



WHAT IF . . .

We fail to curb climate change?

It bears repeating that the future of medicine is almost exclusively the domain of the unknown. But here's one thing we do know without any shadow of uncertainty: Climate change is an urgent problem, and it's an urgent problem right now.

Consider the scientists. It's well-known that scientific consensus, especially around problems as massive and multifaceted as climate change, is rare. It's rare by design, baked into the operating framework within which scientists work. But on this topic, that consensus is now inarguable. Speaking on a podcast recently, Elizabeth Kolbert, a journalist whose book *The Sixth Extinction* won the Pulitzer Prize in Nonfiction in 2015, talked about how diligent these scientists are in separating the signal from the noise in their data—in figuring out what lies outside the scope of natural variability.

"They are extremely conservative. This is one thing I cannot emphasize enough," she said. "The dialogue around climate change is just completely insane and will go down as world-historically stupid and damaging and disastrous. Words fail me." Some who recognize the state of affairs have been beset by fear and anxiety, a condition that has been unofficially labelled "pre-traumatic" stress. Climate scientists themselves appear to be especially prone.

What does this mean for Canadian family doctors? The chances that a despondent climate scientist may one day land in your office are slim, but you will see others like them, and more of them. But more importantly, this slow-motion

catastrophe will touch primary care in ways that are going to become more unnerving. You already know sea levels are rising, ice caps are melting, infectious diseases are spreading to new latitudes, and that storms have increased in both frequency and intensity. All of that is horrible, but it likely remains a kind of abstraction, too difficult to connect to your life as a physician.

Other parts hit closer to home. The medical supply chain in many parts of the world, including in Canada, is reliant on single sources of manufacturing for medication, supplies, etc. When hurricane Maria hit Puerto Rico last year, it crippled one of the world's largest manufacturers of sterile saline bags, resulting in widespread shortages and price hikes of over 600%.

Air pollution is linked to over 20,000 preventable deaths a year in Canada and 620,000 primary care visits. Those numbers will get worse before they get better. Doctors in B.C. and Alberta are already familiar with asthma exacerbations and similar ailments provoked by the smoke that blanketed huge parts of the western provinces during 2018's record-breaking fire season, which itself followed a record-breaking season in 2017.

Then there's the heat. Even at the low-end projections of two degrees of warming (a limit the signees of the Paris Climate Accords have now all but acknowledged we will blow past), cities like Karachi and Kolkata will regularly experience paralyzing heat waves. If we get to four degrees, a 2012 report from the World Bank suggests that a "normal

summer" will look a lot like the European heat wave of 2003, which killed as many as 2,000 people per day. If we get to six degrees, temperatures in places like Toronto will exceed those in the hottest places on the planet and in *those places* it will be hot enough for hyperthermia to kill people in their sleep. A July 2018 modelling study published in *PLOS One* suggested that, in Canada, we could see a five-fold increase in heat-related deaths in the 50 years after 2030 compared to the 50 that came before.

Not to mention the world economy, the oceans, or the geo-political tensions that arise as a result of these factors. There will be more intense droughts. There will be more crop failures. There will be more armed conflicts as certain groups of people without access to sufficient resources grow more desperate (as happened in Syria's civil war). The effects of those conflicts will be felt in Canada (just as the one in Syria has been). There is scarcely one aspect of human life that is untouched by this phenomenon.

To reiterate, these are projections, but there is enough evidence to suggest they will come to pass barring a dramatic shift in the way our carbon-powered world operates. Other scenarios are less likely, based on too many unknowns, but still present a credible risk and doctors should be aware of them.

For instance, we know that the range of certain infectious diseases will continue to change, but we don't know whether the makeup of those pathogens might change. In 2016, in the Russian tundra, one person died, 115 were hospitalized and another 2,000 reindeer were infected with anthrax. The bacteria was traced to the carcass of a reindeer which emerged from the permafrost after it had been encased there decades earlier. In Alaska, researchers discovered remnants of the 1918 flu, which killed up to 100 million people.

"Experts caution that many of these organisms won't actually survive the thaw," David Wallace-Wells wrote last year, a tiny sliver of comfort in an otherwise harrowing story for *New York* magazine. "(But) there are now, trapped in Arctic ice, diseases that have

Indications and Clinical Use:

Monotherapy: JARDIANCE® (empagliflozin) is indicated for use as an adjunct to diet and exercise to improve glycemic control in adult patients with type 2 diabetes mellitus for whom metformin is inappropriate due to contraindications or intolerance.

Add-on combination: JARDIANCE® is indicated in adult patients with type 2 diabetes mellitus to improve glycemic control, when metformin used alone does not provide adequate glycemic control, in combination with:

- metformin
- metformin and a sulfonylurea
- pioglitazone (alone or with metformin)
- basal or prandial insulin (alone or with metformin)

when the existing therapy, along with diet and exercise, does not provide adequate glycemic control.

Important Limitation of Use: Use of JARDIANCE® with insulin mix (regular or analogue mix) has not been studied. Therefore, JARDIANCE® should not be used with insulin mix.

Contraindications:

- Patients with a history of hypersensitivity reaction to the active substance or to any of the excipients
- Patients with severe renal impairment (eGFR less than 30 mL/min/1.73 m²), end-stage renal disease and patients on dialysis

Most Serious Warnings and Precautions:

Diabetic Ketoacidosis: Clinical trial and post-market cases of diabetic ketoacidosis (DKA), a serious, life-threatening condition requiring urgent hospitalization, have been reported in patients on JARDIANCE® and other sodium-glucose co-transporter 2 (SGLT2) inhibitors. Some cases of DKA have been fatal. A number of these cases have been atypical with blood glucose values below 13.9 mmol/L (250 mg/dL).

