

OPINION EDITORIAL

Offshore Development Contamination in Canada's Arctic: A Threat to Food Quality and Safety?

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INTRODUCTION

Due to the warming of the Arctic and ensuing ice melt, the accessibility of oil and gas reserves on the continental shelf has increased. These undeveloped reserves have one of the world's largest quantities of oil and, though a moratorium currently exists on offshore oil drilling in the Canadian Arctic, it seems inevitable that oil drilling projects will expand in the future [1]. There are many risks associated with offshore oil drilling, and Arctic communities will bear the brunt of these risks.

For thousands of years, the harvest, sharing, and consumption of country foods (also known as traditional foods) have had important nutritional, health, psychosocial, and cultural benefits [2-5].

Over the last several decades, the Indigenous peoples of Northern Canada have experienced rapid socioeconomic and environmental changes that have resulted in a significant nutrition transition. The nutrition transition is characterized by increased consumption of high energy, low-nutrient market foods and a decrease in nutrient-dense country food [2]. Notwithstanding, country foods remain a vital food source, and a diet consisting of these foods results in better health outcomes.

As 62% of Inuit are food insecure, further change in the access or quality of marine country food resources (such as beluga or ringed seal) may exacerbate food insecurity in the Arctic [6]. Furthermore, the altered accessibility and quality of these country foods may result in increased consumption of nutritionally inadequate market foods, thus increasing susceptibility to the double

burden of malnutrition, where individuals consume too many calories but inadequate nutrients [1,6]. Currently, a gap in knowledge exists in the explicit evaluation of the environmental and health impacts of oil and gas development [7]. Moreover, few studies have investigated the possible health and food security impacts on coastal Indigenous peoples who rely on marine resources to survive. Therefore, this paper conceptualizes the possible effects of polycyclic aromatic hydrocarbon and oil spill contamination on marine country food quality and safety, with the aim of sparking dialogue about the possible environmental-human health risks that development poses to Arctic coastal Indigenous communities.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

Contamination of the marine environment is a large concern when considering the impact of oil development on the safety and quality of country food. In the exploration phase, drilling can pollute the marine environment through drill cuttings and accidental blowouts (by-products of exploration) [8]. Heavy metals, naturally occurring radioactive materials, and hydrocarbons may be released in the local and regional environment throughout this phase. In the production phase, well-drilling, well-production, and operational wastes further pollute the local and regional marine environment through produced water (which can contain heavy metals, hydrocarbons, high levels of salt, organic and inorganic material), drilling fluids, cuttings, and hydrocarbons. Drilling fluids and drill cuttings have the capacity to be stored in sediments, making them highly available for bottom-feeding benthic

communities [8,9].

Contaminants are of particular concern to humans, due to carcinogenic effects, are PAHs [9-14]. High contamination of PAHs in blood and tissue samples has been documented in various fish species exposed to petroleum development [11-15]. The bioaccumulation of hydrocarbons present in organs and consumable tissue poses a serious risk to the food web. Bioaccumulation of PAHs is not only limited to fish but can also be seen in large marine mammals with high metabolisms. Indeed, PAHs have been measured in the blood of orcas after consuming fish contaminated by PAHs [16] and in the tissue and blubber of belugas, a key source of country food [17,18]. It can be deduced that exposure to PAH through water and food significantly increases the risk of cancer to individuals living in close proximity to oil and gas development projects.

OIL SPILLS

Oil spills are additional environmental contamination risks that have been shown to have detrimental impacts on the marine ecosystem through the release of large quantities of hydrocarbons, heavy metals, and bacteria. After the 2006 Jiyeh Oil Spill in Lebanon, a high bacterial contamination rate was found in oysters that are consumed raw by humans globally [19]. A decade after the Gulf War Oil Spill in 1991, high concentrations of zinc and copper, which were largely associated with the spill, were found in the muscle tissues of crabs [20]. In Spain, following the 1992 Aegean Sea Oil Spill, acute hydrocarbon contamination was recorded in salmon and turbot species of fish [21]. Finally, seven years after the 1989 Exxon Valdez Oil spill, otters continued to show evidence of hematological changes due to oiling [22]. Evidently, oil spills contaminate key food species acutely and chronically. In a subsistence-based community, the impact of environmental contamination due to an oil spill could considerably affect the accessibility and quality of marine country food, and therefore, Arctic food security.

CONCLUSION

The drivers of food quality and safety in the Arctic are complex, and food contamination can occur through many pathways. This article focuses on the potential impacts of oil and gas development on the quality of Arctic marine country food. Specifically, it theorizes the conceivable impacts of PAHs and oil spill contamination on marine country food. Given the considerable importance of country food to the livelihood and well-being of Arctic Indigenous communities, research should aim to address the possible stresses that offshore drilling development may have on food security and food systems before any exploration begins.

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