22nd Century Group, Inc.
Form 10-K
January 30, 2014

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

x **Annual Report under Section 13 or 15(d) of the Securities Exchange Act of 1934**
For the fiscal year ended December 31, 2013

or

¨ **Transitional Report under Section 13 or 15(d) of the Securities Exchange Act of 1934**
Commission File Number: 000-54111

22nd Century Group, Inc.
(Exact name of registrant as specified in its charter)

Nevada	**98-0468420**
(State or other jurisdiction of incorporation)	(IRS Employer Identification No.)

9530 Main Street, Clarence, New York 14031
(Address of principal executive offices)

(716) 270-1523
Registrant's telephone number, including area code

Securities registered under Section 12(b) of the Act: None

Securities registered under Section 12(g) of the Act:

Common Stock (Par Value - $0.00001 per share)

Indicate by check mark if the registrant is a well-known seasoned issuer as defined in Rule 405 of the Securities Act
Yes ¨ No x

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Exchange Act.
Yes ¨ No x

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports) and (2) has been subject to such filing requirements for the past 90 days.

Yes x No ¨

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Date File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files) Yes x No ¨

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ¨

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, or a non-accelerated filer.

Large Accelerated Filer ¨ Accelerated Filer ¨ Non-Accelerated Filer ¨ Smaller Reporting Company x

Indicate by check mark whether the registrant is a shell company (as defined by Rule 12b-2 of the Act).Yes ¨ No x

As of June 28, 2013, the last business day of the registrant's most recently completed second fiscal quarter, the aggregate value of the registrant's common stock (excluding the 19,040,893 shares held by affiliates), based upon the $0.71 price at which such common stock was last sold on June 28, 2013, was approximately $18.3 million.

As of January 28, 2014, there were 58,252,770 shares of common stock issued and outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement for its 2014 Annual Meeting of Stockholders are incorporated herein by reference in Part III of this Annual Report on Form 10-K. Such Proxy Statement will be filed with the Securities and Exchange Commission within 120 days of December 31, 2013.

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Cautionary Note Regarding Forward-Looking Statements

This Annual Report on Form 10-K contains forward-looking statements concerning our business, operations and financial performance and condition as well as our plans, objectives and expectations for our business operations and financial performance and condition that are subject to risks and uncertainties. All statements other than statements of historical fact included in this Annual Report on Form 10-K are forward-looking statements. You can identify these statements by words such as “aim,” “anticipate,” “assume,” “believe,” “could,” “due,” “estimate,” “expect,” “goal,” “intend,” “objective,” “plan,” “potential,” “positioned,” “predict,” “should,” “target,” “will,” “would” and other similar expressions that predictions of or indicate future events and future trends. These forward-looking statements are based on current expectations, estimates, forecasts and projections about our business and the industry in which we operate and our management's beliefs and assumptions. These statements are not guarantees of future performance or development and involve known and unknown risks, uncertainties and other factors that are in some cases beyond our control. All forward-looking statements are subject to risks and uncertainties that may cause actual results to differ materially from those that we expected, including:

- Our ability to manage our growth effectively;
- Our ability to comply with existing and new government regulations;
- Our ability to retain key personnel;
- Our ability to enter into additional licensing transactions;
- The prospect of one of our subsidiaries becoming a member of the U.S. Master Settlement Agreement;
- Our ability to achieve profitability;
- The potential for our clinical trials to produce negative or inconclusive results;
- Our ability to obtain significant revenue for our tobacco products in the U.S.;
- Our ability to obtain U.S. Food and Drug Administration (“FDA”) clearance for our potentially modified risk tobacco products and FDA approval for our *X-22* smoking cessation aid;
- Our ability to gain market acceptance for our products;
- Our ability to compete with competitors that may have greater resources than us;
- The potential for our competitors to develop products that are less expensive, safer or more effective than ours;
- The potential exposure to product liability claims, product recalls and other claims; and
- Our ability to adequately protect our intellectual property and to avoid infringement on rights of third parties.

