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Tobacco Control Programme



Regulatory Proposal for Reducing Fire Risks from Cigarettes

A Consultation Paper

Table of Contents

1.0	Introduction	1
2.0	Why regulate the ignition propensity of cigarettes?	2
2.1	Cigarette fires cause the highest number of fire-related fatalities in Canada	2
2.2	Fires ignited by cigarettes result in more property damage than fires ignited by other sources	3
2.3	The most vulnerable members of our society are at greater risk from cigarette-ignited fires	3
2.4	Although flammability standards and public education have likely reduced the number of cigarette fires, these fires still exact a significant toll on Canadians	4
2.5	The technology exists to produce cigarettes which are less of a fire hazard.	4
3.0	History of “Reduced-Ignition Propensity (RIP) Cigarettes”	5
4.0	Technology overview	6
4.1	How can cigarettes be modified to reduce ignition propensity?	6
4.2	How can cigarettes be tested for ignition propensity?	7
5.0	Regulatory Proposal	9
5.1	How can we be sure that RIP cigarettes are not more toxic than current cigarettes?	10
5.2	How can we be sure that our efforts will not cause a false sense of security among smokers?	10
5.3	What about other tobacco products such as tobacco sticks, fine-cut tobacco (roll-your-own) or kreteks?	10
6.0	The Federal Tobacco Control Strategy	11
	References:	12

Introduction



Fires started by the careless use of smokers' materials^a are the leading known cause of fire-related death in Canada, on average killing more than 70 people per year.¹ On a per fire basis, fires ignited by smokers' materials result in more fatalities and property damage than fires ignited by other sources.^{2,3,4,5}

From an analysis of Canadian fire statistics for the years 1995 to 1999, the Canadian Association of Fire Chiefs (CAFC) reported that at least 14,030 fires were started by smokers' materials. These fires killed 356 people, injured 1,615 people and cost more than \$200 million in property damage.⁵ The victims of these fires are often among society's most vulnerable such as children, the elderly and the financially poor.²

Health Canada's fire prevention efforts have included: educating the public of the dangers of careless handling of lit cigarettes;⁶ prohibiting or restricting flammable consumer products such as mattresses and bedding; restricting ignition sources such as matches and lighters pursuant to the *Hazardous Products Act*; and working with the Canadian Council of Furniture Manufacturers (CCFM) to implement voluntary flammability stan-

dards for upholstered furniture.⁷ It is generally considered that these approaches have been successful in reducing the number of fires started by cigarettes, yet these fires continue to exact a significant toll on Canadian society.

The main purpose of this document is to elicit comments on the possibility of a government regulated standard for cigarette ignition propensity. The results of this consultative process will help shape the direction the government takes in this regard. This paper also provides interested stakeholders with a detailed overview of the fire hazards of cigarettes and the technologies available to reduce these hazards.

Interested parties are invited to forward their comments by January 31, 2003 to:

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a: "Smoker's materials" includes cigarettes, cigars and pipes. Over 95 percent of fires started by "smoker's materials" are ignited by cigarettes¹⁴.

Why regulate the ignition propensity of cigarettes?



2.1 Cigarette fires cause the highest number of fire-related fatalities in Canada

When cigarettes come into contact with flammable products such as mattresses, bedding or upholstered furniture, they can start a smouldering process that can continue undetected for some time before bursting into flame. Smoke from the smouldering materials can render people in the vicinity unconscious, thus putting them at greater risk of injury or death from the ensuing fire.

Cigarette fires are typically the result of careless handling of lit cigarettes such as leaving a lit cigarette unattended, smoking in bed or smoking while under the influence of alcohol, illicit drugs or medication. Anywhere from 25 and 60 percent of cigarette-fire deaths can be attributed to persons smoking while intoxicated.⁸ A study of the fire deaths that occurred in Ontario between 1990 and 1995 determined that smoking was involved

in 53% of alcohol-impaired fire-related fatalities and 35 percent of non-alcohol-impaired fire-related fatalities.⁹ Multivariate analysis of the increased risk of a fatal fire from the alcohol-cigarette combination indicates that, of the two, smoking contributes more to the risk.¹⁰

Given the above information, it is not surprising that fires started by smoker's materials incur a disproportionately high number of fatalities. As shown in Table 1, fires ignited by smokers' materials have a much higher fatality rate than those started by cooking equipment, another common ignition source for house fires.

