

Antidote to Organophosphate Poisoning—Atropine Sulfate Rapidly Disintegrating Sublingual Tablet

Poisoning caused by organophosphates is a major health concern in various parts of the world where they are widely used in insecticides, pesticides and weedicides. It is also used for self-harm, mostly in rural areas of developing nations. They are also a major constituent of nerve gases such as sarin, soman and tabun used as chemical weapons. According to World Health Organization (WHO) annually, there are over 3 million incidences of hospitalization because of organophosphate poisoning and 15% of them result in fatality. It is estimated that each year this poison leads to some kind of episodes of poisoning in twenty five million agricultural workers. Currently one of the most commonly used antidote against organophosphate is atropine. Either it is used as an injection or sometimes, ophthalmic eye drops are used off-label. Both these methods have significant drawbacks. Injections are not always readily available and application of atropine eye drops are neither accurate nor capable of deterring the effects quickly enough. To tackle this issue, researchers at NSU have developed a rapidly disintegrating sublingual tablet (RDST) for atropine sulfate that can be placed under the tongue. This proposed invention offers an easy to implement, rapid and efficient antidote for this poison. It also, offers more convenient way to administer multiple doses as needed compared to injections.

Technology

Dr. Mutasem Rawas-Qalaji of NSU's College of Pharmacy has developed a rapidly disintegrating sublingual tablet or RDST for delivering atropine sulfate to victims of organophosphate poisoning. The key property of this tablet that makes it the ideal platform to be used for organophosphate antidote is the unique composition that ensures rapid drug release and dissolution. This property allows the RDST to disintegrate and deliver the antidote in less than 30 seconds. Unlike currently used methods, this technology will enable accurate and immediate administration of the antidote. As majority of incidences of organophosphate poisoning happen in rural agricultural areas of developing countries which often have limited access to healthcare facilities the ease-of-use of this atropine RDST compared to an injection will make it easier to implement. For military personnel in danger of chemical weapons attack, having the antidote in a tablet form makes easier to carry, store and apply compared to an injection or ophthalmic solution.

Application

- Antidote for accidental poisoning caused by exposure to pesticides, insecticides, weedicides and other agricultural products containing organophosphates
- Military application to protect soldiers against possible attacks with chemical weapons containing organophosphates
- Atropine RDST can also be applied to reduce salivation in patients suffering from hypersalivation caused by cerebral palsy, Parkinson's disease, stroke or any other condition that results in impaired facial muscle control

Advantages/Benefits

- Compared to atropine injection this is much easier to use and the administration will not require any specific expertise or prior training.
- RDST offers more accurate and easier delivery than using atropine ophthalmic drops.
- The antidote starts acting almost instantaneously similar to injections due to the capability of developed RDST to release atropine within 30 seconds.
- Agricultural workers and soldiers are the two types of people most likely to be affected by organophosphates. As they are highly likely to be in remote areas at the time of occurrence of poisoning, a tablet will be much easier to carry and/or store compared to eye-drops or injection.

Status of Development

The RDST formulation has been optimized and their performance with atropine sulfate has been evaluated. Diffusion tests have indicated that this unique composition of the tablets does not cause any hindrance to release of atropine into solution.

Patent Status

Patent Application filed in US, Europe, and Canada in 2017.

Information on Inventors



- Dr. Mutasem Rawas-Qalaji is currently an Associate Professor at Department of Pharmaceutical Sciences at NSU. He has multiple patents and extensive experience in the field of formulation and drug delivery.
- Dr. Alhussain Aodah graduated in 2017 from NSU's College of Pharmacy with a PhD in Pharmaceutical Sciences.
- Rawan Bafail, B. Pharm, MSc is currently a PhD candidate (Pharmaceutical Sciences) at NSU's College of Pharmacy.

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