For the discussion of these risks and uncertainties and others that could cause actual results to differ materially from those contained in our forward-looking statements, please refer to “Risk Factors” in this Annual Report on Form 10-K. The forward-looking statements included in this Annual Report on Form 10-K are made only as of the date hereof. We undertake no obligation to publicly update or revise any forward-looking statement as a result of new information, future events or otherwise, except as otherwise required by law.

Unless the context otherwise requires, references to the “Company” “we” “us” and “our” refer to 22nd Century Group, Inc., a Nevada corporation, and its direct and indirect subsidiaries.

PART I

Item 1. Business.

Background

22nd Century Group, Inc. was incorporated under the laws of the State of Nevada on September 12, 2005 under the name Touchstone Mining Limited. On January 25, 2011, we entered into a reverse merger transaction with 22nd Century Limited, LLC, which we refer to herein as the Merger. Upon the closing of the Merger, 22nd Century Limited, LLC became our wholly-owned subsidiary. After the Merger, we succeeded to the business of 22nd Century Limited, LLC as our sole line of business.

22nd Century Limited, LLC was originally formed as a New York limited liability company on February 20, 1998 as 21st Century Limited, LLC and subsequently merged with a newly-formed Delaware limited liability company, 22nd Century Limited, LLC, on November 29, 1999. Since inception, 22nd Century Limited, LLC has used biotechnology to regulate the nicotine content in tobacco plants.

Business Overview

22nd Century Limited, LLC ("22nd Century Ltd"), our wholly-owned subsidiary, is a plant biotechnology company focused on tobacco harm reduction and smoking cessation products produced from modifying the nicotine content in tobacco plants through genetic engineering and plant breeding. We exclusively control 114 issued patents and an additional 38 patent applications; of these, we own 13 issued patents plus 25 patent applications and we license the remaining patents and patent applications on an exclusive basis. Goodrich Tobacco Company, LLC ("Goodrich Tobacco") and Hercules Pharmaceuticals, LLC ("Hercules Pharmaceuticals") are subsidiaries of 22nd Century Ltd. Goodrich Tobacco is focused on commercial tobacco products and potentially reduced-risk or modified risk tobacco products. Hercules Pharmaceuticals is focused on *X-22,* a prescription smoking cessation aid in development.

Our Strategy

Our long-term focus is the research, development, licensing, manufacturing, and worldwide sales and distribution of our products to reduce the harm caused by smoking. Annual worldwide tobacco product sales, cigarettes and smokeless products, are approximately $700 billion and 90 percent are cigarette sales according to Euromonitor International. Worldwide smoking prevalence has decreased in recent years, but the number of cigarette smokers worldwide has increased to approximately 1 billion due to population growth, according to a 2013 research report from the Institute for Health Metrics and Evaluation (IHME) at the University of Washington.

We believe that the tobacco industry is at the beginning of a paradigm shift towards the development and commercialization of reduced-risk tobacco products which represent a significant step toward achieving the public health objective of harm reduction. Our 15 years of research and development on the tobacco plant, mainly on the nicotine biosynthetic pathway, uniquely positions us to become a major benefactor of this paradigm shift developing in the tobacco industry. Our technology has created, and will continue to develop, a pipeline of products. We are primarily involved in the following activities:

- The international licensing of 22nd Century Ltd's technology, proprietary tobaccos, trademarks;
- The manufacture, marketing and international distribution of *RED SUN* and *MAGIC* proprietary cigarettes;
- The production of *SPECTRUM* research cigarettes for the National Institute on Drug Abuse ("NIDA");
- The research and development of potentially reduced-risk or modified risk tobacco products;
- The development of *X-22*, a prescription-based smoking cessation aid consisting of very low nicotine ("VLN") cigarettes; and

- The pursuit of necessary regulatory approvals and clearances from the FDA to market in the U.S *X-22* as a prescription smoking cessation aid and *BRAND A and BRAND B* as reduced-risk or Modified Risk Cigarettes.

We believe our proprietary technology, tobaccos and products will generate multiple significant revenue streams from licensing of our technology and tobacco and from the sales of our products.

