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What Is The Buzz Around The Current State Of Patents In The Cannabis Industry?

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Introduction

The topic of cannabis has been featured heavily in the news. It is licensed for medical purposes, and as at October 17, 2018, adult Canadians could legally consume cannabis for recreational purposes.

The legalization of cannabis raises many questions, in terms of public health, regulation, cultivation, supply, distribution, etc. In this article, we will discuss cannabis from the perspective of patents, a topic that is probably not the first that comes to mind.

In particular, we will briefly review the current financial situation of the Canadian cannabis industry, examine recent patent filing activities, and look at current and concrete examples of patents in various categories.

Financial situation of the industry

Several studies show that the global Cannabis industry is flourishing. And for good reason: consumer spending in legal products reached 6.7 billion USD in 2016, a 34% increase compared to 2015.

It should be noted that, contrary to what many people may think, Canada is not the most advanced country in terms of legalization. In a way, Canada will align with other jurisdictions (such as Uruguay and, to a lesser extent, certain US states) where recreational and medical cannabis is already permitted. Among our neighbors to the south, eight (8) American states have already legalized the recreational use of cannabis for adults[1], twenty-two other states already allow, like Canada, the use of cannabis for medical purposes, and fourteen states allow Cannabidiol (or CBD), an active derivative of cannabis that does not have the euphoric effects of THC. Only seven (7) US states are still resisting the takeover[2] (**Figure 1**).

[1] Alaska, California, Colorado, Maine, Massachusetts, Nevada, Oregon and Washington.
[2] However, cannabis is still banned at the federal level in the United States, which causes various problems to the industry.

Figure 1: Cannabis Market in North America October 17, 2018

Analysts predict consumer spending will increase more than 25% over the next few years as cannabis use becomes legal in more and more states, becoming a 23.4 billion USD market in 2022[3].

Canada still has a special status because it is one of only three countries exporting cannabis for therapeutic use, along with the Netherlands and Uruguay[4]. Since cannabis use has to date only been permitted for medical purposes, it is controlled by Health Canada, which issues licences. For example, more than 100 companies have obtained authorization from Health Canada for the cultivation, production or sale of medical marijuana, and soon for recreational cannabis. And the pace is accelerating since more than 50% of these permits were granted in the last 12 months[5].

This growing interest is reflected in the financial markets. There is also a Marijuana Index[6] for listed companies and this index has had a multiplier of approximately 6-7 over the last three years. However, financial analysts suggest that this is a highly speculative market as the majority of companies listed have limited or no income.

Some Canadian companies in the sector still had impressive market capitalizations, with the main ones being Aurora Cannabis (14.3 billion CAD), Canopy Growth (11.8 billion

[3] Arcview Market Research
[4] On October 17, 2018, Canada will also become the first industrialized country to legalize cannabis on a national basis and to regulate its sale and distribution.
[5] A list of all producers authorized by Health Canada to produce or sell cannabis for medical purposes is available at: https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/licensed-producers/authorized-licensed-producers-medical-purposes.html
[6] http://marijuanaindex.com/

CAD), Aphria Inc. (4.1 billion CAD), PhamaCan Capital/The Chronos Group (2.5 billion CAD), Hexo Corp (1.7 billion CAD) and CannTrust Holdings Inc. (1.3 billion CAD)[7].

With all this popularity, it is legitimate to wonder about the existing situation in terms of patents in the cannabis industry.

Patent filing activities in recent years

To determine patent filing activities related to cannabis, we searched a specialized database that covers issued and published patents worldwide. To identify relevant patents, we used a relatively simple combination of keywords relating to 1) cannabis itself or equivalent words such as marijuana or hashish and 2) keywords related to active derivatives such as cannabinoids[8].

This research strategy revealed that the number of patent filings for cannabis has been steadily increasing in recent years. As seen in Figure 2, over five years, the number of annual patent filings worldwide has nearly doubled from around 600 families per year in 2012 to almost 1,200 per year in 2016[9]. With the exception of a 40% peak in 2014 compared to 2013, the average annual growth of filings is around 20%[10].

