

DIQUAT DIBROMIDE

Diquat dibromide is a non-selective contact herbicide, desiccant and plant growth regulator for use as a general herbicide for control of broadleaf and grassy weeds in terrestrial non-crop and aquatic areas. In aquatic sites, diquat may be injected below the water surface for submerged weeds or sprayed for weed control along the edges of aquatic sites.

A thorough review of the scientific data base underlying diquat dibromide's registration was conducted and reviewed by the Environmental Protection Agency (EPA). The purpose of the Agency's review was to reassess the potential hazards arising from the currently registered uses of the pesticide; to determine the need for additional data on health and environmental effects; and to determine whether the pesticide meets the "no unreasonable adverse effects" criterion of FIFRA.

It was determined by the EPA that the uses of diquat dibromide as currently registered will not cause unreasonable risk to humans or the environment

There is an exposure potential for persons entering treated sites after application is completed. These exposures included persons swimming in diquat treated aquatic sites.

In regard to this type of exposure: Diquat dibromide is readily dissolved in water and it becomes a compound with a positive charge in water which gives it the characteristic of being absorbed very slowly and in small amounts through the skin. The very low absorption of diquat through an intact skin, observed in *in vivo* studies (studies in living organisms), and confirmed in *in vitro* studies (studies outside of a living organism) reviewed by the EPA.

The margin of exposure (MOE) was calculated in the EPA report for a 6 y old person exposed while swimming in a treated body of water for 3 hours: The total swimmer exposure is estimated to be $[0.354 \text{ mg/day}]/\text{body weight} = 0.016 \text{ mg/kg/day}$ or an MOE of 1250, for a 21.9 kg (48 lbs) 6 year old person.

The MOE is a ratio of no-observed-adverse-effect level obtained from animal studies to the predicted or estimated human exposure level or dose. It is commonly used in human health risk assessment. An MOE threshold of above 100 ($\text{MOE} > 100$) for a chemical substance is a level considered to be protective of bad outcomes and the MOE for diquat dibromide is 10-fold over this protective level (i.e. more protective) at 1250 – thus supporting the lack of risk associated with normal exposures of diquat dibromide while swimming in a treated body of water.

The potential of diquat dibromide to cause cancer (carcinogenic potential) was evaluated by the Health Effects Division Reference Dose (RfD)/Peer Review Committee on March 31, 1994. The Committee classified diquat dibromide into Group E which means that diquat dibromide does not cause cancer based on a lack of evidence of cancer in acceptable studies with two animal species, rat and mouse. The dose levels tested in both studies were considered to be adequate for carcinogenicity testing.

Rats were given radioactive diquat dibromide by mouth and the amount of radioactive diquat dibromide was then assessed in their urine and feces at selected time intervals following the administration of the radioactive diquat dibromide. The majority (about 90%) of the radioactivity was found in feces, indicating that diquat was poorly absorbed from the gut or gastrointestinal tract – thus having less of an ability to get into the bloodstream or body tissues which contributes to the prevention of toxic side effects.

Diquat dibromide was slowly absorbed from the gastrointestinal tract of male and female rats. Irrespective of the type of dosing (oral or intravenous), diquat did not accumulate in tissues of rats or mice

Development (proper organ system development in the young), reproductive toxicity (toxicity related to exposure during pregnancy) mutagenicity (toxicity resulting in gene mutations), and neurotoxicity (toxic to the central nervous system – brain) studies were conducted in animal models and also demonstrated that diquat dibromide is not a developmental, reproductive (not an endocrine disrupter), mutagenesis (cause gene mutations) or neurotoxic agent.

In summary, diquat dibromide is not considered a risk to individuals swimming in a treated body of water, including children, as it is poorly absorbed into the skin, poorly absorbed into the body when swallowed. It also does not cause problems in animal models (that are valid to assess human exposure) when exposed during pregnancy or during development in very young ages. Nor does it cause the body to develop problems with the brain, problems with mutations in genes or cause cancer.

Prepared by

DR .Cheryl Pikora MD, PhD
Pediatric infections disease specialist