Table 1: Smokers' materials vs. cooking equipment as ignition sources

Where/When	Fires Included	Ignition Source	Fires (%)	Fatalities (%)
Ontario¹¹ 1995-1997	Residential	Smokers' materials, lighters and matches	9.5	40.8
		Cooking equipment	26.5	12.4
Alberta¹² 2000	Residential	Smokers' materials, lighters and matches	25	59
		Cooking equipment	9.5	11

2.2 Fires ignited by cigarettes result in more property damage than fires ignited by other sources

Fires started by smokers' materials tend to result in more property damage than other fires. From 1996 to 1999, the highest average property damage from all fires in Canada was \$3,937, while the estimated average property damage from fires caused by smokers' materials was \$15,910⁵ – more than four times higher.

In fact, carelessly discarded lit cigarettes are the suspected cause of some of the most famous fires in history, including the one that burned down the Centre Block of our Federal Parliament buildings in 1916.¹³

2.3 The most vulnerable members of our society are at greater risk from cigarette-ignited fires.

Two out of five victims of fires started by smokers' materials are not the smokers themselves but individuals who live in the same building. Those who perish are often young children or older persons who are less able to respond to and escape from the fire.¹⁴

Individuals with lower incomes are also disproportionately impacted. An epidemiological investigation of the factors involved in fires in the houses of smokers in the United States found that 75% of the households that had experienced a cigarette fire had an annual household income level of less than \$20,000 per year.^{2,b}

The same study found that mattresses, bedding and upholstered furniture accounted for 70 percent of the materials first ignited in all fires examined.² As we will see in the next section, standards have been set and adopted to reduce the flammability of upholstered furniture and mattresses. However, these items are long-lived consumer products and items that predate the adoption of the standards will be found in people's homes for many years to come. This could partially explain the higher risk observed for people with lower incomes as they are more likely to own old or used furniture.

b: In comparison, 36% of the households that did not experience cigarette fires had incomes under \$20,000².

2.4 Although flammability standards and public education have likely reduced the number of cigarette fires, these fires still exact a significant toll on Canadians

The Hazardous Products (Mattresses) Regulations were set in 1980 with the purpose of reducing the risk of mattress fires caused by smouldering cigarettes. Textile bedding products such as sheets, pillowcases, blankets, comforters and mattress pads are prohibited from being advertised, sold or imported into Canada unless they meet the flammability requirements specified in Item 13 of Part I of Schedule I to the *Hazardous Products Act*. The results of recent enforcement activities indicate that compliance with the flammability requirements is greater than 90% for bedding and conventional mattresses, but less than 60% for futons.¹⁵

In 1987, the Canadian Council of Furniture Manufacturers, a national trade association representing Canadian furniture manufacturers, implemented a voluntary program termed the Upholstered Furniture Action Council (UFAC) with the purpose of making upholstered furniture more resistant to ignition from smouldering cigarettes. Major elements of the UFAC program include flammability standards/criteria for the materials used in the manufacture of furniture, furniture construction techniques, product labels to show

compliance, consumer education, compliance monitoring by the manufacturer's association, and support for research on smoulder resistant upholstered furniture. In 1994, a Health Canada sponsored evaluation study of the UFAC program estimated conformance of about 90% among upholstered furniture items sold in Canada.⁷

Though these approaches are generally considered to have been successful in reducing the number of fires started by cigarettes, recent fire statistics, such as those presented in this document, indicate that cigarette fires continue to exact a significant toll on Canadian society.