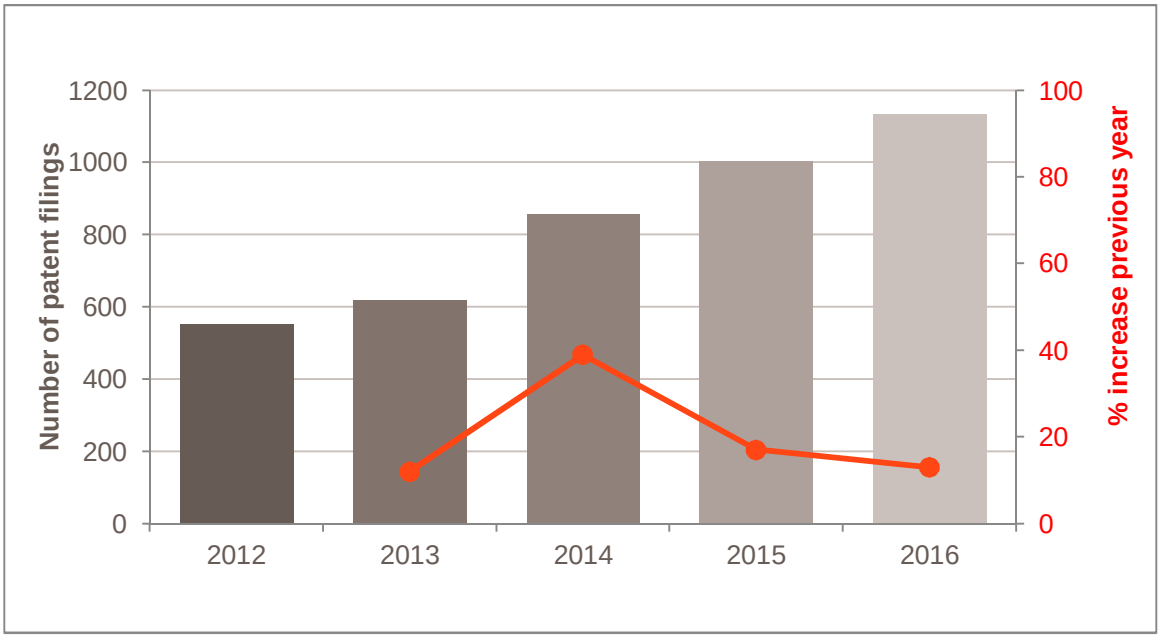

Figure 2: Overall annual cannabis patent filing growth

In order to perform certain statistical analyses, we focused on analyzing the bulk of all the most recent patents, i.e. those filed since January 1, 2014. Combining these results,

[7] As at September 30, 2018
[8] The research was carried out in April-May 2018
[9] Here, each filing represents a particular invention or family of patents, each family may contain one or more members.
[10] We have intentionally excluded the figures for 2017 and 2018 because these figures would have been incomplete since it takes a year and a half before a patent application is published.

we arrive at more than 2,500 different families totaling nearly 10,500 patent applications, including more than 3,000 patents granted (around 30%).

The data reveals that these patented or pending inventions originate in nearly every country, mainly China, the United States and Canada. In terms of the number of filings, **Figure 3** more precisely presents the different jurisdictions with patent filings. China has double the number of US filings and twice the number of PCT (WIPO) international filings. There is a similar number of filings at the European Patent Office (EPO) and in Canada. As a result, Canada ranks third nationally, ahead of several other countries, including Australia, Japan, India, South Korea and Mexico. In fact, it is uncommon to find Canada in the lead because, in other sectors, there are many more patents in other countries, with Canada generally ranking 9th or 10th in terms of national filings.

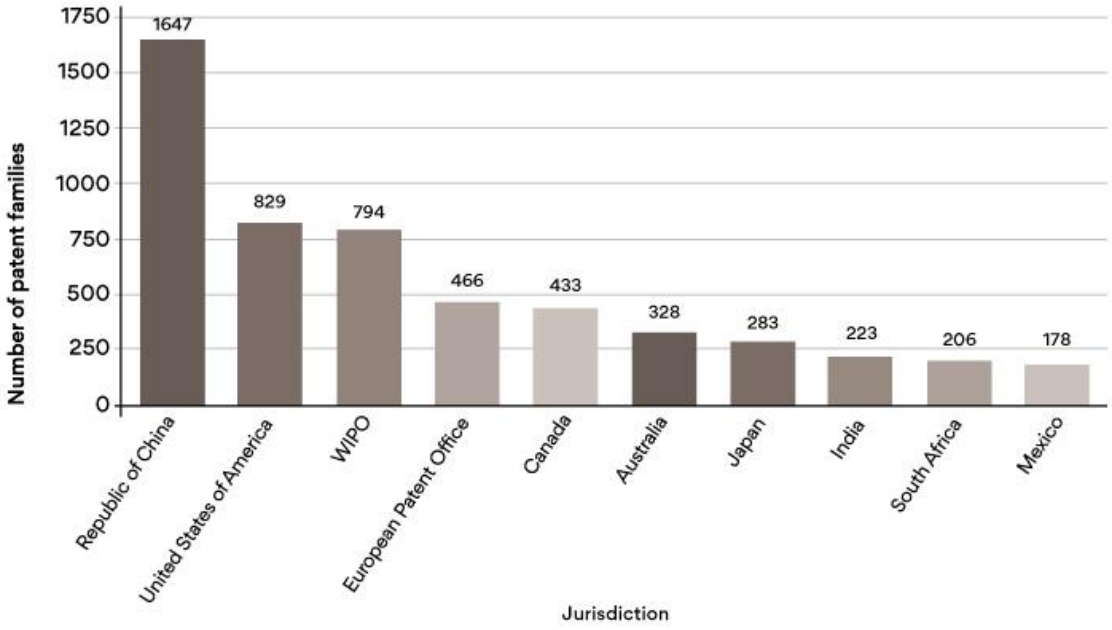

Figure 3: Patent families in the ten primary jurisdictions (> 2014)