Our Technology

Our proprietary technology enables us to decrease or increase the level of nicotine (and other nicotinic alkaloids such as nornicotine, anatabine and anabasine) in tobacco plants by decreasing or increasing the expression of gene(s) responsible for nicotine production in the tobacco plant using genetic engineering. The basic techniques include, but are not limited to those that are used in the production of genetically modified ("GM") varieties of other crops, which are also known as "biotech crops." However, our proprietary technology can also be implemented without the resulting plants being GM, as long as no foreign DNA (not inherent to a plant species such as *Nicotiana tabacum*) is present in the engineered plant.

The year 2012 was the 17th year of commercialization of biotech crops. Biotech crop hectares increased by an unprecedented 100-fold from 1.7 million hectares in 1996 to 170.3 million hectares in 2012, according to the International Service for the Acquisition of Agri-Biotech Applications. The top biotech crops in order of hectarage are the following: soybean, maize, cotton, and canola. Alfalfa, sugarbeet, papaya, squash, poplar, tomato, sweet pepper and tobacco are other biotech crops grown in 2012. Of the 28 countries which planted biotech crops in 2012, 20 were developing countries and 8 were industrial countries. The 5 leading developing countries are Brazil, Argentina, India, China and South Africa, planting 46% of global biotech crops in 2012. The top 5 countries planting biotech crops are United States, Brazil, Argentina, Canada and India.

Approximately 90% of the corn and soybeans grown in the United States are GM. The only components of the technology that are distinct from those in commercialized GM varieties of major crops are segments of tobacco genes (DNA sequences) that are also present in all conventional tobacco plants. GM tobacco that we use in our commercial products has been deregulated by the USDA. Thus, plants may be grown and used in products in the United States without legal restrictions or labeling requirements related to the genetic modification. Nevertheless, our proprietary tobacco is grown only by farmers under contracts that require segregation and prohibit transfer of material to other parties.

During the development of genetically-engineered plant varieties, many candidate plant lines are evaluated in the field in multiple locations over several years, as in any other variety development program. This is carried out in order to identify lines that have not only the specific desired trait, e.g., very low nicotine, but have overall characteristics that are suitable for commercial production of the desired product. This process allows us to determine if there are undesirable effects of the genetic modification approach or the specific genetic modification event, regardless of whether the effects are anticipated or unanticipated. For example, since nicotine is known to be an insecticide that is effective against a wide range of insects, reduction of nicotine content in the plants may be expected to affect susceptibility to insect pests. While there are differences in the susceptibility of VLN tobacco to some insects, all tobacco is attacked by a number of insects. The measures taken to control insect pests of conventional tobacco are adequate to control insect pests in VLN tobacco.

Once a genetically-engineered tobacco plant with the desired characteristics is obtained, each plant can produce hundreds of thousands of seeds. When each seed is germinated, the resulting tobacco plant has characteristics similar to the parent and sibling plants and the nicotine content of these plants generally fall within a narrow range. Tobacco products with either low or high nicotine content are easily produced through this method. For example, one of our proprietary tobacco varieties contains the lowest nicotine content of any tobacco ever commercialized, with approximately 97% less nicotine than tobacco in leading "light" cigarette brands. This proprietary tobacco grows with virtually no nicotine without adversely affecting the other leaf constituents important to a cigarette's characteristics, including taste and aroma.

Our Intellectual Property

Our proprietary technology is covered by 12 patent families consisting 114 issued patents and an additional 38 patent applications; of these, we own 13 issued patents plus 25 patent applications and we license the remaining patents and patent applications on an exclusive basis from third parties. A “patent family” is a set of patents granted in various countries to protect a single invention. Our patent coverage in the United States and China, two of the most valuable smoking cessation and cigarette markets in the world, consists of 16 issued patents and 8 pending applications and 6 issued patents and 3 pending patent applications, respectively. We have exclusive rights to all uses of the following genes responsible for nicotine content in tobacco plants: *NBB*, *QPT*, *A622*, *MPO* and several transcription factor genes. We have exclusive rights to plants with altered nicotine content produced from modifying expression of these genes and tobacco products produced from these plants. We also have the exclusive right to license and sublicense these patent rights. The patents owned by or exclusively licensed to us are issued in 78 countries where at least 75% of the world’s smokers reside.

