



Controlling Mosquito Breeding in Rainwater Catchment Systems and “Dry” Injection Wells

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Controlling mosquitoes in rainwater catchment systems

The Hawaii Department of Health (DOH) suggests the following essential actions to control mosquito breeding in rainwater catchment systems:

Prevent ponding (standing water)

Ponding allows the mosquito to lay its eggs near the collected water, and allows the next rain to wash the eggs into the catchment tank where they can begin their development cycle. Every effort should be made to prevent ponding:

- ***Collection surfaces*** -- Catchment collection surfaces should have a slope to direct the collected water, which prevents ponding. Keep surfaces clear so that debris is not allowed to collect and cause ponding.
- ***Gutters*** -- Clear and maintain gutters so that ponding does not occur.
- ***Rainwater catchment tanks serving vacant homes or otherwise not in use*** --
These tanks should be entirely drained, leaving no standing water. After complete draining, do not allow water to collect again. Care must be taken when draining these tanks not to cause flooding or other damage to surrounding property. Hoses may be used to divert the water into safe drainage pathways.
In some instances, complete draining will not be possible due to the fact that the tank has no bottom drain. In these cases, covering should be considered. Unused tanks can be reported to Hawaii County Civil Defense at 808-935-0031.
- ***Rainwater catchment tanks serving occupied homes*** -- Some users may be willing to drain their tanks for the duration of the dengue outbreak. In these cases, please take the precautions listed above for tanks serving vacant homes or otherwise not in use to drain the tank.

Utilize physical barriers

The Department of Health suggests physical barriers as the best and safest means to prevent your rainwater catchment tank from becoming a breeding source of mosquitoes, while at the same time keeping the water safe for human consumption. There are several kinds of physical barriers. These include:

- ***Solid material cover*** (concrete, steel, aluminum, or wood) attached to the storage tank. These are considered the best form of protection as long as there is no gap between the cover and the tank sides. Any gaps should be screened with a fine mesh screen. There may

be instances where even with a solid cover, mosquito breeding does occur. In these cases, it is possible that the mosquito eggs were washed into the tank and the development cycle was initiated through the water contact with the eggs.

- **Suspended solid cover.** Again, there should be mosquito-proof screening between the cover and the tank.
- **Flexible non-porous cover** (tarp, canvas, rubberized). Ideally, these should be stretched over the tank with an elevating support in the center to provide a slope to prevent ponding. If stretched horizontally across the top of the tank, care should be taken that ponding of rainwater does not occur on the surface of the cover. A tight seal needs to be provided and maintained to prevent mosquitoes from getting under the cover.
- **Flexible porous cover** (screen, shade cloth, etc.). Ideally, the cover should be supported above the water level. If stretched horizontally over the top of the tank, make sure the material does not dip below the surface of the water and allow mosquito access. A tight seal needs to be maintained to prevent mosquitoes from getting under the cover.

Apply additions to tank

If the tank cannot be drained or covered adequately, or if you are already experiencing mosquito growth in your catchment tank, there are other options:

- **Introduction of mosquito fish**
 - The fish will eat the egg larva (wigglers) and possibly the pupae stages of mosquito growth.
 - The fish cannot be introduced into tanks that are chlorinated. The chlorine will kill them quickly.
 - Fish are live organisms and therefore will discharge waste, reproduce, and die, at rates dependent on the food and oxygen supply. Any dead fish must be removed and disposed of, as the remains and waste discharges will adversely affect the taste and potability of the water.
 - The fish must not be released into the environment. They will endanger Hawaiian native species and habitats.
- **Introduction of cooking oil on the surface of the catchment water**
 - Oil should interrupt the wiggler's ability to breathe at the surface of the water.
 - Cooking oil is suggested because it can be safely consumed by humans. Enough oil needs to be applied to the surface of the water to completely cover the surface.
 - Drawbacks to using oil:
 - Provides a food source for microbes, greatly increasing the bacteriological presence in the water
 - Eventually turns rancid, affecting the taste and odor of the water
 - Can clog or otherwise disrupt the function of water filters and/or treatment devices
 - Needs to be removed once the dengue outbreak has subsided. This may be accomplished by skimming it off the surface and scrubbing the sides of the tank. Disposal of the skimmed oil must be done properly.
- **Introduction of larvicides**

This should be the last measure to be considered. Larvicide uses are very specific, and must not be used in any application or to treat media not specifically named on the label. Very few larvicides have been found to be available to treat potable water.

- If you intend to use the water in your rainwater catchment tank for human consumption (e.g., drinking, bathing, brushing teeth, cooking, laundering, etc.) only use a product approved for this use. There are a number of larvicides available on the market; most are **not** approved for use in water meant for human consumption.
- Larvicides that can be purchased by the general public, such as those that can be purchased at garden centers or home improvement stores, are known as general use pesticides. Other larvicides are restricted use pesticides and can only be purchased and applied by certified pest control operators. Certification is given by the Hawaii Department of Agriculture. *All pesticides carry the statement that it is a violation of federal law to use it contrary to label instructions. Products not specified for this use must not be used.*
- When any larvicides are used, they should be applied and reapplied according to label directions for as long as the dengue outbreak is in effect.
- Warning signs should be placed prominently around the tank to advise potential users of the presence of larvicide(s) in the tank. Once the outbreak is declared over, thorough cleaning of the tanks should take place before further use. Oil based larvicides may be skimmed from the water surface and the product disposed of properly. The tank will also need to be cleaned thoroughly as some of the oil will stick to the sides of the tank, fostering bacterial growth.
- ***Cautions against using other applications in tanks***
 - Using dishwashing detergent for rainwater catchment tanks is not recommended because of the requirement of an almost 5% concentration solution. The large amount of detergent needed to create the solution would be very costly and have a severely adverse impact on water quality.
 - Chlorine is not known to kill larvae.

Controlling Mosquitoes in “Dry” Injection Wells

The term dry well refers to an injection well for storm water injection. Dry wells can serve roads, parking lots, roofs, fields, drainage basins, yards, landscaped areas, and other paved areas. Some of these wells can penetrate the groundwater table and therefore contain standing water which provides a place for mosquitoes to breed.

Dry wells in risk areas known to have standing water and/or a mosquito breeding problem should be treated with larvicide. Depending on the location of the dry well, the larvicide should preferably be acceptable for use in potable water since its application would impact the groundwater. (See discussion of larvicides in rainwater catchment systems.)

For more information on dengue fever and the current Hawaii Island outbreak, go to:

<http://health.hawaii.gov/docd/dengue-outbreak-2015/>

<http://health.hawaii.gov/docd/files/2015/12/dengue-catchment-fact-sheet.pdf>