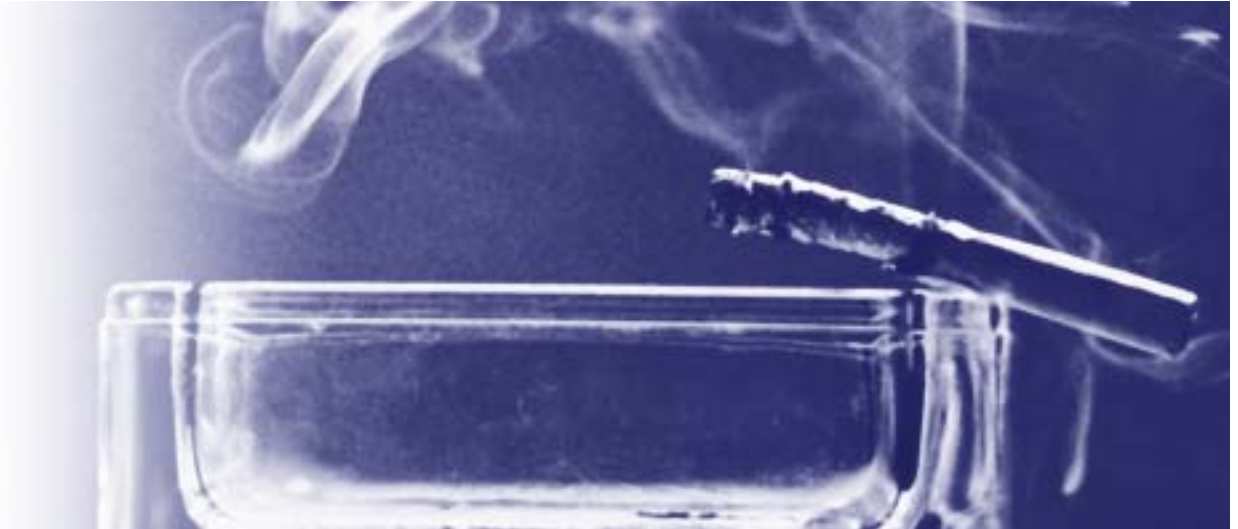
Two out of five victims of fires started by smokers' materials are not the smokers themselves.

2.5 The technology exists to produce cigarettes which are less of a fire hazard.

A major cigarette manufacturer released a reduced-ignition potential version of one of its brands in the United States in July 2000¹⁶ and then in New Zealand in April 2001.¹⁷ When tested by the U.S. National Institute of Standards and

Technology (NIST), these cigarettes were found to have a significantly reduced-ignition potential.¹⁸ An overview of the technology used by the manufacturer to reduce the ignition potential of this brand can be found in Section 4.1.

History of “Reduced-Ignition Propensity (RIP) Cigarettes”



The push to make cigarettes less of a fire hazard is not new. The first North American patent for a self-extinguishing cigarette was registered as early as 1854 and about 100 more have followed.^{19,20} The majority of earlier designs to reduce cigarette ignition propensity included the addition of fire retardants to the cigarette paper or the addition of unusual features that would make the cigarettes difficult to smoke.

In 1984, U.S. Congress enacted a bill requiring the creation of a Technical Study Group of Cigarette and Little Cigar Safety (TSG) to determine the technical, economic and commercial feasibility of developing a cigarette with a minimum propensity to ignite upholstered furniture and mattresses.²⁰ After the TSG determined that this was feasible, the U.S. Congress passed the *Fire Safe Cigarette Act* of 1990. Among other things, this *Act* required NIST to develop a standard test method to determine cigarette ignition propensity. The results of this round of research were released in 1993.²¹

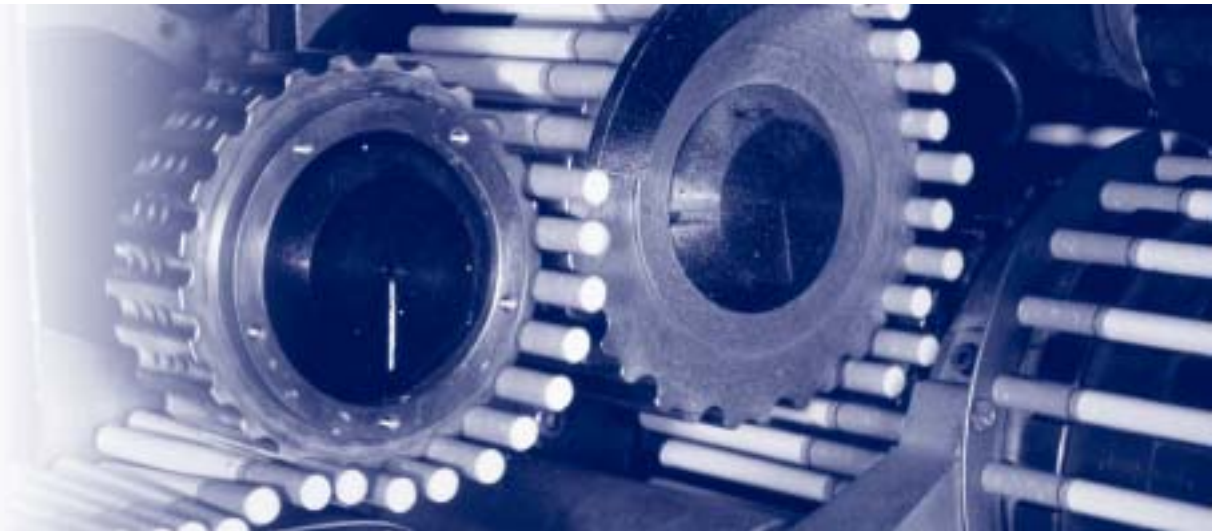
Since this time, the State of New York has become the first jurisdiction in the world to enact legislation mandating that the ignition propensity of cigarettes