The previous figure showed the number of patent "families". A family may have one (1) or more patents filed in one (1) or more countries. If we look at the total number of individual patent applications, then the United States comes in first followed by China, the International Bureau (WIPO), the European Patent Office (EPO) and, again, Canada (**Figure 4**). So, the filers clearly recognize the United States as being a very important market to protect. Once again, it is uncommon to find Canada in the lead, as it is generally much farther down compared to other countries. Filers therefore recognize the need to secure the cannabis market in Canada, particularly in light of legalization.

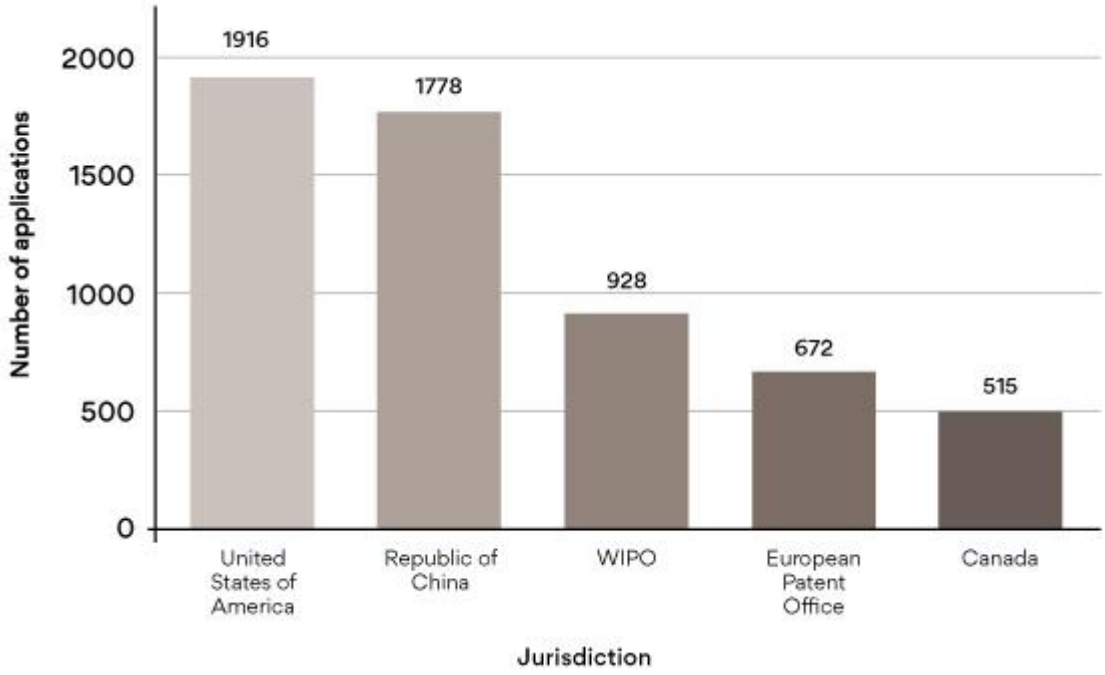

Figure 4: Patent filings in the five primary jurisdictions (> 2014)

We also analyzed "what" all these patents cover. A first indicator is the frequency of the main terms or expressions found in these patents. Statistical analyses of 10,000 localized patent documents reveal the most common keywords. The drawings in **Figure 5** illustrate these results in different ways. Looking at these two drawings, we understand a little more why China stands out among one of the largest filers, as many of the patents relate to traditional Chinese medicine, raw materials and extracts. The chart on the right also shows that many aspects of these patents are related to medicine, including side effects, pharmaceuticals, diseases and health care.

