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### **Canada: The Ramifications of Mercury on the Indigenous Population**

Hydrargyrum (Latin) derives from the Greek word *hydragyros*, meaning “water” and “silver.” The metal is more commonly referred to as Mercury, and its vernacular, “quicksilver.” The Romans believed the gods and goddesses controlled all earthly processes, and “quicksilver” was soon to be called Mercury, relating to the messenger god whose qualities were of speed and mobility, similar to the metal. Mercury has also been identified as a neurotoxicant, which is incredibly dangerous if handled inappropriately. Toxic heavy metals, such as mercury, affect the metabolic functions of the body in a myriad of devastating ways. Once a substantial amount has accumulated in an individual’s body, it disrupts the function in their vital organs such as the brain, heart, and kidneys. Mercury displaces important minerals from the body, and without their presence, mercury inhibits the system from functioning as it should. In Canada, citizens located in more industrialized areas are not at high risk levels for mercury poisoning; however, the same does not go for the country’s Indigenous inhabitants. The safety of all Canadians should be a top priority for the Canadian government, and it needs to begin with a comprehensive and effective plan of action to ensure that clean water and sanitation is available for all.

Canada contains an incredibly diverse mixture of cultures and people, constantly welcoming immigrants to its land. The population equates to over 35,000,000 people. Canada has one of the highest bio capacities in the world; as the second largest country in the world, it possesses a vast amount of land. Approximately 20% of Canadians occupy rural areas whereas the rest of the population resides in more urban regions. The number of First Nations people has immensely declined as European settlers encroached on their territory and brought newfound diseases such as smallpox that killed off a majority of the Indigenous residents during the 1600s. The Indigenous people only comprise a meager 4.17% of the Canadian population as of now (Evason, 2016). There are large socioeconomic discrepancies between the First Nations people and the non-Indigenous population. Canada establishes itself as a constitutional monarchy, meaning that the monarch shares power with the legislature and judiciary, abiding by the constitutional principles on which the country was established (Morton, William L., et al., 2023).

Agriculture is a major contributor to the Canadian economy; it is a highly diversified sector. “In 2021, Canada exported nearly \$82.2 billion in agriculture and food products (including raw agricultural materials, fish and seafood, and processed foods). Canada is the fifth-largest exporter of agri-food and seafood in the world, exporting to over 200 countries” (Canada, Agriculture, 2022). Canada has an immense potential for high levels of economic growth. With a highly diversified landscape, there are numerous possibilities for monetary gain. Cropland is generally focused in prairie landscapes, where the climate is excellent for prosperous yields. This is where large amounts of grain (particularly wheat) and oilseeds (especially canola) are cultivated, as well as where cattle grazing is located (Morton, William L., et al., 2023). Canada's contribution to GDP from crop production was \$26.3 billion, creating approximately 115,500 jobs (Canada, Agriculture, 2022).

Canada is largely influenced by European (specifically British and French) and American culture. These families and lifestyles are nearly indistinguishable from American culture. Families are likely to be nuclear; however, traditional gender roles do not apply as much in Canadian society. There are plenty of single-parent and LGBTQ+ families as the acceptance of newer lifestyles are becoming more common

(Evason, 2016). This way of life is typical for the average Canadian, whether they live in an urban or suburban area. Unfortunately, the same cannot be said about the quality of life when referring to Canada's Indigenous population. After settlements were established by incoming Europeans, the First Nations people were driven out of their land and had their resources and culture stripped away from them. There have been minimal efforts by the Canadian government to resolve these concerns, as the Indigenous peoples of Canada are facing discrimination and generally are at a lower standard of living than the average Canadian citizen. First Nations people are becoming increasingly dependent on government provided social and welfare programs to survive. Colonialism has demonstrated its massive negative impact on the lives of Indigenous Canadians; the Indigenous often live on rural reservations and are not close to any infrastructure found in more urbanized areas which creates a prolonged cycle of conflict. European colonization has had a detrimental effect on the health and overall wellbeing of the First Nations populations, the educational system and henceforth, the unemployment rate, the crime rate, and has created for many, unsuitable living conditions (Durand-Moreau, Quentin, et al., 2022).

Indigenous communities often rely on practices such as hunting, fishing, and gathering as a part of cultural and subsistence activities. However, their proximity to locations with heavy mercury pollution such as bodies of water and the atmosphere affect their health which not only affects their physical well-being, but also the cultural practices. In large part, mercury contamination's largest effect is on the wildlife, mainly the fish used for eating and economic purposes. Fish is one of the main consumed proteins for indigenous people as their location makes this resource highly accessible to them, yet the continued consumption of fish exposes these communities to incredibly high levels of mercury which contribute to developmental and neurological issues. Not only is food security compromised through mercury contamination, but the economic impact for indigenous people is devastating as well. There are many communities which rely on commercial fishing and trapping as a primary source of income, and the fact that mercury makes most of the marine life they catch dangerous to eat and utilize, it leads to financial hardship for families involved in these trades. A typical suburban family in Canada is not as exposed to the substantial amount of mercury the indigenous people encounter. They are usually not as reliant on food sources such as fish and can purchase a wider variety of proteins in order to sustain themselves. Families in Canada frequently have more access to quality healthcare services provided by their government. Even if mercury contamination was just as large of an issue for the non-indigenous families of Canada, there are better facilities and treatment options in these urbanized locations. Lastly, the suburban and urban populations of Canada have more resources and political influence to advocate for environmentalism and have quicker access to knowledge which allows them to be more informed about potential risks in a timely manner.