be reduced. The legislation, which was passed in August 2000, gives the Office of Fire Prevention and Control until January 1, 2003 to promulgate an ignition propensity standard. By July 2003, all cigarettes sold in the state of New York will have to have reduced ignition propensity.²² Similar bills have been introduced into other U.S. state legislatures and into the U.S. Congress, but these bills have been unsuccessful thus far.

In New Zealand, a Member's Bill named “Cigarettes (fire safety) Bill” made it to second reading in July 2002, but was later withdrawn after the Acting Minister of Consumer Affairs agreed that he would follow up on the issue, stating: “(...) This could involve requesting Standards New Zealand to develop a standard for cigarettes. The Ministry of Consumer Affairs will then investigate making the standard mandatory, through ‘normal channels’ using the *Fair Trade Act*.”²³

In Canada, Bill C-260, an *Act to amend the Hazardous Products Act (fire-safe cigarettes)*, was introduced in the House of Commons as a Private Member's Bill and given first reading on October 25, 2002.

Technology overview



4.1 How can cigarettes be modified to reduce ignition propensity?

The ignition of a substrate (upholstered furniture, mattress or bedding) by a lit cigarette is a complex process that depends on the following factors: the characteristics of the substrate; the area of the burning cigarette coal; the speed of smouldering by the cigarette; and the zone of contact between the substrate and the smouldering cigarette. Ignition of the substrate occurs when the burning cigarette heats the substrate fabric or padding to the point where it begins to smoulder. Therefore, a less ignition-prone cigarette must generate less heat (i.e., burn less fuel or restrict access of oxygen to the fuel), or heat the fabric less efficiently.²⁰

The TSG identified four distinct design features of cigarettes that could be altered to make cigarettes less fire-prone. These design changes are as follows:

A) **Reduced tobacco density** was found to be the most important factor for reducing ignition propensity.²⁴ Tobacco density can be decreased by expanding the volume of the tobacco strands

or by cutting them wider.²⁰ It is believed that the reduction in the amount of tobacco itself is responsible for the observed reduction in ignition propensity as there is less tobacco available for fuel per unit length of the cigarette.²⁴

- B) **Reduced paper porosity** was the second most important factor identified by TSG for reducing ignition. Why this is the case is still not fully understood though it is believed to be related to a reduction in the availability of oxygen which is necessary to fuel the smouldering process.²⁴
- C) **Decreased circumference of cigarettes** was also found to play a role in reducing ignition propensity. Decreasing the circumference of a cigarette reduces the available tobacco, the paper per unit area and the contact zone between the substrate and the cigarette. Each of these factors reduces the tendency of a cigarette to ignite a substrate.²⁴

D) Considerable controversy has surrounded the tobacco industry's use of burn additives to enhance the burn rate of cigarette paper. It would appear logical that the **removal or reduction of burn additives** would reduce ignition potential. Further, all three of the experimental cigarettes with the lowest ignition potential in the TSG study had no burn additives in their papers. However, the reduction of paper burn additives has been found to have a highly variable effect on ignition propensity and is thus not statistically supportable as a significant or reliable method of decreasing the fire hazard of cigarettes.²⁴

The presence and length of a filter are other possible design features that may affect cigarette ignition propensity. An epidemiological study of factors that affect smoking found that households where smokers consumed filterless cigarettes tended to have more fires and that there was a weak but statistically significant relationship between increased filter length and reduced ignition propensity.² However, when tested in a laboratory, some researchers have observed that the presence

of a filter decreases ignition propensity, while others have observed the opposite – that the presence of a filter increases ignition propensity. Still others have found no difference in the ignition propensity of filtered and unfiltered cigarettes.²⁴ More research is required to fully understand the relationship between the cigarette filter and ignition propensity.

