

# BRINE FACTSHEET



## Radioactive Liquid Waste from Oil & Gas Production



By: Buckeye Environmental Network tm

Ohio Department of Natural Resources tests confirms dangerously high levels of radium 226 & 228 in brine from oil and gas production wells. Brine is used on some Ohio roads as a deicer and dust suppressant, where it may get into the soil, can be tracked into homes, or become airborne as radioactive dust and can contaminate drinking water sources and agricultural products.

### SOURCES for brines used on Ohio roads

Brines from conventional, low-volume oil and gas extraction wells can legally be *and are* used on many Ohio roads by some ODOT districts (covering at least 28 counties as of 2019) and by many counties and townships.

### Ohio Department of Natural Resources (ODNR) Oil and Gas Brine TEST RESULTS

Radioactive levels of **radium** 226 and 228 in brine from 151 oil & gas well samples.

Well Type	# Wells Sampled	Results*
Conventional (vertical, shallow) wells, the old mom & pop wells	118	66 to 9602 pCi/L**
Horizontal (deep) wells	25	173 to 3264 pCi/L
Out-of-state (brine disposed in OH)	8	54.6 to 9798 pCi/L

\* Source: Tests completed for ODNR Radiation Safety Section, Division of Oil and Gas, cited in their memos of 1-23-18 and 7-2-18  
 \*\* Picocuries: a measure of the intensity of radioactivity; pCi/L reflects the intensity of radioactivity per liter of water.

### Legal Exposure Limits

Ohio Administrative Code sets the legal limit for combined Radium-226 and Radium-228 discharge to the environment to 120 pCi/L. (OAC 3701:1-38-12, Appendix C, Table II) U.S. Environmental Protection Agency drinking water standard for combined Radium 226 and 228 is 5pCi/L. (40 CFR 141.66)

### Health-based exposure limits: from *Radioactive elements most commonly detected in drinking water Environmental Working Group Tap Water Database 2019* [ewg.org/tapwater/reviewed-radiological.php](http://ewg.org/tapwater/reviewed-radiological.php)

Element	Primary health concern	Detection level, in picocuries per liter	Health-based limits (based on one-in-a-million cancer risk)	National Maximum Contaminant Level (MCL) in pCi/L	Cancer risk at legal limit
Radium-226 & -228	Bone cancer, other cancers	1	0.05 pCi/L	5 pCi/L for combined radium 226+228	7 cancer cases per 100,000 exposed

### Health Effects and Dangers of Radium

U.S. EPA and the National Academy of Sciences Committee on Biological Effects of Ionizing Radiation list radium as a known human carcinogen. (ATSDR ToxFAQs) Human exposure results in an increased incidence of bone, liver, and breast cancer. Radium-226 is especially dangerous because, unlike many radioactive isotopes, it dissolves readily in water. When the contaminated water is ingested, the body mistakes Ra-226 for dissolved calcium and deposits it in bones. Radium-226 is thus called a bone seeker. Radium 226 and 228 are the parents of radon gas, a major cause of lung cancer.

USEPA has set a health guideline of zero for all radioactive elements in drinking water. However, federal legal limits for radiation and radioactive contaminants are based on the cost of removing contaminants and don't necessarily reflect exposure levels considered safe by public health and medical officials. Since detection limits (minimum level needed for detectability) of radioactive substances in water are higher than health-based guidelines, even residents of communities with "no detected radiation" may face cancer risks from radioactivity in drinking water.

We have been told over and over that brine spreading is safe because it is from waste produced by conventional wells rather than unconventional horizontal wells. As we suspected all along, this assumption is false; waste from conventional wells can be highly radioactive. Radium 226 has a half-life of 1,600 years, meaning that in 1,600 years half

of the radium concentration will still be present. Thus for the highest concentration tested from an Ohio well (9,602 picocuries), the concentration will still be 4,801 picocuries 1,600 years from now.

## AQUASALINA

Aqua Salina is a product made by filtering brine from conventional wells and adding an anti-corrosive chemical. It has been sold to the general public as well as to the State of Ohio for use on our roads. For a third time, a legislative bill (HB 545) has been introduced, seeking to protect this product from future regulation.

All samples of AquaSalina tested by ODNR exceeded federal Drinking Water legal limits for combined Ra-226 and Ra-228, averaging 1,731 pCi/L, or 346 times the EPA standard. The highest concentration found (from a container of AquaSalina purchased from a hardware store in Hartville, OH) was almost 500 times the standard. Ra-226 and Ra-228 radioactivity in all samples also exceeded State of Ohio limits for discharge to the environment (OAC 3701:1-38-12, App. C, Table II, Effluent Concentrations). The combined radium Ra226/Ra228 concentration in all samples of post-production AquaSalina, other than the Hartville Hardware sample, averaged within 10% of each other at 1,578.6 pCi/l. (ODNR Interoffice Memo 7/26/17; pdf at [benohio.org issues page](http://benohio.org/issues))

## UPDATE ON AQUASALINA TESTING

In February and March of 2020 the Ohio Department of Natural Resources did split sampling of AquaSalina with Nature's Own Sources. Their conclusion was that the process did not *increase* the concentration of Radium 226 and 228. However, this conclusion is irrelevant — it has nothing to do with whether the levels found are *safe*. They clearly are not! See below for a short breakdown of the concentration.

**Table 3** - Summary of DOGRM split-sample results from Table 1 (radiochemistry analysis).

Combined Ra226 & Ra228	Minimum pCi/l	Average pCi/l	Maximum pCi/l
Raw Brine (conventional wells)	1047	3715	9602
Finished Brine (AquaSalina)	901	2510	5628

**Table 4** - Summary of DOGRM split-sample results from Table 2 (indirect gamma analysis).

Combined Ra226 & Ra228	Minimum pCi/l	Average pCi/l	Maximum pCi/l
Raw Brine (conventional wells)	1328	3987	9541
Finished Brine (AquaSalina)	1328	3251	7415

- Aquasalina is approved for road use in 224 townships/municipalities in Ohio.
- Ohio Department of Transportation also uses AquaSalina on state roads in 29 counties.

## Additional Concerns about the Approval Process for Oil&Gas Brine-spreading

- Approvals authorize multiple applications per roadway and do not have an expiration date.
- The specific batch of oil or gas brine used does not have to be tested for radioactivity.
- Testing for naturally occurring radioactive materials is not required.
- There are no provisions for follow-up monitoring or enforcement of radioactivity in the environment.

Under federal and state Underground Injection Control (UIC) regulations, any waste containing radioactive concentrations exceeding those designated by the Nuclear Regulatory Commission (10 CFR 20 Appendix B, Table 2, Column 2) must be treated as radioactive and disposed of accordingly. For both radium-226 *and* radium-228 the threshold is 60 pCi/L for a combined threshold of 120 pCi/L. Only legal exemptions for oil and gas industry waste allow this radioactive waste to be both sold as a commodity and used indiscriminately on public roads with no assessment of environmental and public health impacts. Allowing the spreading of radioactive waste in the environment is a serious health issue that must be halted now!

For more info, contact [info@benohio.org](mailto:info@benohio.org). Useful background and links at [rollingstone.com/politics/politics-features/oil-gas-fracking-radioactive-investigation-937389/](http://rollingstone.com/politics/politics-features/oil-gas-fracking-radioactive-investigation-937389/) published 1-21-20