Along with the egregious discrimination that Canada's Indigenous population faces, their circumstances are only compounded by the unsafe environment in which a majority of them reside. Clean water for drinking and utility purposes, as well as sanitation services, are critical to the well-being of all people. This is unfortunately not a reality for most of the First Nations people. Mercury is not only affecting the water for consumption, but also the aquatic environments that are filled with life. Plants and animals take in this Mercury and it continues to bioaccumulate through the food chain. A majority of environmental Mercury contamination comes from industrial land development projects. Oftentimes the performances of these building and mining operations synthesize Mercury by-products through manufacturing or chemical processes. The Indigenous people receive very little benefit from these projects as they only create more strife in their everyday lives. (Wheatley, 1996). The preponderance of Canada's river contamination began in the early 1960s and 1970s in Dryden, Ontario. A pulp and paper mill owned by the Dryden Chemical Company was dumping 2-4.5 kilograms of Mercury into the English-Wabigoon river daily, which after a while accumulated to over 10 tons of toxic waste. The company's pollution was arrested due to the efforts of George Kerr, the Ontario Minister of energy and Natural Resource Management, as he

arranged for the company to cease Mercury dumping by March of 1970 (Mosa, Adam, and Jacalyn Duffin, 2017). The daily intake of Mercury per the average person in Canada, is said to be around 0.013 mg, however, this number is exceeded by communities who rely on fish and meat for food sources, namely the residents of the White Dog and Grassy Narrows communities, which are home to a great number of Indigenous people. Due to the fact that their diets contain large amounts of fish, the First Nations people are at greater risk for Mercury poisoning. The fish in the English-Wabigoon river have bio-concentrations of up to 15 mg/kg, which greatly surpasses the Canadian guidelines for edible fish: 0.5 mg/kg (Canada, Health, 2009).

Most Indigenous people of Canada take part in traditional lifestyles, which the bioaccumulation of Methylmercury in fish, poses harm to. B. Wheatly remarks, “The results of a 20 year testing program of methylmercury exposure levels of 38,571 Canadian Aboriginal people in 514 native communities across Canada are presented. 608 individuals had blood or blood equivalent levels over 100 micrograms/l. The highest individual level was 660 micrograms/l. The highest mean levels were found in the Inuit in N.W.T. In that same group, over 30% of women aged 15-45 years who were tested had levels over 10 micrograms/g methylmercury in hair with a mean of 16 micrograms/g, well into the 10-20 micrograms/g "risk" range defined by WHO for fetal exposure” (Wheatley, B, and S Paradis., 1996).

Though the Canadian government has promised clean up of the Mercury in Northwestern territories, neurotoxicity is still prevalent, as the federal and provincial authorities have failed to take action. Years have passed and no substantial work has actually been done to aid the members of the White Dog and Grassy Narrows communities. As significant as it is, the disregard for this issue has been proven by the lack of mitigation by governmental figures. Mercury poisoning continues to persist, not only in older members of the community, but much of the younger Indigenous population as well. The members of the community are subjected to the physical and mental health strains of Mercury exposure, not to mention the higher rates of mortality and overall inadequate living conditions. (LaFortune, 2021)

The 6th Sustainable Development Goal of the Canadian government is to ensure that their citizens are able to ensure access to clean water and sanitation services. The Government of Canada states that, “Canada’s ambition for this goal is to ensure Canadians have access to drinking water and use it in a sustainable manner. The national target is for all of the long-term drinking water advisories on public systems on First Nations reserves to be resolved” (Canada, Employment and Social Development, 2023). It is alleged within the government’s statement that the improvement of safer water for drinking and utility for First Nations people is a priority, however, more intensive action must be taken by the government in order for real and long-lasting change to occur.

According to the Government of Canada, they are aware of the socio-economic gaps between the Indigenous and non-Indigenous population. The federal government has made over \$5.2 billion dollars in support of aiding the First Nations people to repair water and wastewater infrastructure, as well as ensuring efficacious maintenance of the reserves. They have invested their resources into programs such as the Canada Infrastructure Program (ICIP) and the Canada Community-Building Fund (CCBF) to manage these efforts. (Canada, Employment and Social Development, 2023) The Canadian federal government has made claims that their programs are “well-established” however they have not made considerable efforts in actually taking the time and effort to clean any of the Mercury out of water bodies affecting the First Nations communities. Authorities in Ontario have made promising starts by developing Mercury care homes for those who are suffering from the ramifications of Mercury poisoning as well as compensating members of the Grassy Narrows and White Dog communities. (LaFortune, 2021)