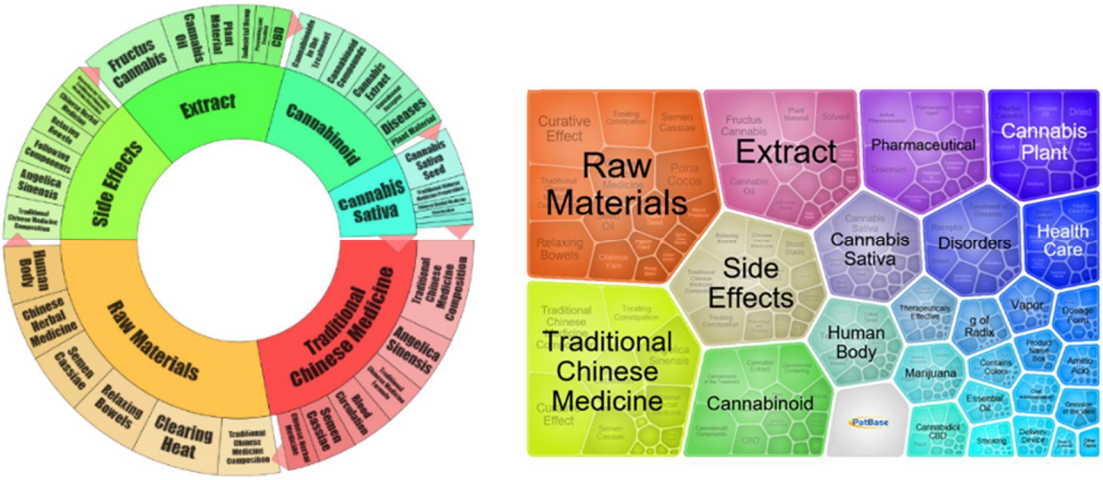

Figure 5: Key words found in localized patents

Medical applications are also confirmed when looking at the classification of these patents. For database search purposes, the patent offices assign one or more classes or categories to patents that are filed. **Figure 6** shows the main classifications of the 10,000 localized patents that relate to cannabis. These patents are mainly aimed at therapeutic applications, particularly pharmaceuticals and medical technologies. Several patents are also food-related and involve chemistry (2X), which likely include patents for active molecules or extraction processes.

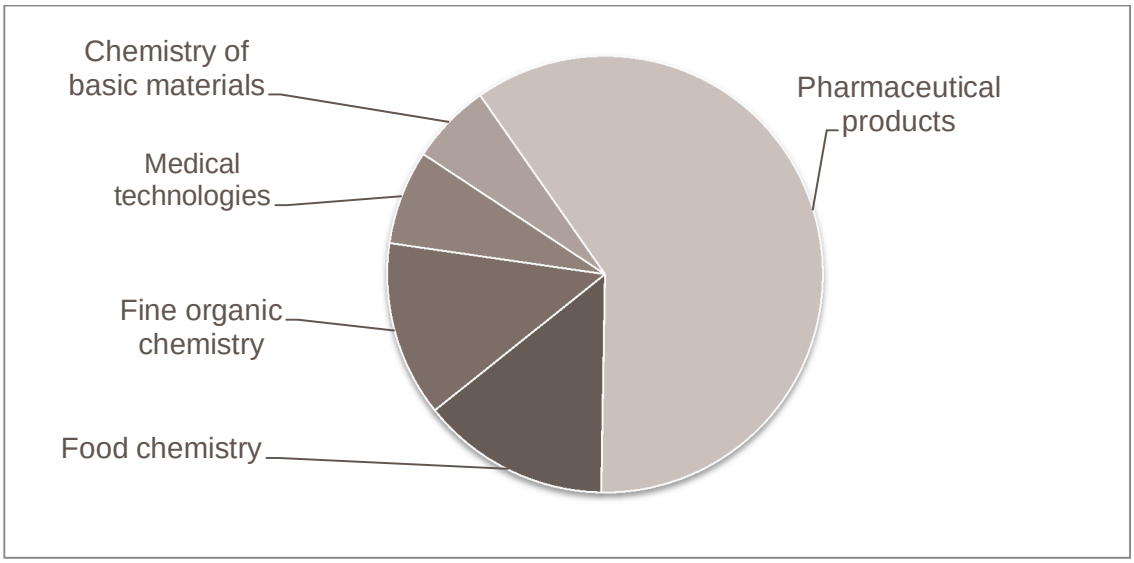

Figure 6: Five main patent classifications related to cannabis

We have also identified the main patent filers in the cannabis sector. **Figure 7** shows the top filers in terms of the number of patent families. GW Pharma (Great Britain) is in first place. Its leading position makes sense when we realize that the first drug developed by GW Pharma is Sativex™, a drug currently marketed for the treatment of multiple sclerosis. The active compounds of this product are two molecules extracted from the cannabis plant, namely tetrahydrocannabinol (the famous THC) and cannabidiol (or CBD). GW Pharma also has another drug, Epidiolex, in clinical study for the treatment of epilepsy. We also note the presence of several Chinese companies, which overlaps the previous global activity data (**Figure 3**). It may also be surprising to many to see that several large pharmaceutical companies are very active in the cannabis sector, notably Sanofi (8th), Lundbeck (9th) and Hoffman Laroche (13th). In 15th place is One World Cannabis, an Israeli company that specializes in developing new cannabis-based drugs[11].