We own various registered trademarks in the United States. We also have exclusive plant variety rights in the United States (plant variety protection certificates are issued by the U.S. Department of Agriculture) and Canada. A PVP certificate prevents anyone other than the owner/licensee from planting, propagating, selling, importing and exporting a plant variety for twenty (20) years in the U.S. and generally for twenty (20) years in other member countries of the International Union for the Protection of New Varieties of Plants, known as UPOV, an international treaty concerning plant breeders’ rights. There are currently more than 70 countries that are members of UPOV.

Licensing our technology and tobacco

We have been in negotiations with various parties in the tobacco and pharmaceutical industries for licensing its technology and products since early 2012. On October 1, 2013, 22nd Century Ltd entered into a Research License and Commercial Option Agreement (the "BAT Research Agreement") with British American Tobacco (Investments) Limited ("BAT"), a subsidiary of British American Tobacco plc.

Under the terms of the BAT Research Agreement, BAT receives an exclusive worldwide license to certain patent rights (subject to worldwide rights retained by 22nd Century Ltd for use in its own brands) and licensed intellectual property rights (as such terms are defined in the BAT Research Agreement) of 22nd Century Ltd within the field of use as defined in the BAT Research Agreement) for a period of up to four (4) years (the "Research Term"). During the Research Term, BAT also has an option, which can be exercised by BAT at any time during the Research Term, to obtain an exclusive worldwide license (subject to worldwide rights retained by 22nd Century Ltd for use in its own brands) to commercialize certain products derived from utilizing the patent rights and licensed intellectual property rights under the terms of a commercial license agreement (the "Commercial License"). BAT and the Company also agreed to collaborate with each other as each party engages in its own independent research during the term of the Research Agreement.

Simultaneous with the signing of the BAT Research Agreement, BAT paid 22nd Century Ltd a non-refundable $7.0 million. Further, 22nd Century Ltd may receive payments from BAT of up to an additional $7.0 million during the Research Term in the event certain milestones are met by BAT with respect to its research and development of the patent rights and licensed intellectual property rights licensed by 22nd Century Ltd to BAT. There are four separate milestones, two of which BAT would pay 22nd Century Ltd $2.0 million for each milestone achieved, and two of which BAT would pay 22nd Century Ltd $1.5 million for each milestone achieved. BAT may terminate the BAT Research Agreement at any time, subject to the requirements for certain payments to 22nd Century Ltd by BAT upon termination as set forth therein. 22nd Century Ltd may also terminate the BAT Research Agreement in the event of certain uncured breaches of the BAT Research Agreement as set forth therein.

BAT also granted to 22nd Century Ltd a worldwide license to any and all registered research results (as such term is defined in the BAT Research Agreement) developed and owned by BAT which results or arises from any research, development or other activities of BAT under the BAT Research Agreement, with the terms of such license from BAT to 22nd Century Ltd (i) to be on commercially reasonable terms to be negotiated in good faith between the parties, but in any event on terms which are no more onerous than the terms of the Commercial License, if any, and (ii) to be dependent on what, if any, research results the Company elects to license.

If BAT exercises the option for a worldwide Commercial License, BAT is required to pay 22nd Century Ltd $3.0 million in aggregate annual license fees over a 2-year ramp-up period, and thereafter, a royalty of (i) $100 per metric ton of licensed tobacco that is supplied to, or grown and ready for shipment to, BAT and is affiliates (other than Reynolds American, Inc. and Reynolds' affiliates) and all other third parties; and (ii) $200 per metric ton of licensed tobacco supplied to, or grown and processed by, BAT's affiliate Reynolds American, Inc.

The minimum and maximum amount of annual royalties under the terms of the Commercial License, which commence after the two-year ramp-up period from the exercise of the option, are $3.0 million and $15.0 million, respectively for a period of three years. Thereafter, the minimum and maximum annual royalties increase to $5.0 million and $25 million, respectively, until September 28, 2028. Thereafter, no further minimum royalties are due and the maximum annual royalties due remain at $25 million until expiration of the Commercial License.

