

**Greg Pace testimony to the
Ohio Senate Agricultural and Natural Resources Committee
in opposition to SB 171
6/22/2021**

Chairman Shaffer and members of the committee,

I want to thank you for this opportunity to stand before you and present my concerns about SB 171.

My name is Greg Pace, I live in Columbus and am a founding member of the ‘Columbus Community Bill of Rights’, a local non-profit organization. Our concern is to keep central Ohio’s water, soil and air resources free from contamination from oil and gas production wastes.

Because SB 171 will be a sizable step into allowing virtually unlimited amounts of frack brine products to be spread on the surface of the state of Ohio with radium-226 levels that exceed US EPA set limits for environmental discharge by more than 333 times, I will spend time reviewing why the EPA considers the 5 picocurie/liter (pCi) drinking water limit, and the 60 pCi environmental discharge limit for radium-226 to be a safe level for the residents of Ohio. To save time, I am reading from the larger print, but please on your time read the smaller as well.

Paraphrasing from page 10 of ‘Public Health Goal for Radium -226 and -228 in Drinking Water’
Office of Environmental Health Assessment, CA EPA March 2006

“<https://oehha.ca.gov/media/downloads/water/chemicals/phg/phgradium030306.pdf>”

In 1976, the US EPA created maximum contaminant levels (MCLs) for combined Ra-226 and Ra-228 at 5pCi. In 1991, EPA was prepared to raise this level to 20pCi, but in 2000, when final rules for drinking water were drawn, updated dosimetry and risk levels could not justify increasing the original limits.

The reason radium-226 can be so damaging is that it is an alpha emitter that completely dissolves in water evading normal filtering systems, and is bone-seeking. Alpha emitters are a form of “ionizing radiation”, which ionizes, or changes atomic structures in our body’s cells, thereby destabilizing them. Cells mutate, sometimes into cancer cells, and many cells are killed.

Quoting from page 2 of [‘EPA Facts About Radium’, published by the EPA in 2002:](https://semspub.epa.gov/work/HQ/176335.pdf)
<https://semspub.epa.gov/work/HQ/176335.pdf>

“Exposure to radium over a long period may result in many different harmful effects. If inhaled as dust, or ingested as a contaminant, risk is increased for several diseases including, lymphoma, bone cancer, and hematopoietic (blood formation) diseases, such as leukemia, and aplastic anemia. These effects take years to develop. If exposed externally to radium’s gamma radiation, risk of cancer is increased in essentially all tissues and organs, though to varying degrees. However, in the environment, the greatest risk associated with radium is actually posed by its direct decay product radon. Radon has been shown to cause lung cancer.”

[note from presenter Greg Pace: radon is widely known to be the second leading cause of lung cancer, behind smoking tobacco products]

From [Toxicological Profile For Radium - 1990](https://www.atsdr.cdc.gov/toxprofiles/tp144.pdf) published by
[Agency for Toxic Substances and Disease Registry , U.S. Public Health Service](https://www.atsdr.cdc.gov/toxprofiles/tp144.pdf)
[In collaboration with: U.S. Environmental Protection Agency](https://www.atsdr.cdc.gov/toxprofiles/tp144.pdf)
<https://www.atsdr.cdc.gov/toxprofiles/tp144.pdf>

Page 33:

“Radium, similarly to calcium, deposits in bone within those areas where new bone mineral is being formed and also on all bone surfaces. Radium remains in those areas of new bone formation, but the radium deposits on bone surfaces eventually move into the depths of compact bone as new bone matrix is deposited on top of them. In this deposition process, short-lived radium-224 rapidly decays, leaving no radioactivity within bone; whereas, long-lived radium-226 remains in the skeleton indefinitely (Rowland 1966). Mays et al. (1975) have demonstrated that the radon to radium ratio in bone increased with time after injection in beagles.”

Pg 37:

“Bone sarcomas are known to be induced by both radium-226 and radium-228, while carcinomas of the bones enclosing the mastoid air cells and paranasal sinuses are known to be induced by exposure to radium-226. These carcinomas are believed to be caused by radon, a gaseous daughter product of radium-226, which migrates from the location where it was formed and becomes trapped within air cells in these structures. Here the subsequent decay products of radon irradiate the sensitive cells on the surfaces, and this irradiation is thought to induce the malignant change.”

[Note from presenter Greg Pace: see Dr. Julie Weatherington Rice comments on HB 393 2018 section on

*‘Brine exposure has killed Ohioans, Ohio does not track these deaths, other states do’
[paraphrasing]*

In the 1990’s, Dr. Melvin Palmer, an environmental scientist associated with The Ohio State University, and a neighbor of his died from a rare form of lymphoma.