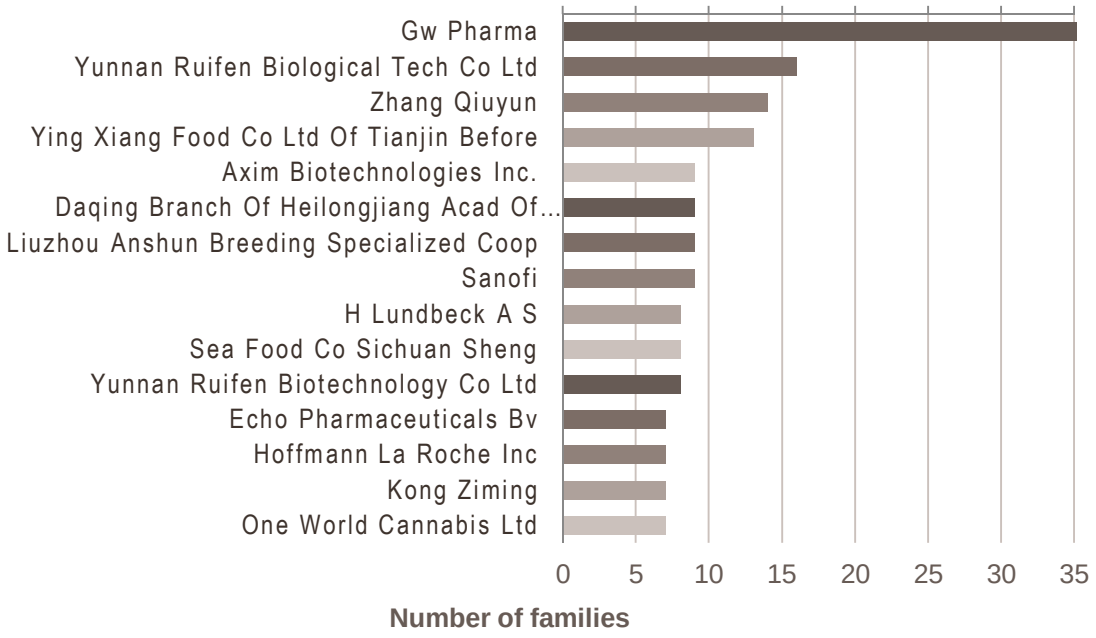

Figure 7: Fifteen leading patent filers in the cannabis sector (Number of families > 2014)

As mentioned above, the number of families refers to the number of different inventions and each family may technically have one single patent, which, of course, includes smaller players. When we look at filing activity in absolute numbers, which is the largest number of individual patents filed or granted, the major international pharmaceutical companies are clearly more active than the Chinese companies, which disappear completely from the ranking (**Figure 8**). The leading companies are almost all recognized pharmaceutical companies, including GW Pharma (1st), Purdue Pharma (2nd), Lundbeck (3rd), Sanofi (4th), Hoffman Laroche (5th), Genentech (6th), Boehringer Ingelheim (7th), Pharmacia (8th), Abbvie (9th), Takeda (12th) and AstraZeneca (15th).

[11]The treatments target multiple myeloma, psoriasis, fibromyalgia, post-traumatic syndromes and migraines. http://www.owcpharma.com/

So, even though we don't hear much about it, large pharmaceutical companies are clearly present in the medical applications of cannabis and its derivatives.

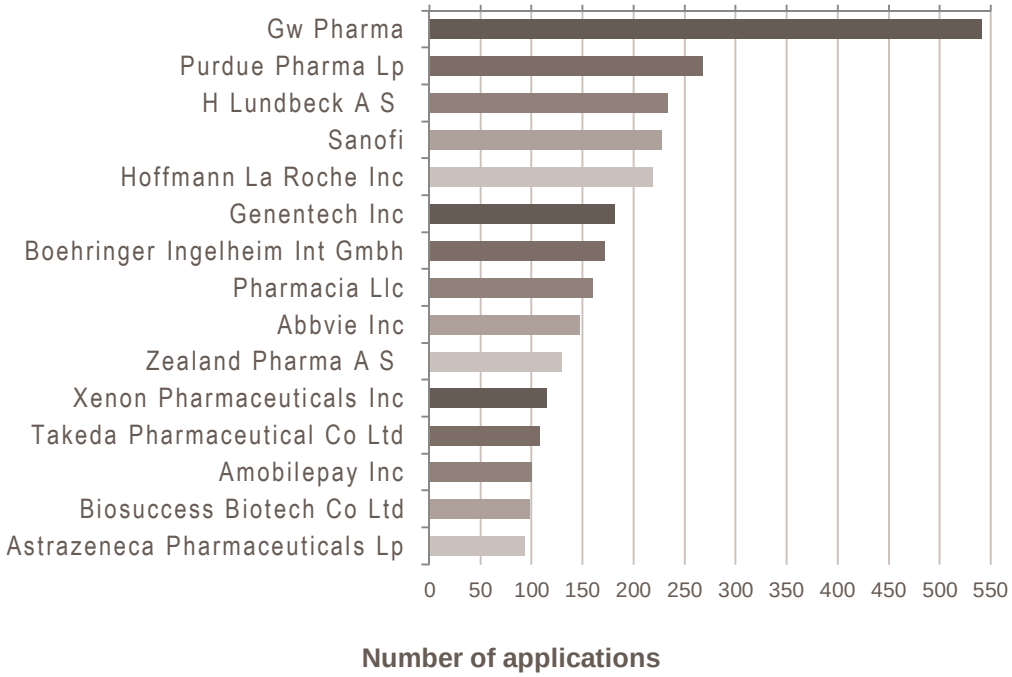

Figure 8: Fifteen leading patent filers in the cannabis sector (Number of families > 2014)