Beginning three years from the start of the Commercial License, both 22nd Century Ltd and BAT may license/sublicense rights to any unaffiliated third party for use of the technology outside the United States and 22nd Century Ltd and BAT will equally share all profit from all such licensees/sublicensees. Inside the United States, BAT

may only sublicense BAT's commercial rights to Reynolds American Inc. 22nd Century Ltd may sublicense any party in the United States.

British American Tobacco sells product in approximately 180 countries. In 2012, global production of tobacco leaf was approximately 5,700,000 metric tons, of which BAT utilized approximately 10% for BAT's and its affiliates' brands.

Our RED SUN and MAGIC Cigarettes

Our subsidiary, Goodrich Tobacco, introduced two super-premium priced cigarette brands, *RED SUN* and *MAGIC*, into the U.S. market in the first quarter 2011. Both brands are available in regular and menthol and all brand styles are king size and packaged in hinge-lid hard packs. In 2014, we intend to focus our marketing efforts on tobacconists, smoke shops and tobacco outlets in the U.S. The ban in 2009 by the FDA of all cigarettes with characterizing flavors (with the exception of menthol) has resulted in a product void in these specialty tobacco channels for super-premium priced products. We believe that certain U.S. cigarette wholesalers and retailers will carry our brands, among other reasons, to increase their margins.

Our SPECTRUM Government Research Cigarettes

We were chosen to be a subcontractor for a government contract between RTI International ("RTI") and the National Institute on Drug Abuse ("NIDA") to supply altered nicotine research cigarettes (from very low to high) cigarettes to NIDA. These government research cigarettes are distributed to researchers free of charge under the mark *SPECTRUM*. Goodrich Tobacco has thus far delivered approximately 12 million *SPECTRUM* research cigarettes. We received a purchase order for an additional 5.5 million *SPECTRUM* research cigarettes that will be manufactured and shipped in January 2014.

Rationale for and History of Modified Risk Tobacco Products

A substantial number of adult smokers are unable or unwilling to quit smoking. For example, each year one-half of the adult smokers in the United States do not attempt to quit. Nevertheless, we believe the majority of these smokers are interested in reducing the harmful effects of smoking.

In a 2005 analyst report, *The Third Innovation, Potentially Reduced Exposure Cigarettes*, JP Morgan examined the effects of FDA regulation of tobacco, including the market for safer cigarettes. JP Morgan's proprietary survey of over 600 smokers found that 90% of smokers are willing to try a safer cigarette. Among JP Morgan's other conclusions, it stated: "FDA oversight would imbue PREPS ['potential reduced exposure products' which essentially equate to potential modified risk tobacco products] with a regulatory 'stamp of approval' and allow for more explicit comparative health claims with conventional cigarettes. Consumers should trust the FDA more than industry health claims." Prior to the Tobacco Control Act becoming law in 2009, no regulatory agency or body had the authority to assess potential modified risk tobacco products.

Some major cigarette manufacturers have developed and marketed alternative cigarette products. For example, Philip Morris USA developed an alternative cigarette, called Accord®, in which the tobacco is heated rather than burned. R.J. Reynolds Tobacco Company has developed and is marketing an alternative cigarette, called Eclipse®, in which the tobacco is primarily heated, with only a small amount of tobacco burned. Philip Morris and RJ Reynolds have indicated that their products may deliver fewer smoke components compared to conventional cigarettes. Both Accord® and Eclipse®, which are not conventional cigarettes but cigarette-like devices, have only achieved limited sales. Vector Tobacco Inc. ("Vector Tobacco"), our former licensee, has marketed a cigarette offered in three brand styles with reduced levels of nicotine, called Quest®. With the exception of Eclipse®, the above products are no longer being sold.

Complete cessation from all tobacco and medicinal nicotine products is the ultimate goal of the public health community. However, some public health officials desire to migrate cigarette smokers en masse to medicinal nicotine (also known as NRT) or smokeless tobacco products to replace cigarettes. We believe this is unattainable in the foreseeable future for many reasons, including because the smoking experience is much more complex than simply seeking nicotine. In a 2009 WHO report, statistics demonstrate that approximately 90% of global tobacco users smoke cigarettes. Worldwide cigarette sales (in U.S. dollars) are approximately 12 times greater than sales of smokeless tobacco products and approximately 200 times greater than sales of NRT products. Although a small segment of the smoking population is willing to use smokeless tobacco products in conjunction with cigarettes (known as dual users), a large percentage of smokers is not interested in using smokeless tobacco products exclusively.

