

Drugs and drowning

Electrical activity of the heart is commonly monitored by the electrocardiogram (ECG). Such electrical activity depends on certain proteins called ion channels. These channels control the timing and the flow of electrically charged particles (ions) in and out of heart cells at various times in the heart cycle. The time between the electrical signal for contraction (Q wave on the ECG) and the electrical signal for relaxation (T wave on the ECG) is known as the QT interval of the ECG. Ion channels are sometimes inherited in an abnormal form, a condition known as a 'channelopathy'. Several different kinds of inherited channelopathies result in an abnormally long QT interval; so-called inherited long QT syndrome.

Persons with inherited long QT syndrome are at increased risk of abnormal heart rhythms (arrhythmias). The consequences of inherited long QT syndrome can vary from little or no effect on health to an increased risk of premature sudden death (see Sudden Arrhythmia Death Foundation). The risk of sudden death increases when reflexes normally associated with swimming are combined with long QT. Swimming reflexes, such as the mammalian dive reflex, normally slow the heart and conserve oxygen. On the other hand, when combined with long QT syndrome, the dive reflex may cause a fatal heart rhythm and sudden death. Death in the water is considered by most to be a 'drowning' but may actually happen because of a fatal heart rhythm rather than by the inhalation of water.

Certain prescription medications and drugs of abuse alter ion channel activity and thus may cause drug-induced long QT syndrome. Nearly 200 so-called QT-prolonging drugs are listed on the CredibleMeds website. Evidence based on case reports and preliminary review of drugs present in drowning victims supports the hypothesis that drug-induced long QT syndrome, like inherited long QT syndrome, increases the risk of drowning.

Alcohol is the drug most commonly associated with drowning. In moderate to high amounts alcohol causes long QT syndrome. It is therefore suggested that intoxication is not the only effect of alcohol that contributes to drowning. A fatal heart rhythm prompted by a combination of swimming reflexes and alcohol-induced long QT syndrome may play a role in a significant number of cases.

A variety of commonly prescribed medications that cause prolonged QT are also found in drowning victims. Unlike alcohol, these drugs do not typically cause intoxication in doses that prolong the QT interval. It is reasonable to suggest that, when combined with swimming reflexes, such drug-induced long QT syndromes increase the risk of drowning by promoting fatal heart rhythms. Drug-induced long QT syndrome and increased risk of drowning is thus a potentially significant potential drug safety issue. Possible associations between QT prolonging drugs and drowning need to be confirmed or refuted by further examination of the presence of drugs in large numbers of drownings. Such research is underway in collaboration with Professor Philippe Lunetta of the University of Turku in Finland.

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[Drug-induced long QT syndrome increases the risk of drowning.](#)

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