

## Fracking in BC: A public health concern

**H**ydraulic fracturing, popularly referred to as *fracking*, is a method of extracting natural gas from previously untappable reservoirs. The practice has become an issue of international attention and debate, and in some cases condemnation. France, Bulgaria, and Vermont have prohibited the process, and moratoriums exist in Quebec, New York, and Delaware. Yet while some areas are banning fracking, BC is allowing it to boom—to the tune of 7300 wells fracked since 2005. Much of the controversy surrounding fracking lies in the largely unknown health effects, particularly given the potential for drinking water contamination with toxic and carcinogenic chemicals.

Concerns and anecdotal evidence of already-present deleterious health outcomes have led to precautionary bans in the Sacred Headwaters region of BC and reviews at both the provincial and federal level. While we await the results of these comprehensive analyses, the Environmental Health Committee has created the following outline of the fracking process and its potential health effects.

In Canada approximately 27 trillion cubic metres of natural gas exist in traditionally inaccessible tight shale formations. These exist about 2 kilometres below the surface in BC, with the majority of deposits in the Montney Basin near Dawson Creek and the Horn River Basin near Fort Nelson. To extract this gas, wells are drilled first vertically and then horizontally into the shale layer. After the wells are encased in cement, inch-long holes are blasted in the horizontal portion. Then the fracking process begins, with

as much as half a million litres of water injected, under high pressure, into the shale layer. The water contains a mixture of additives designed to aid the process. Vertical fractures hundreds of feet long are created, freeing the natural gas, which flows to the well-head with a portion of the injected fluids. Multiple fracs can be conducted per well.

**Fracking fluid could enter drinking sources by ascending from the shale layer, as a result of surface spills and through improper disposal of “flowback.”**

The potential contamination of drinking water with chemicals used in the fracking process is often cited as the main health concern. While additives make up only 2% of the total fluid volume, this can represent 40 000 litres of additives injected per well. The chemicals used are widely variable, and while public disclosure of ingredients is mandatory in BC, proprietary claims and trade secrets are exempt. An analysis of 353 of these chemicals found that more than 75% could have respiratory, gastrointestinal, dermatological, and ocular effects; 40% to 50% could be neuro-, immuno- and nephrotoxic; 37% could be endocrine disruptors, and 25% could be carcinogenic.<sup>1</sup>

Obviously these chemicals are of concern, and contamination of a freshwater reservoir could be regionally devastating. Fracking fluid could enter

drinking sources by ascending from the shale layer, as a result of surface spills and through improper disposal of “flowback” (Figure). While there is no documented groundwater contamination in BC from fracking fluid, an EPA investigation has found high concentrations of benzene, xylenes, and other hydrocarbons in Wyoming wells specific for both deep and surface routes.<sup>3</sup> Surface spills and improper disposal are highly feasible in BC, especially given the vast amount of waste fluid (4.2 billion litres in 2009)<sup>4</sup> that is transported and disposed of mainly in cement-lined underground reservoirs. However, it is unclear if injected fluid is of concern in BC as fracking wells are much deeper than in the tested area, and tightly packed overlying rock formations are thought to act as an impermeable barrier.

Methane contamination of drinking water reservoirs has been documented in fracking-rich areas of the US,<sup>5</sup> leading to dramatic videos of seemingly ignitable tap water. However, the mechanism of entry and adverse effects of methane are unclear—while it is an asphyxiant, explosive, and fire hazard in enclosed spaces, methane is not hazardous to ingest.

Submissions to the first phase of the BC review identified a plethora of other concerns including freshwater depletion, air quality, social factors, and greenhouse gas emissions.<sup>6</sup> New technologies permit wellheads to be situated in close proximity to residential areas, and numerous reports of headaches, nausea, asthma exacerbations, depression, fatigue, and reduced cognitive functioning have been anecdotally attributed to noxious fumes and flare gas.

Another effect of the fracking industry is the impact on demographics.

---

*This article is the opinion of the Council on Health Promotion and has not been peer reviewed by the BCMJ Editorial Board.*