There are newer forms of smokeless tobacco products that have been introduced in the market that are less messy to use than chewing tobacco or dry snuff (since spitting is not involved). These products include Swedish-style snus such as Camel® snus made by R.J. Reynolds Tobacco Company and dissolvable tobacco products such as Ariva® and Stonewall® owned by Star Scientific Inc. Although use of such products may be more discreet and convenient than traditional forms of smokeless tobacco, they have the same route of delivery of nicotine as nicotine gums and nicotine lozenges, which have been available over-the-counter in the United States for approximately 30 years and 22 years,

respectively, and have not significantly replaced cigarettes.

Cigarette-like devices are being developed by the largest tobacco companies and are referred to as “next generation products” or “NGPs.” These include heat-not-burn cigarettes in which most if not all of the tobacco is heated and not burned resulting in reduced tobacco toxins. At the Morgan Stanley Global Consumer Conference on November 20, 2013, Philip Morris International presented three platforms of NGPs, the first two of which contain tobacco and are heat-not-burn products and the third uses a chemical reaction to generate a nicotine-containing aerosol. On January 10, 2014, Philip Morris International announced an investment of up to €500 million into its first manufacturing facility in the European Union and an associated pilot plant near Bologna, Italy to produce its potentially reduced-risk tobacco products. Once fully operational by 2016, the factory and pilot plant combined are expected to reach annual production capacity of up to 30 billion units.

The Tobacco Control Act and Our Potentially Modified Risk Cigarettes BRAND A and BRAND B

The 2009 Family Smoking Prevention and Tobacco Control Act ("Tobacco Control Act") granted the FDA authority over the regulation of all tobacco products. While it prohibits the FDA from banning cigarettes outright, it allows the FDA to require the reduction of nicotine or any other compound in tobacco and cigarette smoke. The Tobacco Control Act also banned all sales in the U.S. of cigarettes with characterizing flavors (other than menthol). As of June 2010, all cigarette companies were required to cease the use of the terms "low tar," "light" and "ultra light" in describing cigarettes sold in the U.S. Besides numerous other regulations, including certain marketing restrictions, for the first time in history, a U.S. regulatory agency will scientifically evaluate cigarettes that may pose lower health risks as compared to conventional cigarettes.

The Tobacco Control Act establishes procedures for the FDA to regulate the labeling and marketing of cigarettes that (i) reduce exposure to tobacco toxins and (ii) are reasonably likely to pose lower health risks as compared to conventional cigarettes ("Modified Risk Cigarettes"). The Tobacco Control Act requires the FDA to issue specific regulations and guidance regarding applications submitted to the FDA for the authorization to label and market modified risk tobacco products, including Modified Risk Cigarettes. On March 30, 2012, the FDA issued *Modified Risk Tobacco Product Applications Draft Guidance.* We have been continuing to gather additional information since the FDA's draft guidance on the subject, including from the FDA, to submit complete applications for our two Modified Risk Cigarette candidates, which we expect to do so in 2014. Depending on how many exposure studies and other information the FDA will require, it is likely that we will require additional capital to complete the entire FDA authorization process for our Modified Risk Cigarettes.

We believe that *BRAND A* and *BRAND B* will qualify as Modified Risk Cigarettes and we intend to seek FDA authorization to market *BRAND A* and *BRAND B* as Modified Risk Cigarettes. We believe that our *BRAND A* and *BRAND B* cigarettes will benefit smokers who are unable or unwilling to quit smoking and who may be interested in cigarettes which reduce exposure to certain tobacco smoke toxins and/or pose a lower health risk than conventional cigarettes. This includes the approximate one-half of the 44 million adult smokers in the United States who do not attempt to quit in a given year. Compared to commercial cigarettes, the tobacco in *BRAND A* has approximately 95% less nicotine than tobacco in cigarettes previously marketed as "light" cigarettes and *BRAND B*'s smoke contains an extraordinary low amount of "tar" per milligram of nicotine.

