TAKING CARE WITH ROOF-COLLECTED DRINKING WATER

Nothing could be as fresh and pure to drink as rainwater – could it? A Massey University study shows people must take care to ensure roof-collected rainwater is safe to drink.

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More than 10% of New Zealand's population, especially people in rural areas without municipal town water supplies, depend on collecting rain off their roofs for use as drinking water. There is a perception that rainwater is pure and safe to drink and its consumption has proved popular. However, a 5-year Massey University study has shown this perception may be incorrect.

Generally, the risk of disease from roof-collected rainwater is low, providing the water is visibly clear, has little taste or smell and, most importantly, the rainwater is stored and collected through a properly-maintained tank and roof catchment system. But the roof catchment and subsequent run-off can directly affect the microbiological quality of the stored rainwater. Deposits by birds and small mammals, airborne micro-organisms and decaying organic debris can all affect the water.

In the 5-year study, Massey University investigated the microbiological quality of roof-collected rainwater samples from 560 dwellings in New Zealand. At least half the samples analysed exceeded the minimum acceptable standards and 30% showed evidence of heavy faecal contamination.

Sources of contamination

The likely sources of contamination were faecal deposits by birds, frogs, rodents and possums, and dead animals and insects, either on the roofs or in the gutters, or even in the water tanks.

Many of the roof water supplies surveyed revealed deficiencies in the use of rainwater catchment systems and components. Many supplies with heavy faecal contamination showed:

- lack of maintenance
- inadequate disinfection of the water
- poorly-designed delivery systems and storage tanks
- failure to adopt physical safeguards against microbiological contamination.

Collecting rainwater off roofs for drinking is popular in rural areas without town water supplies.

Many of the organisms found in contaminated roof water have the potential to infect humans and, under certain conditions, could lead to outbreaks of gastrointestinal diseases such as *Salmonella, Campylobacter, Giardia* and *Cryptosporidium.*

Increased risk of disease

In another analysis of 621 cases of gastro-enteritis in New Zealand, it was found that the consumption of roof-collected rainwater was associated with three times the risk of campylobacteriosis than that of non-consumers. An estimated 237 cases (2%) of the annual campylobacteriosis cases in New Zealand are likely to be due to the consumption of faecally-contaminated rainwater.

An investigation of an outbreak of *Salmonella* in New Zealand in 2003 also found that a number of people had drunk roof-collected rainwater where the pathogen was detected in the rainwater tanks. In another case-control study on risk factors for giardiasis among children in Auckland, it was again found that consumption of roof-collected rainwater significantly increased the risk of the disease.

Illnesses under-reported

While relatively few disease outbreaks linked to contaminated roof-collected rainwater have been reported in New Zealand and

overseas, the indications are that there could be massive under-reporting of illnesses associated with contaminated roof water. The lack of reports may be due, in part, to most systems serving individual households of only a few people. Residents experiencing sporadic gastrointestinal illnesses are less likely to seek medical attention unless the illnesses are severe or life-threatening. Only a minority of people who become ill are accounted for in the notifiable disease statistics since people are only recorded if they've been to a doctor who takes a positive sample.

Contaminated rainwater is also more likely to be a source of sporadic disease episodes in these households because of possible immunity in those exposed, and asymptomatic infection in others. Visitors or persons who have not drunk roof-collected rainwater previously could be especially at risk from waterborne diseases if the water supply is contaminated.

In New Zealand, statutory control of individual water supplies falls under the Health Act 1956, the Local Government Act 1974 and the Building Act 2004. The Building Act requires premises to be provided with potable water for consumption, oral hygiene, utensil washing and food preparation. Under Section 39 of the Health Act it is illegal to let or sell a house unless there is a supply of potable water.

While there will always be some risk of gastrointestinal illnesses to consumers from contaminated supplies, a variety of products and systems are now available in New Zealand for reducing and sometimes eliminating microbial contamination of stored roof-collected rainwater.

How to avoid contamination

There are many ways to minimise contamination of roof-collected rainwater.

USE NON-TOXIC MATERIALS

Ensure the roof used to collect the water is clean and made from impervious, non-toxic materials. Remove any items containing lead (e.g. paints, flashings, nails) and replace with approved materials.

KEEP ROOFS AND GUTTERS CLEAR

The roof catchments should be clean and clear of moss, lichen, debris and leaves. Remove overhanging vegetation as branches can provide roosting points for birds and access for animals such as rodents, cats and possums. If appropriate, install removable gutter guards and/or screens.

Inspect gutters regularly. Gutters, tank inlets and screens should be cleaned at least every 3–4 months. Before cleaning disconnect the pipe(s) that feeds the water tank and secure the ladder. Avoid going anywhere near overhead power lines, or have the power disconnected first.

INSTALL FIRST FOUL FLUSH DIVERSION

Ensure that chimneys near roof water collection areas are high enough to minimise the settlement of ash or residues on the roof and gutters. Use a course filter (leaf slide) and first foul flush device to intercept water entering the tank, especially for any area susceptible to contamination with organic material, dust, ash, sand, salt or airborne chemical residues.

If there is nearby weed or chemical spraying, advise the contractor that the roof is used to collect drinking water so there must be no over-spraying. Obtain a guarantee that persistent organochlorine pesticides will not be used.

KEEP EVERYTHING ELSE OUT OF TANK

Prevent access by small animals, birds and insects into storage tanks by screening all tank inlets as well as overflows, and keeping access hatches closed. Also prevent run-off from areas other than the roof catchment entering below-ground tanks. Tank roofs must be secure and the sides and bottom should be sealed to prevent egress.

Tanks should be inspected annually and, if necessary, cleaned out professionally. If tank contamination is apparent then the supply should be disinfected.

Ensure that tank taps or draw-off pipes are at least 100 mm above the tank floor, or use a floating arm draw-off valve.

Useful publications

The New Zealand Ministry of Health has published a number of information resources on the safe collection and storage of roof-collected rainwater systems. These can be obtained from your local Health Protection Officer or Environmental Health Officer. The last one below can also be found on the Ministry of Health website under publications (www.moh.govt.nz/Publications).

Water collection tanks and safe household water (ref. HE 10148) gives a brief outline of the steps involved for the safe collection and storage of rainwater.

'Small, individual and roof water supplies' (chapter 19 of *Guidelines for drinking water quality management for New Zealand*) is a very detailed 48-page chapter on the collection, storage and treatment of roof water.

Household water supplies: The selection, operation, and maintenance of individual household supplies (ref. HP 4602) is a booklet about the supply of safe drinking water to households other than those connected to town water supplies. Information on water sources and treatment options have also been included.

Public health risk management plan guide: Roof water sources (Version 1, ref. S1.2) covers many of the causes of contamination of roof water and measures necessary to ensure the safety of the water supply. Included are contingency plans for events such as water shortages and when roofs are contaminated by spraydrift or volcanic ash.