

DICHLOROACETIC ACID

Overview

Dichloroacetic Acid (DCA), also known as dichloroethanoic acid, is an analogue of [acetic acid](#) in which two of the three hydrogen atoms of the methyl group have been replaced by [Chlorine](#) atoms. It is prepared by the reduction of trichloroacetic acid.

Just the facts

Physical Information

Name: Dichloroacetic Acid (DCA)

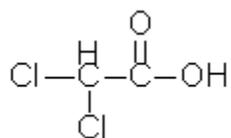
Use: therapeutic

Source: synthetic chemistry

Recommended daily intake: none

Absorption: dermal, inhalation, ingestion

Chemical Structure



Structure retrieved from cheric.org

Chemical Description

Dichloroacetic Acid (DCA) is a colorless liquid with a pungent aroma which decomposes when heated and produces toxic byproducts, including [hydrogen chloride](#). It is highly acidic, reacts strongly with bases, and is not combustible.

Uses and Benefits

It is used therapeutically to stem the production of lactic acid to treat lactic acidosis. It was used clinically in children to treat lactic acidosis and was found to be well accepted. It also being investigated as a possible cancer treatment.

Health Effects

The health effects of DCA are listed in the table below. These symptoms and treatments are the result of certain exposures and the [carcinogenic](#) effects are further below.

Route of Exposure

Symptoms

Prevention

First Aid

Inhalation

Burning sensation, sore throat, coughing, heavy breathing/shortness of breath

breathing protection (ie. mask) adequate ventilation and open air when handling cyclohexanol

Fresh air and rest. If symptoms persist, contact advanced medical personnel.

Skin/Dermal

dry skin and localized redness

protective gloves and clothing

remove contaminated clothing and wash affected areas. refer to medical authorities

Eyes

redness and pain

use eye protection when working with cyclohexanol

rinse with water then refer to medical authorities

Ingestion

abdominal pain, diarrhea, cough, dizziness, nausea

do not eat, drink or smoke when handling cyclohexanol

rinse mouth and refer to medical authorities

Use Against Cancer

Tests conducted at the University of Alberta, Canada found that DCA killed lung, breast, and brain cancer cells but not healthy cells ([#Coghlan, 2007](#)). Additionally, tumors in rats shrunk substantially when treated with DCA.

The reasons for this reaction is highlighted by [#Coghlin](#) in the *New Scientist*:
"DCA attacks a unique feature of cancer cells: the fact that they make their energy throughout the main body of the cell, rather than in distinct organelles called mitochondria. This process, called glycolysis, is inefficient and uses up vast amounts of sugar."

"Until now it had been assumed that cancer cells used glycolysis because their mitochondria were irreparably damaged. However, Michelakis's experiments prove this is not the case, because DCA reawakened the mitochondria in cancer cells. The cells then withered and died (Cancer Cell, DOI: 10.1016/j.ccr.2006.10.020)."

Michelakis suggests that the switch to glycolysis as an energy source occurs when cells in the middle of an abnormal but benign lump don't get enough oxygen for their mitochondria to work properly (see diagram). In order to survive, they switch off their mitochondria and start producing energy through glycolysis.

"Crucially, though, mitochondria do another job in cells: they activate apoptosis, the process by which abnormal cells self-destruct. When cells switch mitochondria off, they become 'immortal', outliving other cells in the tumour and so becoming dominant. Once reawakened by DCA, mitochondria reactivate apoptosis and order the abnormal cells to die."

These findings however are disputed. See [Opinion by Ken Lichtenfeld, MD](#).

Environmental Effects

DCA is harmful to aquatic organisms.

Source : <http://www.toxipedia.org/display/toxipedia/Dichloroacetic+Acid>