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Air pollution from unconventional gas wells may affect human health

Residents living within half a mile of unconventional natural gas wells may have an increased risk of illness from exposure to air pollution from the wells, according to a recent study. The peer-reviewed study recommends that risk prevention efforts to minimise impacts on human health should concentrate on communities living and working close to wells during well completions and that further studies on health effects of exposures to air emissions from such projects should be carried out.

In the United States, vast reserves of natural gas are held in deposits that are difficult to extract. However, advances in technology, such as horizontal drilling and hydraulic fracturing (the high pressure injection of water, proppants and chemicals into the drilled area to release the gas) means it is more feasible to access unconventional sources of natural gas, found, for example, in shale deposits, coalbeds and tight sands.

In this study, the researchers estimated the health risks associated with exposure to air emissions from a natural gas development tight sand site in Colorado, USA, for two groups of residents: those living less than half a mile from the site and those living more than half a mile away from the site. Based on US Environmental Protection Agency (EPA) guidance, the researchers assessed the non-cancer health impacts and excess life-time cancer risks from hydrocarbon exposure using local air monitoring data collected over three years.

Among the potentially damaging hydrocarbons found in the air around the site were benzene, ethylbenzene, toluene and xylene. Benzene levels, in particular, could potentially increase the risk of developing cancer, as well as short and long-term non-cancer health problems.

People who lived within half a mile of the wells had a greater risk of developing non-cancer health effects from hydrocarbon air emissions than those living further away. The greatest health risk came from short-term exposure to the high emissions released during the well completion period, the latter stage of a well development which involves fracturing and the return of fracking fluids, naturally occurring materials , liquid hydrocarbons and natural gas to the surface. The greatest risk was from exposure to trimethylbenzenes, aliphatic hydrocarbons and xylenes. All these hydrocarbons affect the nervous and/or respiratory systems, and symptoms include eye, nose and throat irritations, headaches and impaired lung and nervous system functions. Headaches and throat and eye irritation have already been reported by residents during well completion activities, which the researchers say are consistent with known health effects of many of the hydrocarbons they assessed.

In addition, the life-time risk of cancer was higher for people living closer to the wells than those living further away. For all residents, exposure to benzene was the most significant factor contributing to an increased risk of cancer. For residents living within half a mile of the wells, exposure to ethylbenzene also contributed to an increased risk of cancer, while for people living more than half a mile from the wells, exposure to 1,3-butadiene was also a primary cause of an increased risk of cancer.

By identifying where and when the impacts of developing unconventional natural gas deposits are most likely to occur, authorities would be able to target mitigation efforts in a more effective way. This study has found that air emissions are a source of risk to the community around the gas wells. Public health would be most affected by well completion activities with residents living closest to the wells most at risk. Strategies to control, monitor, capture and reduce emissions during completion activities, and to keep the local community informed during development would help minimise health risks for nearby residents.

Source: McKenzie, L.M., Witter, R.Z., Newman, L.S., Adgate, J.L. (2012) Human health risk assessment of air emissions from development of unconventional natural gas resources.*Science of the Total Environment*. 424: 79–87. DOI:10.1016/j.scitotenv.2012.02.018.
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