Canadian companies are a part of it. By cross-referencing the information available from various sources, our research has allowed us to identify more than one hundred Canadian companies working directly or indirectly in the cannabis sector. For each of them, we checked whether these Canadian companies had patents and we identified about ten. **Table 1** shows these companies and their respective patents. For example, patents filed by CanaboLabs, CannMedica Pharma, CannScience Innovation, Canntab Therapeutics, Canopy Growth, Inmed Pharmaceuticals, Intelgnx Corp., Prairie Plant Systems Inc., Radient Technologies and Tweed. There are surely several other patents that we could not identify because they are not yet published[12],[13]. So, it's clear that what we can see right now is just the tip of the iceberg and that many more patents will emerge over the next few years.

[12]Patent applications are only published 18 months after filing and remain secret for 1.5 years.

[13]For example, in April 2018, Canopy Health Innovation announced the filing of a series of eight new patent applications. https://www.newswire.ca/news/canopy-growth-corporation

Table 1: Recent patents from Canadian companies

Businesses	Patent Publication No.	Title
CanaboLabs	WO 2017/178958:	Device and a method for **controlled administering** of a therapeutic composition to a patient
CannMedica Pharma	CA 2,893,697:	Single-use **beverage capsule** containing cannabis
CannScience Innovation	WO 2018/000094:	Decarboxylated **cannabis resins**, uses thereof and methods of making same
Canntab Therapeutics	WO 2018/058235:	Sustained release **cannabinoid formulations**
Canopy Growth Corp	CA 2,923,399:	Method of **representing attributes**, physical characteristics or compounds of an article or substance
InMed Pharmaceuticals	WO 2017/190249:	Use of **topical formulations** of cannabinoids in the treatment of epidermolysis bullosa and related connective tissue disorders
Intelgenx Corp.	US 8,735,374:	**Oral Mucoadhesive** dosage form
Prairie Plant Systems Inc.	CA 2,504,743:	**Crystalline derivatives** of a cannabinoid and method for purifying a cannabinoid
	CA 2,770,448:	**Cannabinoid esters**
	CA 2,383,182:	Energy-saving **light fixture** and use of this device
	CA 2,506,877:	Method and Device for the planned **production** of plant extracts
Radient Technologies Inc.	CA 2,780,578:	**Process for the extraction** and direct concentration of active components derived from a natural product
Tweed	WO 2016/189384:	**Cannabis plants** having modified expression of THCA Synthase
	WO 2016/095024:	Method of **treating marijuana plants** with a reactive oxygen species

Examples of recent patents

To complete our analysis, we took a closer look at specific patents that may belong to different categories that we pre-selected. With some more specific combinations of keywords, we therefore sought to understand the significance of certain fields of activity among the 2,533 patent families identified.

Figure 9 gives an overview of the results obtained. Not surprisingly, the medical field is by far the largest. There are also fewer, but similar, patents in the areas of farming, testing, food and devices. Finally, to a lesser extent, there are also patents using genetic manipulations, patents for traceability and patents for recreational use.

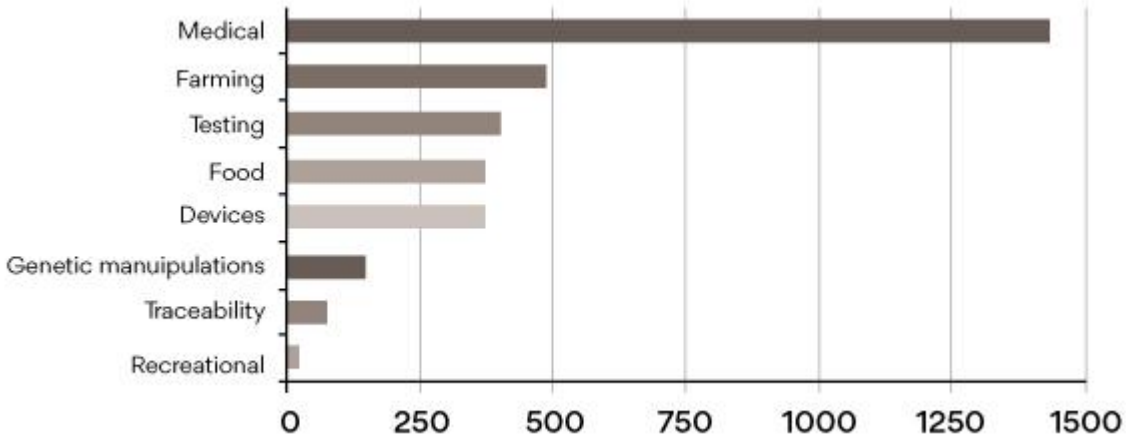

Figure 9: **Number of patents in different categories relating to cannabis**

Table 2 gives examples of specific patents in the medical field. We note that attempts are being made to protect the use of cannabis to treat several types of varied diseases, such as fibromyalgia, epilepsy and even to prevent rejection during organ or tissue transplants. There is also the use of cannabis via – let us say – less conventional absorption methods, such as suppositories.

