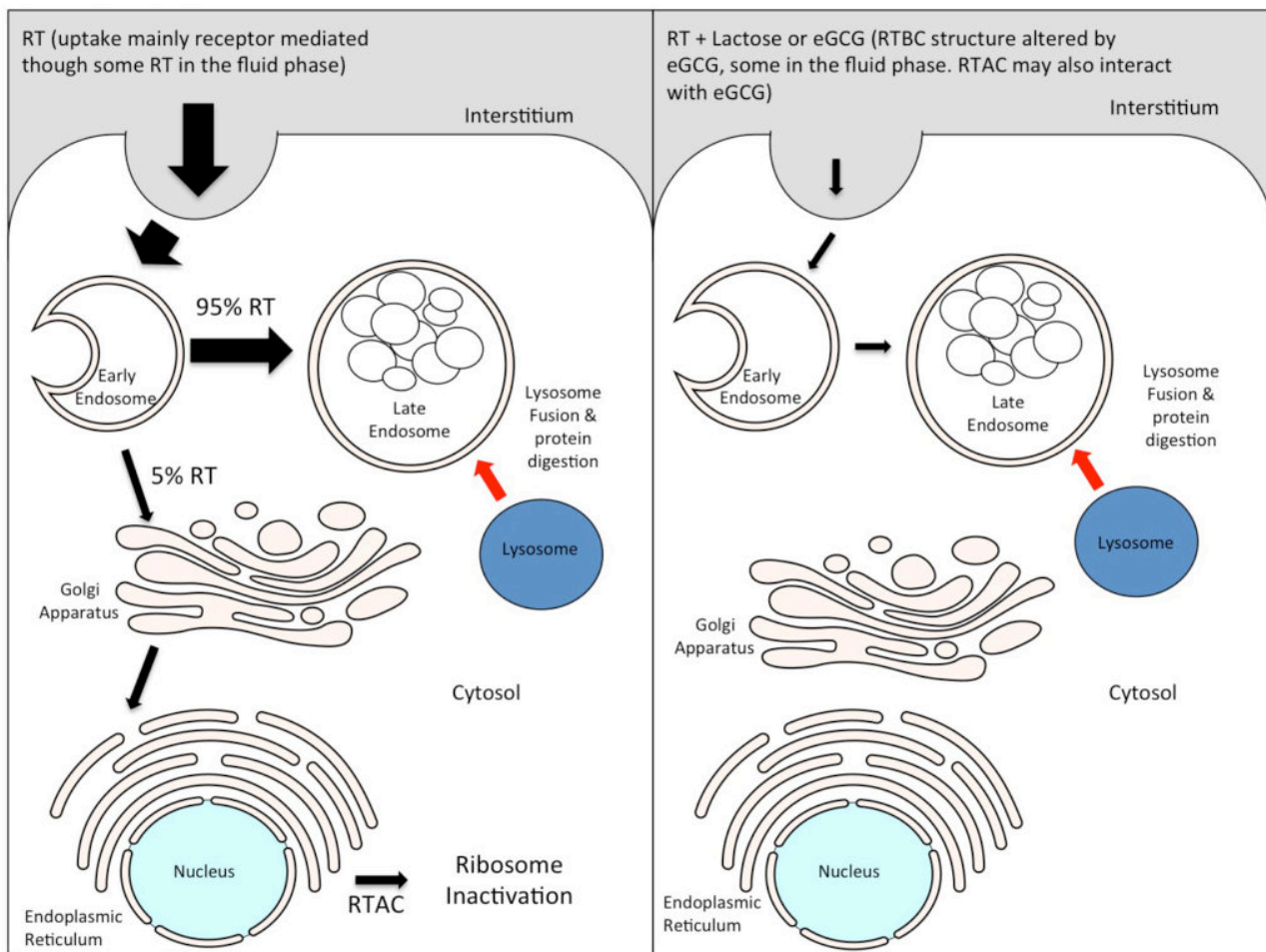


Components of tea may help in the fight against bioterrorism

Ricin toxin (RT), a protein produced by the castor bean (*Ricinus communis*) and is rated by the US Centres for Disease Control and Prevention as a level B biothreat.

This is because it is: 1) available and 2) currently has no cure or vaccine. The UK and US government exploited these observations during the production of “compound W” (RT) prior to the Biological and Toxin Weapons Convention of 1972 and the Chemical Weapons Convention of 1973. The availability of RT was underpinned by both the intoxication of Roger Bergendorff in 2008 and the discovery of RT containing letters sent to Bill Frist in 2004, who was, at the time the US senate majority leader.



Cartoon depicting the intracellular trafficking of RT with and without an inhibitor (eGCG or lactose). This cartoon proposes a mechanism to explain the inhibition of RT toxicity mediated by eGCG.

RT is composed of two protein chains that have some unusual properties, which manifest in the ability of 5-10% of the internalized RT to move out of the cells “digestive tract” i.e. following the endocytic pathway, to the cells stomach or “endolysosome” where proteins are digested. The 5-10% that escaped digestion moves to the cells cytosol via the Golgi body and the endoplasmic reticulum (ER) via several recycling events. Once in the ER one of the protein chains separates from the other and enters the cytosol where its target, the machinery responsible for the production of new proteins (ribosomes), is deactivated, killing the cell.

The inhibition of a variety of protein toxins (and microbes) such as anthrax, tetanus, botulinum and Shiga toxin by polyphenols (found in tea), has also been reported. One such polyphenol, also found in a cup of tea, is epigallocatechin gallate (eGCG).

Here we present evidence following an evaluation of the inhibitory effect of eGCG upon RT and it was found that eGCG could not only reduce the toxicity of RT when using two different types of mammalian cell, but also the inhibition was evident when a static concentration of either toxin (against a variable concentration of eGCG) or when a static concentration of eGCG (against a variable concentration of toxin) was used. In an attempt to discover why this was happening we examined the structure of RT with and without eGCG using an optical technique called circular dichroism (CD). CD told us that the structure of the protein toxin was changing after exposure to eGCG and one of the effects of this was a reduction in the ability of the toxin to enter cells and move to the Golgi.

Given the eGCG activities recorded here, it is unlikely that a cup of tea could provide a feasible antidote to RT intoxication. However, these intriguing results suggest that there may be value in further investigating eGCG's ability to reduce RTs toxicity with a view to isolating active groups or moieties within eGCG in order to improve its RT inhibitory potential.

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Publication

[An in vitro evaluation of epigallocatechin gallate \(eGCG\) as a biocompatible inhibitor of ricin toxin.](#)

Dyer PD, Kotha AK, Gollings AS, Shorter SA, Shepherd TR, Pettit MW, Alexander BD, Getti GT, El-Daher S, Baillie L, Richardson SC.

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