BRAND A Cigarettes

Compared to commercial tobacco cigarettes, *BRAND A* has the lowest nicotine content. The tobacco in *BRAND A* contains approximately 95% less nicotine than tobacco in leading "light" cigarette brands. Clinical studies have demonstrated that smokers who smoke VLN cigarettes containing our proprietary tobacco smoke fewer cigarettes per day resulting in significant reductions in smoke exposure, including "tar," nicotine and carbon monoxide. Due to the very low nicotine levels, compensatory smoking does not occur with VLN cigarettes containing our proprietary tobacco (Hatsukami *et al*. 2010).

In a June 16, 2010 press release, Dr. David Kessler, the former FDA Commissioner, recommended that "[t]he FDA should quickly move to reduce nicotine levels in cigarettes to non-addictive levels. If we reduce the level of the stimulus, we reduce the craving. It is the ultimate harm reduction strategy." Shortly thereafter in a Washington Post article, Dr. Kessler said that the amount of nicotine in a cigarette should drop from about 10 milligrams to less than 1 milligram. *BRAND A* contains approximately 0.7 milligram of nicotine per cigarette.

A Phase II smoking cessation clinical trial at the University of Minnesota Masonic Comprehensive Cancer Center (Hatsukami *et al*. 2010) also measured exposure of various smoke compounds in smokers from smoking a VLN cigarette containing our proprietary tobacco over a six (6)-week period. Smokers significantly reduced their smoking as compared to their usual brand of cigarettes. The number of VLN cigarettes smoked per day on average decreased

from 19 (the baseline number of cigarettes of smokers' usual brand) to 12 by the end of the six (6)-week period, even though participants were instructed to smoke ad libitum (as many cigarettes as desired) during treatment. Furthermore, besides significant reductions in other biomarkers, carbon monoxide (CO) levels, an indicator of smoke exposure, significantly decreased from 20 parts per million (baseline) to 15 parts per million. Cotinine, a metabolite and biomarker of nicotine, significantly decreased from 4.2 micrograms/mL (baseline) to 0.2 micrograms/mL. All differences were statistically significant ($P<0.05$).

We believe these and other results and future exposure studies the FDA will require will result in a modified risk cigarette claim for *BRAND A*. We further believe smokers who desire to smoke fewer cigarettes per day while also satisfying cravings and reducing exposure to nicotine will find *BRAND A* beneficial. There is no guarantee that *BRAND A* will be classified as a Modified Risk Cigarette by the FDA.

BRAND B Cigarettes

Using a proprietary high nicotine tobacco blend in conjunction with specialty cigarette components, *BRAND B* allows the smoker to achieve a satisfactory amount of nicotine per cigarette while inhaling less "tar" and carbon monoxide. At the same time, we do not expect exposure to nicotine from *BRAND B* to be significantly higher than some commercially available full flavor cigarette brands. We believe smokers who desire to reduce smoke exposure but are less concerned about nicotine will find BRAND B beneficial. *BRAND B* has a "tar" yield between typical "light" and "ultra-light" cigarettes, but a nicotine yield of typical full flavor cigarettes.

In a 2001 report, entitled *Clearing the Smoke, Assessing the Science Base for Tobacco Harm Reduction*, the Institute of Medicine notes that a low "tar"/moderate nicotine cigarette is a viable strategy for reducing the harm caused by smoking. The report states: "Retaining nicotine at pleasurable or addictive levels while reducing the more toxic components of tobacco is another general strategy for harm reduction." We believe that evaluation of *BRAND B* in short-term human exposure studies will confirm that exposure to smoke, including certain tobacco smoke toxins and carbon monoxide, is significantly reduced when smoking *BRAND B* as compared to smoking the leading brands of cigarettes. We believe results from these exposure studies will warrant a modified risk claim for *BRAND B*. There is no guarantee that *BRAND B* will be classified as a Modified Risk Cigarette by the FDA.