Table 2: Examples of recent patents in the medical sector

Patent application number	Title
US 2018/116998	USE OF CANNABIS TO TREAT **FIBROMYALGIA**, METHODS AND COMPOSITIONS THEREOF
US 2015/359755	USE OF CANNABINOIDS IN THE TREATMENT OF **EPILEPSY**
US 2015/359755	CANNABIDIOL FOR THE PREVENTION AND TREATMENT **GRAFT-VERSUS-HOST DISEASE**
US 2018/110753	**SUPPOSITORIES** COMPRISING CANNABINOIDS

Media headlines regularly remind us that the food sector is a very promising sector for the cannabis industry[14]. It is therefore not surprising to see, as shown in **Table 3**, that companies have filed and even already obtained several patents to secure their innovations in this sector. Therefore, the selected examples indicate that, if you were motivated or eager enough, you could eat patented cannabis products for every meal. At breakfast, you could smother your toast with *honey* produced by cannabis-fed bees while drinking a *coffee* containing cannabis. At lunchtime, you could go to your favorite fast food restaurant and eat a hamburger whose bun is sprinkled with cannabis-flavoured *sesame seeds*. For dessert or as a snack, you could enjoy *frozen treats* made from cannabis juice. And, after eating all these foods, you might want to freshen your breath with, of course, cannabis-infused chewing gum![15]

[14] News headlines often report the existence or upcoming arrival of cannabis-based foods and beverages such as oils, cakes, cookies, candy, beer, etc.

[15] It is very unlikely that any of these products will ever be marketed given the many challenges to be addressed, particularly in terms of the advertising and food regulations.

Table 3: Examples of recent patents in the food industry

Patent application number	Title
WO 2017/013661	**BEE-INGESTIBLE** COMPOSITIONS, METHODS OF USING SAME FOR PRODUCING **HONEY** AND HONEY PRODUCED THEREBY
US 2016/044934	METHOD FOR MAKING **COFFEE** PRODUCTS CONTAINING CANNABIS INGREDIENTS
CN 107821551	**BLACK SESAME** FLAVOR OF CANNABIS AND ITS MANUFACTURING METHOD
US 9,955,716	PACKAGED **FROZEN ICE POPS** OF CANNABIS JUICE PUREE
US 2016/199299	CANNABIS INFUSED **CHEWING COMPOSITION**

Several patents also target devices as shown in **Table 4**. As might be expected, some patents are for *vaporizers* or devices for *smoking* cannabis. There are also other possible absorption methods like *patches*. There are also patents on equipment related to the *extraction* of cannabis, its oils and other active derivatives.

Table 4: Examples of recent patents in the sector

Patent application number	Title
US 2018/116278	INTEGRATED RECREATIONAL **DRUG SMOKING APPARATUS**
US 2018/117268	**VAPORIZER**, APPARATUS, DEVICE, AND METHODS
US 2016/331913:	METHODS AND **APPARATUS** FOR PRODUCING HERBAL **VAPOR**
US 2017/07187	**TRANSDERMAL DELIVERY** OF CANNABIDIOL WITH OTHER ACTIVE MOIETIES INCLUDING CANNABINOIDS
CN 204111719	**EXTRACTION EQUIPMENT** FOR INDUSTRIAL MARIHUANA ESSENTIAL **OIL RICH** IN CANNABIDIOL

Since cultivating cannabis plants is the basis of the entire industry, there are, of course, patents in this area, including patents for new systems for *farming*, *lighting* and even patents on *secure enclosures* (**Table 5**).

Table 5: Examples of recent patents in the cannabis farming sector

Patent application number	Title
US 2018/116131	CANNABIS **FARMING SYSTEMS** AND METHODS
US 2016/184237	METHODS OF **GROWING** CANNABACEAE PLANTS USING **ARTIFICIAL LIGHTING**
US 9,936,650	SECURE AND EXTERNALLY **CONTROLLABLE GROWING ENCLOSURE**

Molecular biology is also brought into the fold and many seek to manipulate the genes of the cannabis plant for the synthesis of THC and other cannabinoids. As shown in **Table 6**, several international PCT patent applications include genetic promoters, transgenic plants with modified expression levels of THCa synthase and genetic markers for differentiation of cannabis strains[16].