The James Cancer Hospital determined that the disease was environmentally triggered by long-term exposures to hydrocarbons and heavy metals. With help from colleagues at OSU, the source of contaminants that most probably caused the disease was ascertained from a dried-up dust “puddle” in his driveway that contained concentrated amounts of heavy metals. He and his neighbor repeatedly breathed in dust that covered their bodies as they mowed their lawns situated next to a dirt road that for years had been subject to oil and gas brine spreading for dust control in Licking County. The State of Ohio does not track diseases that result from oil and gas production contaminations. Citizens themselves have finally have begun to form a disease registry to track these health concerns.]

Back to the toxilogical profile report - Pg 57:

“Radium may be bioconcentrated and bioaccumulated by plants and animals, and it is transferred through food chains from lower trophic levels to humans.”

Pg 123: **APPENDIX B**

Workers who ingested radium-226 while painting watch dials had an increased incidence of leukemia and bone cancer (ATSDR 1990c). These studies indicate that depending on radiation dose and the exposure schedule, ionizing radiation can induce cancer in nearly any tissue or organ in the body. Radiation-induced cancers in humans are found to occur in the hemopoietic system, the lung, the thyroid, the liver, the bone, the skin, and other tissues.

From **US EPA publication** named
Radiation Protection - Radiation Basics

<https://www.epa.gov/radiation/radiation-basics>

From the section titled ‘Alpha Particles’:

“The health effect from exposure to alpha particles depends greatly on how a person is exposed. Alpha particles lack the energy to penetrate even the outer layer of skin, so exposure to the outside of the body is not a major concern. Inside the body, however, they can be very harmful. If alpha-emitters are inhaled, swallowed, or get into the body through a cut, the alpha particles can damage sensitive living tissue. The way these large, heavy particles cause damage makes them more dangerous than other types of radiation. The ionizations they cause are very close together - they can release all their energy in a few cells. This results in more severe damage to cells and DNA.”

EPA 815-F-00-013 November 2000

Technical Fact Sheet: Final Rule for (Non-Radon) Radionuclides in Drinking Water

<https://www.epa.gov/sites/production/files/2015-06/documents/compliance-radionuclidesindw.pdf>

What health effects are associated with exposure to radionuclides from drinking water? Exposure to radionuclides from drinking water results in the increased risk of cancer. The radioactive particles

(alpha, beta and gamma particles) emitted by radionuclides are called "ionizing radiation" because they ionize ("destabilize") nearby atoms as they travel through a cell or other material. In living tissue, this ionization process can damage chromosomes or other parts of the cell. This cellular damage can lead to the death of the cell or to unnatural reproduction of the cell. When a cell reproduces uncontrollably, it becomes a cancer. Certain elements accumulate in specific organs: radium (like calcium) accumulates in the bones and iodine accumulates in the thyroid.

5. What are the sources of radionuclides in water?

Most drinking water sources have very low levels of radioactive contaminants ("radionuclides"), levels low enough not to be considered a public health concern. Of the radionuclides that have been observed to occur in drinking water sources, most are naturally occurring. However, contamination of drinking water sources by anthropogenic ("human-made") nuclear materials also occurs. Naturally occurring radionuclides are found in the Earth's crust and are created in the upper atmosphere. For example, trace amounts of long-lived isotopes (e.g., uranium-238, which has a half-life of almost five billion years) have been present in earth's crust since the crust first formed. As these long-lived trace radionuclides decay, shorter-lived ("more radioactive") daughter products are formed. **Of particular concern are naturally occurring uranium and the naturally occurring radium isotopes, radium-226 and radium-228, which have been observed to accumulate to levels of concern in drinking water sources.** Most of the naturally occurring radionuclides are alpha particle emitters (e.g., the uranium isotopes and radium-226), but naturally occurring beta particle emitters do occur (e.g., radium-228 and potassium-40).

<https://evictradon.org/research-topics/radon-gas-alpha-radiation/>

[from the website]

Led by Dr. Aaron Goodarzi, the Canada Research Chair for Radiation Exposure Disease, Evict Radon is working towards educating Canadians about the harmful effects of radon gas.

Ethics Statement

The University of Calgary Conjoint Health Research Ethics Board has approved this research study.

1. Our cells can repair DNA damage and, most of the time, this is quick and accurate meaning few genetic mutations arise. However, our cells are not good at repairing alpha particle-induced DNA damage quickly or accurately. As a result of this, and unlike the more simple DNA damage from other types of radiation (such as x-rays), there is functionally no dose of particle radiation that is "safe" in terms of 'consequence (mutation)-free' DNA damage induction and repair.