The European Union has also had history dealing with the repercussions of Mercury infested waters and have taken a more extreme as well as effective approach in diminishing the presence of Mercury in their water. The EU wants to work on becoming completely Mercury-free and is doing so by committing to their policy to reduce pollution in manufacturing and chemical facilities. Processes such as coal combustion, waste incineration, cement production, and metal smelting are some of the largest Mercury by-product manufacturers. They've banned all products which operate using Mercury, and most electronic equipment containing Mercury have been exchanged for new apparatuses. The EU has demonstrated their leadership in the movement toward subsiding Mercury pollutants and making the overall environment a more pleasurable and safe place to reside in. It is largely important that Canada can begin to start partaking in considerable actions toward helping their Indigenous community. It may be necessary to proceed with bolder legislative and environmental action to combat the complications of Mercury's damage to quality of lives (EU Commission Editors, 2013). Following the example of the European Union and implementing bolder legislative and environmental measures could help Canada mitigate the damaging effects of Mercury contamination and improve the quality of life for its Indigenous communities. Mercury decontamination is a multi-faceted approach that combines regulatory measures, public engagement, and financial support of indigenous communities. For instance, through the promotion of mercury removal in indigenous communities, it is essential that the technologies we use to remove contamination are clean technologies. Industries engaged in coal combustion, waste incineration, and metal smelting must be encouraged to adopt cleaner and more environmentally friendly practices. These cleaner practices will also reduce the amount of atmospheric mercury emissions. Mercury-free product development is crucial to starting the process that the EU has adopted. This includes products from all sectors including electronics and healthcare equipment. Clean technologies will support the creation of alternative and more sustainable products. For example, dental amalgam has been used in the field of dentistry for over 200 years, but now, there are much better alternatives which not only benefit the environment, but also the consumer as the fillings are closer to tooth colour which make the dental repairs more aesthetically pleasing and natural.

It is imperative that Canada reviews its current environmental regulations and legislation in relation to Mercury contamination. If there are any gaps or weaknesses in the legal framework, that should be the first step to be corrected whether that is through amendments or the enacting of new legislation. Ensuring the strict enforcement of environmental regulations and implementing penalties for non-compliance will deter individuals and corporations from polluting Canada with Mercury. It is important to start off with a comprehensive goal as well. The EU and United Nations have created ambitious goals in order to protect the environment, which is exactly what Canada should be doing in order to alleviate the crisis on their hands, and eventually establish a Mercury-free status. In order to understand the extent of the mercury situation, the soil, air, water, and wildlife must be monitored. Canada should invest in advanced tracking systems as data collection and analysis are critical to identifying the major sources of pollution such as the Dryden Chemical Company's dumping of mercury in the English-Wabigoon River. This data should be reported to the public regularly. Not only will this promote the accountability of scientists and researchers to ensure their transparency, but the promotion of this environmental and sanitation issue among the public will also increase the effectiveness of mitigation efforts by encouraging engagement in environmental protection and public health.

Assuming that progress toward mercury decontamination by Canada has been started and legislation has been enacted by the Canadian government, the consultation and collaboration of the First Nations communities in their exigencies is fundamental. Indigenous customs and traditional knowledge should be followed by the Canadian government or a conflict of ethics could arise if Canada is not conscious of

following proper conduct when cooperating with this minority group. Damage control must also be fulfilled as mercury has produced numerous health issues in communities such as White Dog and Grassy Narrows, so access to regular health check-ups and treatment for affected individuals should be a priority to legislators and representatives. Long-term goals of the Canadian government could be to participate in international organizations in order to address cross-border mercury pollution. Active participation in global efforts to reduce mercury emissions not only benefits the environment and ecosystems around the world by decreasing a major pollutant but also provides more underdeveloped countries with proper sanitation and water. The mercury situation in Canada is still unfamiliar to a majority of countries and the public eye as the world has been dealing with the aftermath of the Covid-19 pandemic for quite some time, however, educating the public and stakeholders about the dangers of mercury contamination is intrinsic to the beginning of establish equity for the indigenous communities of Canada and other Native Peoples in the United States. Educating Canadians about the dangers of mercury contamination and the importance of reducing its presence in the environment will in hopes pare the likelihood that a situation like this will affect a minority group again.

The majority of Canada's Indigenous population are lacking basic necessities for satisfactory livelihoods. Despite making up such a small percentage of the population, the rates of unemployment, incarceration, suicide, and morality are disparate between the non-Indigenous and First Nations. The Government of Canada should take prime concern in equality of all their citizens, whether that is through infrastructure or sanitation services. More than anything, it is crucial that the physiological needs of Indigenous communities are met before anything else. Mercury and its harmful effects have taken a large toll on this particular minority group for too long. Chief Simon Fobister Sr. makes a point as to how Mercury has caused discord to the members of the First Nations, "The story of my people, the Grassy Narrows First Nations, weighs heavily on the collective conscience of Canada. For over half a century, mercury poison has contaminated the river that is our lifeblood" (Mosa, Adam, and Jacalyn Duffin, 2017). Never has there been a more important time to resolve issues of water contamination and poor sanitation as it continually affects a group whose struggles are only compounded by this plight.

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