

Health Concerns Over Rainwater Use? Lead and Sludge Contamination in Rainwater

In Australia, there is a debate on the health of people using harvested rainwater. Earlier this year (2016), at the Rainwater Harvesting Association of Australia (RHAA) seminar in Sydney, [a presentation that included recent research](#) by PJ Coombes of [Urban Water Cycle Solutions](#) was presented. This article will explore some of the issues presented and the different sides.

Sources of Information

In any debate, it is important to understand possible biases of those who participate. For example, much commentary on the healthiness of using harvested rainwater [according to Smit and Coombes](#) is "*funded by water monopolies who have a centralised water distribution perspective quite different to how rainwater harvesting works.*"

Evidently, water monopolies who control a centralised water supply stand to lose money if everyone began becoming self-sufficient and depending upon their rainwater. Thankfully, while their voice is influential, there exist wide differences of opinion on the safety of rainwater use.

RHAA and PJ Coombes come from the other side, based upon empirical studies and research, support the safety of rainwater use as long as simply measures are taken to avoid water contamination.

Real-World Evidence for Rainwater Safety

Rainwater has been depended upon out in the country as a primary source of high-quality water for some time. In fact, the widespread use of rainwater and the absence of health epidemics makes a quite compelling case for its safety. As noted in the article, [Rainwater Health Debate](#):

Australia has a substantial real world case study with over 2.3 million Australians relying on rainwater for drinking water and more than 6.3 million people using rainwater for some household use. In spite of claims of widespread health concerns, there are no health epidemics or widespread notifications of lead contamination by chief medical officers.

Two Concerns with Rainwater Use

There are two main issues often presented against the safety of consumption of rainwater in harvested in water tanks:

1. **Lead contamination** – the influence of roofing material and lead flashing contaminating rainwater tank with poisonous metals.
2. **Sludge and biofilm contamination** – even with water diverters and strainers installed, over time particles still find their way into a tank. This turns into a layer of sludge which reportedly causes contamination and can be a breeding ground for harmful bacteria.

Lead Contamination

A publication by Magyar et al (2014), *Influence of roofing material and lead flashing on rainwater tank contamination by metals*, argued that there was widespread lead contamination in rainwater harvested in tanks.

All sides are in agreement that lead flashings, which stop water penetrating the junction of a roof, should be avoided. There is very good evidence that lead flashing is damaging to rainwater quality and so should be avoided if collecting rainwater for consumption.

Thankfully, building controls in place before the research was carried out address these concerns. Still, many home owners may not be sufficiently aware that lead was once used in flashings in the past. Where lead flashing is on a roof that collects rainwater for drinking purposes, then it should be removed as a priority.

On the other hand, the proposition is that there are high levels of lead in rainwater tanks without lead flashing, such requires further evidence and discussion.

Sludge and Biofilm Contamination

The sludge layer that builds up at the bottom of a rainwater tank is often considered a source of contamination (e.g., Magyar and Ladson). On the other hand, others like Coombes and Spinks see sludge as beneficial to treating rainwater and protecting its quality.

Some studies have indicated that 23% of urban rainwater tanks have lead contamination, yet then as previously mentioned, we must wonder why there aren't more widespread reports of lead contamination amongst the 2.3 million Australians drinking rainwater.

Coombes own studies of old inner city residence in industrial areas counter this research, and found no significant lead contamination. In fact, studies on over a thousand tanks in many parts of Australia in the past 15 years rarely revealed lead contamination. Why? As Coombes and Smit note:

It turns out that a decade of independent research confirms the rainwater treatment train that includes the natural processes of flocculation, settlement, biofilms (including the sludge) and competitive exclusion of bacteria (where more resilient environmental bacteria eliminate more fragile potential pathogens).

Interestingly, the biofilms in rainwater tanks appears to be highly effective at removing lead and other contaminants from the water column. The research highlights that the sludge layer

is held together by sticky substance (polysaccharides). This biofilm absorbs lead and other contaminants and should therefore not be disturbed by regular cleaning.

When inquiring about his research, Coombes commented it is important understand that the microbial communities found in biofilms are predominantly harmless soil or environmental bacteria that consume other bacteria, nutrients and chemicals. Since rainwater tanks are a low nutrient environment, the biofilm is hungry which is good for preserving water quality.

There is not the presence of a thick green or black slime that smells that one would normally associate with a pond. Some very poorly maintained rainwater tanks may reach such a state, but a fully operating rainwater harvesting system with water diverters and strainers as found in urban areas are unlikely to display such characteristics.

Conclusion on Rainwater Safety

Ironically, the assumption that the quality of rainwater poor because of sludge appears to be turned on its head if this biofilm acts as a kind of “sticky filter” that absorbs otherwise heavy contaminants and metals like lead. Despite disagreements, all agree there is a real benefit to be had in ensuring design, maintenance and management of rainwater harvesting systems with adequate protocols developed based upon evidence.

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