- Patients should be assessed for DKA immediately if non-specific symptoms of DKA occur (difficulty breathing, nausea, vomiting, abdominal pain, confusion, anorexia, excessive thirst, unusual fatigue, or sleepiness), regardless of blood glucose level, and JARDIANCE® should be **discontinued immediately**
- JARDIANCE® should not be used for the treatment of DKA or in patients with a history of DKA
- Not indicated, and should not be used, in patients with type 1 diabetes

Other Relevant Warnings and Precautions:

- Not recommended for use in patients who are volume depleted
- Use with caution in patients for whom a drop in blood pressure could pose a risk or in case of intercurrent conditions that may lead to volume depletion. Careful monitoring of volume status and electrolytes is recommended. Temporary interruption of JARDIANCE® should be considered for patients who develop volume depletion until the depletion is corrected
- Caution should be observed in patients at high risk for cerebrovascular accidents
- In clinical situations known to predispose to ketoacidosis (e.g., major surgical procedures, serious infections and acute serious medical illness), consider temporarily discontinuing JARDIANCE®
- Use caution in patients at higher risk of DKA
- Use caution when reducing the insulin dose in patients requiring insulin
- The use of JARDIANCE® in combination with a secretagogue or insulin was associated with a higher rate of hypoglycemia
- Dose-related increases in LDL-C can occur with JARDIANCE®. LDL-C levels should be measured at baseline and monitored
- JARDIANCE® increases the risk of genital mycotic infections, particularly for patients with a history of genital mycotic infections
- JARDIANCE® increases the risk of urinary tract infections (including urosepsis and pyelonephritis)
- Use with caution in patients with an elevated hematocrit
- Not recommended in patients with severe hepatic impairment
- Serious hypersensitivity reactions including rash, angioedema and urticaria have been observed; discontinue JARDIANCE® if hypersensitivity reaction occurs
- JARDIANCE® causes intravascular volume contraction, increases serum creatinine and decreases eGFR in a dose-dependent fashion
- Assessment of renal function is recommended prior to JARDIANCE® initiation and regularly during treatment. In patients with an eGFR <60 mL/min/1.73 m², more intensive monitoring for glycemic and renal biomarkers and signs and symptoms of renal dysfunction is recommended (especially if eGFR <45 mL/min/1.73 m²). JARDIANCE® should be discontinued if eGFR falls below 30 mL/min/1.73 m² during treatment
- Monitoring of renal function is recommended prior to and following initiation of any concomitant drug which might have an impact on renal function
- Acute kidney injury has been reported; consider predisposing factors and concomitant medications before initiating JARDIANCE®. Consider temporarily discontinuing JARDIANCE® in any setting of reduced oral intake or fluid losses; discontinue JARDIANCE® promptly if acute kidney injury occurs
- JARDIANCE® must not be used during pregnancy or breastfeeding
- Should not be used in patients <18 years of age
- Use with caution in patients ≥65 years of age due to a greater increase in risk of adverse events, and because diminished efficacy is expected in this population as older patients are more likely to have impaired renal function
- Patients ≥75 years of age are at a higher risk of volume depletion. Prescribe with caution
- Initiation of therapy in patients ≥85 years of age is not recommended
- Patients receiving JARDIANCE® will test positive for glucose in their urine

For more information:

Please refer to the product monograph at www.JardiancePM.ca for important information relating to adverse events, drug interactions, dosing, and conditions of clinical use. The product monograph is also available by calling 1-800-263-5103 ext. 84633.

For important safety information on SGLT2 inhibitors and the risk of DKA, please refer to <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2016/58404a-eng.php>.

References: 1. JARDIANCE Product Monograph. Boehringer Ingelheim, April 16, 2018. 2. Zinman B, et al. Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes. *N Engl J Med*. 2015;373(22):2117-28.

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FEATURE

not circulated in the air for millions of years—in some cases, since before humans were around to encounter them.” To say primary care would be unequipped to deal with them seems, in all likelihood, to be understating things.

You might say this sounds alarmist, but alarm is warranted. There are doctors who feel that this—what the World Health Organization called the greatest threat to human health of the current century—is someone else’s problem. They believe it will never touch their practice. That may be true, thankfully, but there will be many more doctors in the future who will be less lucky. Parts of their reality will be unrecognizable to us who are responsible for it.

“It takes 40 years or more for the climate to react to the carbon dioxide and the methane we emit,” wrote *N+1* editor Chad Harbach in 2006. “This means that the disasters that have already happened during the warmest decade in civilized history (this one) are not due to our current rates of consumption, but rather the delayed consequences of fuels burned and forests clear-cut decades ago, long before the invention of the Hummer.”

Fixing this is less simple. There is one reason climate change has been politicized: Because the most immediate solutions are political. Absent some technological, carbon-capturing godsend, dialing back and eventually ceasing emissions will require massive political mobilization, new laws, spending, taxes. It’ll require international, cross-party support and clear-eyed leadership. It will look very much like the war efforts of the 20th century.

Moreover, it’s been done. The U.K.’s Climate Change Act sets legally binding targets for greenhouse gas emissions at five-year intervals, and it’s approaching its 10-year anniversary. Between 1990 and 2016 the country has reduced its greenhouse gas emissions by 41% (Canada’s emissions, by contrast, have gone up 16% in that period—over 100 megatonnes).

Such massive efforts might sound unappealing, even scary. But we can say, with a degree of scientific certainty, that the alternative is far worse.

—TRISTAN BRONCA