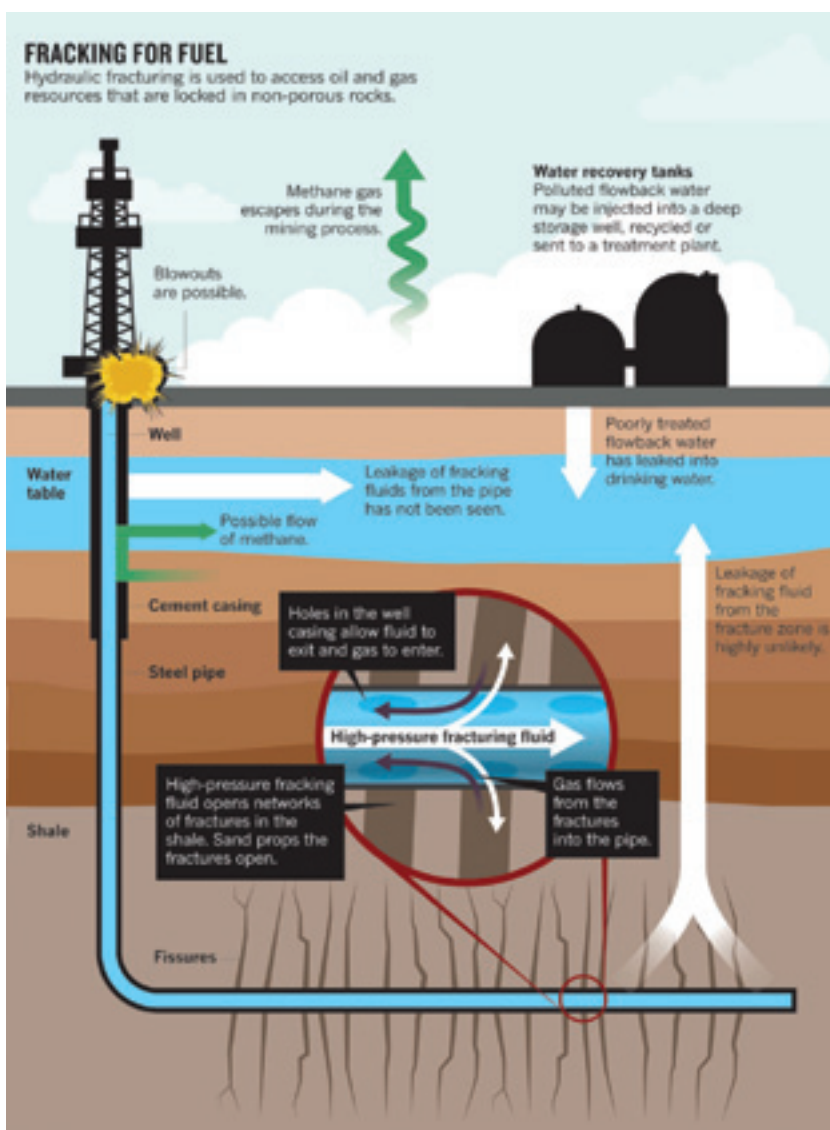
As with boomtowns of the past, the demographics of cities and towns in northeastern BC have changed, with an influx of young males and increased per capita alcohol consumption, crime, violence, and strain on local health care.<sup>7</sup>

By the end of 2014, reviews are due to be published provincially and federally, with two large EPA studies also set for completion.<sup>3,8</sup> The provincial review seems comprehensive in scope, with a “focus on potential impacts to air, land, and food quality and how these relate to public health.”<sup>9</sup> Fracking, while becoming a powerful part of BC’s economy, must be performed in a manner that ensures health is not affected. We welcome a thorough, evidence-based provincial review, free from industry bias.

—Michael A. Benusic  
**UBC MD candidate (2014)**  
**Council on Health Promotion**

**References**

1. Colborn T, Kwiatkowski C, Schultz K, et al. Natural gas operations from a public health perspective. *Human Ecological Risk Assess* 2011;17:1039-1056.
2. Howarth RW, Ingraffea A, Engelder T. Natural gas: Should fracking stop? *Nature* 2011;477:271-275.
3. DiGiulio DC, Wilkin RT, Miller C, et al. Investigation of ground water contamination near Pavillion, Wyoming (draft). US Environmental Protection Agency. December 2011. Accessed 30 April 2013. [www.epa.gov/region8/superfund/wy/pavillion/EPA\\_ReportOnPavillion\\_Dec-8-2011.pdf](http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf).
4. Horne M, Campbell K. Shale gas in British Columbia: Risks to BC’s water resources. Pembina Institute. 14 September 2011. Accessed 12 March 2013. [www.pembina.org/pub/2263](http://www.pembina.org/pub/2263).
5. Osborn SG, Vengosh A, Warner NR, et al. Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. *Proc Natl Acad Sci USA* 2011;108:8172-8176.
6. Fraser Basin Council. Report to BC Ministry of Health: Identifying health concerns relating to oil & gas development in northeastern BC. Human health risk assessment—Phase 1: Compendium of submissions. 30 March 2012. Accessed 1 March 2013. [www.health.gov.bc.ca/library/publications/year/2012/Identifying-health-concerns-HHRA-Phase1-Compendium.pdf](http://www.health.gov.bc.ca/library/publications/year/2012/Identifying-health-concerns-HHRA-Phase1-Compendium.pdf).
7. Goldenberg SM, Shoveller JA, Koehoorn M, et al. And they call this progress? Consequences for young people of living and working in resource-extraction communities. *Critical Public Health* 2010;20:157-168.
8. United States Environmental Protection Agency. Study of the potential impacts of hydraulic fracturing on drinking water resources: Progress report. December 2012. Accessed 1 March 2013. [www2.epa.gov/hfstudy](http://www2.epa.gov/hfstudy).
9. Government of British Columbia. Ministry of Health. Fact sheet. Phase 2: Oil and Human Health Risk Assessment of Oil and Gas Activities in Northeastern BC. 2012. Accessed 10 April 2013. [www.health.gov.bc.ca/protect/pdf/oil-gas-risk-assessment-factsheet.pdf](http://www.health.gov.bc.ca/protect/pdf/oil-gas-risk-assessment-factsheet.pdf).



**Figure.** Basic mechanism of hydraulic fracturing and potential routes of water contamination.<sup>2</sup> Reprinted with permission.