Table 6: Examples of recent patents in the molecular biology sector

Patent application number	Title
WO 2018/18057385	TRICHOME **SPECIFIC PROMOTERS** FOR THE MANIPULATION OF CANNABINOIDS AND OTHER COMPOUNDS IN GLANDULAR TRICHOMES
WO 2016/189384	CANNABIS PLANTS HAVING **MODIFIED EXPRESSION OF THCA SYNTHASE**
WO 2018/072845	**GENETIC MARKERS** FOR DISTINGUISHING THE PHENOTYPE OF A CANNABIS SATIVA SAMPLE

Since everything related to cannabis is closely regulated and controlled, it is not surprising to see that, as shown in **Table 7**, some patents are aimed at cannabis *traceability*, *production control* and *distribution control*.

[16]Another example is Hyasynth Biologicals Inc in Québec. This company produces cannabinoids in yeasts genetically modified by genes from the cannabis plant. Its international patent application PCT WO2018 18/148849 was published on August 23, 2018.

Table 7: Examples of recent patents in the control and traceability of cannabis sector

Patent application number	Title
US 2018/114168:	SYSTEM AND METHOD FOR DIGITAL **SUPPLY CHAIN TRACEABILITY**
US 9,852,393:	CANNABIS **CHAIN OF CUSTODY** MANAGEMENT
US 2017/024689:	SYSTEM AND METHOD FOR **TRACKING THE PRODUCTION AND SALE** OF REGULATED AGRICULTURAL PRODUCTS
US 2017/140388:	METHOD AND APPARATUS FOR **MANAGING JURISDICTIONALLY REGULATED CANNABIS**

As shown in **Table 8**, cannabis *testing* has also led to several pending patent applications or granted patents. These include new methods of cannabis *chemical analysis* and new *toxicology tests* useful at the judicial level or for driving a vehicle.

Table 8: Examples of recent patents in the cannabis screening sector

Patent application number	Title
US 9,952,233:	SYSTEM AND METHOD FOR **ANALYSIS OF CANNABIS**
WO 2018/080938	SYSTEMS AND METHODS FOR **CHEMICAL ANALYSIS** USING FABRY-PEROT TUNABLE FILTER-ATTENUATED TOTAL REFLECTANCE (FPTF-ATR) SPECTROMETER
WO 2018/080938:	SYSTEMS AND METHODS FOR **CHEMICAL ANALYSIS** USING FABRY-PEROT TUNABLE FILTER-ATTENUATED TOTAL REFLECTANCE (FPTF-ATR) SPECTROMETER
US 2016/370388	RAPID AND SENSITIVE METHOD OF **FORENSIC TOXICOLOGY** IN POST-MORTEM SUBJECTS USING ORAL **FLUID TESTING**
WO 2018/067867:	SYSTEM AND METHOD FOR **DRIVING CONDITION DETECTION** AND NOTIFICATION

Finally, we would be remiss in not mentioning the recreational uses that will be more prevalent than ever following legalization. **Table 9** shows that there are, of course, patents for products meant for cannabis smokers. Surprisingly, some patents are even intended to protect more intimate activities since they focus on new condoms![17]

[17] It will be interesting to see the marketing campaign for this future product!

Table 9: Examples of recent patents in the sector

Patent application number	Title
US 2018/116278	INTEGRATED **RECREATIONAL DRUG SMOKING** APPARATUS
US 2017/367875	NOVEL **CONDOM** COMPRISING CANNABIS DERIVED COMPOSITIONS FOR **ENHANCEMENT OF SEXUAL PLEASURE** AND DECREASE OF ERECTILE DYSFUNCTION SYMPTOMS

Conclusions

The cannabis market in North America is extremely active and it appears clear that this market is poised to continue its rapid growth as a result of the product's legalization on October 17, 2018 in Canada and the likely future legalization in other US states. This growth will not only be reflected in the sales of cannabis (recreational or medical), it will also result in continued robust activity in the growth of corporate financing and the number of patent filings.

This article has also shown that there are already many patents related to cannabis, mainly in the medical field and in several other various fields such as farming and production, food, recreation and others.

With all this momentum, the companies that will be the first to position themselves and file patents will certainly have a head start. Patent filers will benefit on many levels, from investor financing to marketing and advertising, as well as their strategic positioning by generating blocking patents that are difficult or impossible to circumvent. On the other hand, new players or those who do not file patents will find it more difficult to find their way and they will have to be very cautious because they will face increased risks of infringing third-party patents.

Therefore, serious businesses should implement early a strategy for protecting their intellectual property and, when appropriate, move quickly and effectively protect their cannabis innovations[18]. These companies should also make sure to perform regular research and verification of patents belonging to third parties to avoid the unpleasant surprise of being sued.[19].

[18] Patenting is not the only form of protection. For instance, sometimes it may be better to keep the innovation secret.

[19] In the United States, the first patent litigation related to cannabis began on August 16, 2018. Cannabis Corp. (Colorado) has filed a lawsuit against Pure Hemp Collective for infringing US Patent 9,730,911 entitled "*Cannabis Extracts and Methods of Preparing and Using Same*".