The RIP cigarette currently available in the U.S. and New Zealand uses a patented paper which has concentric bands of ultra-thin paper applied on top of traditional cigarette paper. The manufacturer claims that "...These bands or rings act as "speed bumps" to slow down the rate at which the cigarette burns as the lit end crosses over them." Of particular importance to this process is the width and the air permeability of the bands, both of which have been found to have relatively strong linear relationships with ignition propensity. Specifically, as air permeability of the paper bands decreases, the ignition propensity of the cigarettes also decreases and conversely, as the width of the bands decreases, ignition propensity increases.²⁵

4.2 How can cigarettes be tested for ignition propensity?

NIST has developed two suitable standard methods for testing the relative ignition propensity of cigarettes: 1) a mock-up furniture ignition test method, and 2) a cigarette extinction method.

The Mock-up Ignition Method uses fabric and foam to simulate a piece of furniture (the substrate). The foam is a block of open-cell, non fire-retarded, flexible polyurethane of a standard size, density and air permeability. The foam is covered with a sheet of one of three standard fabrics of differing weights and a metal rim is placed on top to ensure good contact between layers. For the heaviest fabric a sheet of polyethylene film is included

between the fabric and the foam to increase the ignition resistance. This is done for comparison purposes to ensure that there is one mock-up that can only be ignited by the most ignition prone cigarettes.^{18,26}

To conduct the test, a lit cigarette is placed on one of the mock-ups in a controlled chamber. Ignition is considered to have occurred if the char mark spreads at least 10 mm away from the tobacco column. The procedure is repeated a set number of times^c for each cigarette mock-up combination and the percent of failures is calculated.^{18,26}

*c: The number of times the procedure needs to be repeated will depend on the sensitivity and reproducibility required*²⁶

The Cigarette Extinction Method uses a set number of layers of standard filter paper^d as a heat-absorbing substrate. The filter paper acts as a heat sink for the burning cigarette and once the cigarette coal has cooled to a certain temperature it should self-extinguish. The more layers of filter paper used, the sooner the cigarette should self-extinguish. Thus, the test measures whether a cigarette, when placed on the layers of filter paper, would burn long enough and strong enough to cause ignition should it be dropped on a piece of furniture.^{18,26}

In the test, a lit cigarette is placed on three, ten or fifteen layers of filter paper. For each number of filter paper layers, the procedure is repeated a set number of times^e and the percent failures is calculated. Failure is defined as the cigarette burning its full length. It is important to note that while the end point is the cessation of burning, this is not a test for “self-extinguishing” cigarettes. Generally, cigarette designs that perform well in the filter paper test also perform well in the mock-up ignition test, sometimes burning their full length without causing an ignition.^{18,26}

A comparison of the filter paper and mock-up ignition tests indicates that both tests produce similar results. In addition, nine laboratories, including four in the cigarette industry, showed that both methods produced results that were repeatable and reproducible.

The benefit of the mock-up test is, that the use of material and foam is closer to real world conditions and thus would be expected to be a more reliable test. However, the material and foam used in the manufacture of furniture is highly variable and constantly changing. In order to run a test that can be used for scientific comparison over the long term it is essential to have a guaranteed, long-term supply of standard fabrics of highly uniform quality,

and this has proven extremely difficult to accomplish.^{24,27} Filter paper, on the other hand, is a product that is commonly used in scientific laboratories for a variety of purposes, and can be guaranteed.

Since the results from the filter paper cigarette extinction method have been shown to correlate well with those from the furniture mock-up case, this is the method of choice at the moment.^{18,20,26}

A comparison of the filter paper and mock-up ignition tests indicates that both tests produce similar results.

ASTM International, a U.S.-based organization that develops standard testing methodologies, has recently approved a methodology for testing the relative ignition propensity of cigarettes. The ASTM test is based on NIST’s Cigarette Extinction (filter paper) Method.