Tar, Nicotine, and Smoking Behavior

The dependence of many smokers on tobacco is largely due to the properties of nicotine, but the adverse effects of smoking on health are mainly due to other components present in tobacco smoke, including "tar" and carbon monoxide. "Tar" is the common name for the total particulate matter minus nicotine and water produced by the burning of tobacco (or other plant material) during the act of smoking. "Tar" and nicotine are commonly measured in milligrams per cigarette trapped on a Cambridge filter pad under standardized conditions using smoking machines. These results are referred to as "yields" or, more specifically, "tar" yield and nicotine yield.

Individual smokers generally seek a certain amount of nicotine per cigarette and can easily adjust how intensely each cigarette is smoked to obtain a satisfactory amount of nicotine. Smoking of low yield ("light" or "ultra light") cigarettes compared to high yield ("full flavor") cigarettes often results in taking more puffs per cigarette, larger puffs and/or smoking more cigarettes per day to obtain a satisfactory amount of nicotine, a phenomenon known as "compensation" or "compensatory smoking." A report by the National Cancer Institute in 2001 stated that due to compensatory smoking, low yield cigarettes are not safer than full flavor cigarettes, which is the reason that the Tobacco Control Act has banned the use of the terms "low tar," "light" and "ultra-light" in the U.S. market. Studies have shown, however, that smokers generally do not compensate when smoking cigarettes made with our VLN tobacco, and that smoking VLN cigarettes, such as *BRAND A,* actually assist smokers to smoke fewer cigarettes per day and reduce their exposure to "tar" and nicotine. Other studies have demonstrated that compensatory smoking (e.g., more and/or larger puffs per cigarette) of low-tar research cigarettes, similar to *BRAND B (*though *BRAND B* was not used in such studies), is greatly curtailed resulting in smokers inhaling less "tar" and carbon monoxide. Additional studies will be necessary to establish whether *BRAND B* cigarettes achieve similar results.

X-22

X-22 is a tobacco-based botanical medical product for use as an aid to smoking cessation. The *X-22* therapy protocol utilized in our sponsored Phase II-B clinical trial calls for the patient to smoke our very low nicotine ("VLN") cigarettes over a six-week treatment period to facilitate the goal of the patient quitting smoking by the end of the treatment period. We believe this therapy protocol has been successful in independent clinical trials because VLN cigarettes made from our proprietary tobacco satisfy smokers' cravings for cigarettes while (i) greatly reducing nicotine exposure and nicotine dependence and (ii) extinguishing the association between the act of smoking and the rapid delivery of nicotine. *X-22* involves the same smoking behavior as conventional cigarettes and because patients are simply

switching to VLN cigarettes for 6 weeks, *X-22* does not expose the smoker to any new drugs or new side effects. Our Investigational New Drug Application for *X-22*, a kit of VLN cigarettes, was cleared by the FDA in July 2011 and has been updated annually. Our *X-22* Phase II-B clinical trial was completed in the first quarter of 2012 and did not demonstrate a statistically significant difference in quitting between *X-22* and the active control, a cigarette containing conventional nicotine levels. However, the median number of *X-22* cigarettes smoked during the trial was significantly reduced compared to patients' baseline of usual brand of cigarettes. In evaluating the results of this trial, we believe we may have reduced the nicotine content of *X-22* by too great a percentage, to a level less than half the nicotine content of VLN cigarettes used in various independent smoking-cessation clinical trials that have demonstrated that use of VLN cigarettes increases quit rates.

Due to the limited effectiveness and/or serious side effects of existing FDA-approved smoking cessation products (all of which have been on the market approximately between 8 and 30 years), we believe that if additional clinical trials demonstrate increased smoking cessation rates, *X-22* can capture a share of this market by replacing sales and market share from existing smoking cessation aids and expanding the smoking cessation market by encouraging more smokers to attempt to quit smoking. In contrast to the results of our Phase II-B trial results, independent studies have demonstrated that VLN cigarettes increase quit rates, whether used alone, in conjunction with Chantix® (varenicline) or nicotine replacement therapy ("NRT") such as nicotine patches, gums or lozenges.

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