A copy of ASTM’s *E 2187-02: Standard Test Method for Measuring the Ignition Strength of Cigarettes* (the filter paper method) can be obtained for a fee by contacting:

ASTM International

100 Barr Harbor Drive
West Conshohocken
PA 19428-2959, USA
Phone: (610) 832-9585
Fax: (610) 832-9555
Website: www.astm.org

d: Circular pieces of very pure cellulose paper used to filter liquids in laboratories. The paper only chars when exposed to a lit cigarette, i.e., it does not catch fire or smoulder.

e: The number of times the procedure needs to be repeated will depend on the sensitivity and reproducibility required. Fewer repetitions are necessary when using the filter paper method because the substrate is less variable.²⁶

Regulatory Proposal



A strategy for preventing cigarette fires should include the following:

1. increasing public education on the fire hazards of cigarettes
2. reducing smoking prevalence
3. setting flammability requirements for mattresses, bedding and upholstered furniture
4. promoting the use of smoke detectors
5. reducing the ignition propensity of cigarettes

The first four of these activities have been ongoing in Canada for many years. Health Canada is now considering the possibility of regulating the ignition propensity of cigarettes sold in Canada. The main advantage of this approach is that because the shelf life of cigarettes is only a few months, the impact should be almost immediate.

In ignition tests performed by NIST in the early 1990's, thirteen out of fourteen of the best-selling cigarette brands on the U.S. market failed all ignition tests 100 percent of the time. Testing included both the filter paper and the mock-up methodologies outlined in Section 4. The fourteenth brand had

only two non-ignitions out of 48 tests on the heaviest, least likely to ignite mock-up ignition test.²⁶

Six speciality brands with characteristics expected to reduce ignition potential were also tested. All except one of these brands displayed significant reductions in ignition propensity.²⁶

From the results of the tests on the experimental cigarettes, it was determined that any pass/fail criteria would have to allow for ordinary variance in the test results. This led to an observation that an allowance of no more than 25 percent full-length burns on 10 layers of filter paper both captured a significant expectation of reduced fire losses as well as a commercial manufacturing capability.²⁷ This means that the cigarette must extinguish 75 percent of the time. Health Canada is proposing to adopt this pass/fail rate as our target for cigarettes sold in Canada.

The decision to regulate the ignition potential of cigarettes also requires consideration of the practicalities of regulation and enforcement, as well as the assurance that the health risks of smoking are not increased from the necessary modifications. In the next few subsections we will be asking for your input on these issues.

5.1 How can we be sure that RIP cigarettes are not more toxic than current cigarettes?

There have been concerns raised about the changes in cigarette smoke toxicity that may result from the modifications to cigarettes that make them less prone to ignition.

Q. Is this a valid concern? If so, how can Health Canada ensure that RIP cigarettes are not more toxic than cigarettes currently available?

5.2 How can we be sure that our efforts will not cause a false sense of security among smokers?

Some concern has been expressed that making cigarettes less fire prone will encourage unsafe behaviour on the part of some smokers. If this occurs, the positive effect of reduced ignition propensity could be negated by an increase in carelessly discarded cigarettes.

Q. Is this a valid concern? If so, how can Health Canada guard against a possible increase in unsafe behaviour?

5.3 What about other tobacco products such as tobacco sticks, fine-cut tobacco (roll-your-own) or kreteks?

This regulatory proposal focuses only on an ignition propensity standard for manufactured cigarettes because this is the tobacco product known to start the highest number of fires.^{2,11,14} However, Health Canada would like your views and ideas on regulating the ignition propensity of other tobacco products.

Q. What are your views and ideas on regulating the ignition propensity of other tobacco products?

The decision to regulate the ignition potential of cigarettes also requires consideration of the practicalities of regulation and enforcement, as well as the assurance that the health risks of smoking are not increased from the necessary modifications.

6.0

The Federal Tobacco Control Strategy



The *Federal Tobacco Control Strategy*, launched in 2001, outlines a comprehensive, integrated and sustained approach to the reduction of disease and death associated with tobacco use with four mutually reinforcing components: protection, prevention, cessation and harm reduction. The proposal contained in this document forms part of the protection and harm reduction components of this strategy.

A brochure explaining the strategy can be obtained from Health Canada's Tobacco Control Programme by calling 1-866-318-1116 or by visiting our website at www.gosmokefree.ca.

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