

The Intersection of Blockchain and Genetics: Protecting Your Cannabis IP

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It's no secret that the cannabis industry is currently facing an IP land grab for highly-prized cannabis genetics. In particular, the Biotech Institute's patent on all cultivars carrying the genes for both CBDA and THCA production with a specific terpene profile has stirred up quite a bit of controversy amongst cultivators and breeders. There are numerous others, recently issued patents surrounding highly coveted cannabis genetics that have many concerned that their years of hard work developing such cultivars could one day be considered infringement.

So how does one protect their prized varieties during this land grab?

Hiring patent attorneys and going through the process of the United States Patent and Trade Office can be both extremely time-consuming and costly. Furthermore, there is no guarantee the patent will issue unless the cultivar is truly novel. It's also important to keep in mind that a utility patent and a plant patent are not the same thing. Plant patents cost significantly less to file, however they have much more limited protections and only apply to asexually reproduced plants while utility patents offer much greater protections and apply to sexually reproduced plants (seeds). A key statutory requirement for a utility patent is that the cultivar must be new and non-obvious, meaning that the differences from what has been previously described are not obvious to someone with an ordinary understanding of the technology. Demonstrating that a patent is non-obvious can also be a difficult task.

This article will discuss how cultivators and breeders can protect their IP by publishing their cultivars' unique genetics on the blockchain.

What is blockchain technology?

Popularized by last year's cryptocurrency craze, blockchain technology is arguably the most significant invention in

computer sciences in 50 years. The Bitcoin blockchain is the most successful and well-known blockchain, but it is not the only one. Many other blockchain technologies and cryptocurrencies have sprung up in Bitcoin's wake, each with their own slightly different use cases and methods for creating blocks.

In short, blockchains are decentralized, transparent, hack-proof ledgers, making them ideal for storing data that is valuable to many different collaborative and potentially competitive parties. That's why cryptocurrencies, like Bitcoin, use blockchains to verify and catalog financial transactions. Each time a Bitcoin holder moves Bitcoin from one wallet to another, the transaction must be approved by multiple independent users on the network. Those users, called "miners", ensure that each transaction is valid (i.e. the person giving the Bitcoin has enough Bitcoin in their wallet to complete the transaction, is not double spending, etc.). Each time a miner verifies a transaction, they are rewarded with a small amount of Bitcoin, thus giving them a financial incentive to participate. Once the transaction is approved by a majority of miners, it is recorded in a cryptographic block. That block is linked to the previous block, thus creating a chain that anyone in the world can view, and everyone can verify.

Blockchain's tamper-proof qualities, transparency, and consensus of information flow make it an ideal solution for tracking banking and other sensitive types of information.

How can blockchain be applied to protect cannabis IP and show authenticity?

Blockchain technology is being employed in the cannabis space to document the existence of a given cultivar. When cultivators sequence a cultivar's genome and publish it to the blockchain, they are creating a public, time-stamped record





of their cultivars' existence on a hack-proof ledger. While this doesn't offer them patent protection, it would make it nearly impossible for another cultivator to successfully patent the same cultivar in the future.

Why use genetics to describe a cultivar?

Genetic sequencing can reveal loads of important information about a cultivar including its potential to produce certain cannabinoids, terpenoids, and flavonoids. This is valuable information considering the plant's chemotypic profile has been a key part of cannabis cultivar patents that have been issued.

While some have suggested using chemotypes as a "fingerprint" for a cultivar, this is a misuse of the term fingerprint. There are over 560 compounds found in Cannabis and analytical labs are only measuring a few cannabinoids and less than 24 terpenes. Many of these unmeasured compounds are therapeutic antioxidants like anthocyanins and flavonoids.

The reality is, quantitative analytical techniques and standards for all 560

compounds do not exist in 2019. We do not anticipate affordable, validated, full-profile analytical assays existing in the next decade, if ever. Likewise, many of the terpenes that make up the micro-chemotype are highly volatile with differential vapor pressures suggesting terpene content is highly subject to evaporative or oxidative decay. Additionally, it is well known that chemotype can be highly variable even in plants that have the same genotype, especially in the context of terpene profiles.

The only truly reliable and best proxy for this unmeasured chemical complexity in the plant is the plant's own genome. Using genomics, we can record the chemical potential of the plant beyond what can be measured with today's chemical technology.

Furthermore, the genome provides insight into important plant characteristics, such as flowering time, plant stature, and resistance to certain pests and pathogens. As the cannabis market matures and the wholesale cost of cannabis declines, cultivars

that mature faster and produce greater yields while averting disease will be very valuable to large scale producers. That is IP worth protecting.

What should I look for in a sequencing service?

There are a number of cannabis sequencing services on the market, but not all are created equal. Here are a few things to consider when sequencing your cannabis genetics for IP protection:

Whole Genome Data

When it comes to sequencing your cultivar's genetics for IP purposes, the more data the better. With more data, you can better describe your cultivar and make it more difficult for anyone else to claim novelty. Whole genome sequencing services provide cultivators and breeders with a data file that contains the strain's full genetic sequence. That information can be used to identify important genetic markers and determine novelty.

Sequencing Methods

The cannabis genome is highly polymorphic and can carry SNPs as frequently as every 25 base pairs in areas under high selection such as chemotype-influencing genes. Therefore, a thorough analysis is paramount for producing high-quality data that properly characterizes a cultivar's genome. Beware of cultivar identification and registration services that use single primer sets to characterize given loci, as this methodology can fail to amplify one or more of the alleles present and ultimately lead to allele bias and mischaracterization. Furthermore, data that is not reproducible will not hold up in court, therefore, these certifications aren't really a certification.

Comprehensive Reference Genome

When your cultivar comes off the sequencer, it's in 100 million different pieces. Those pieces are then assembled in order, using a reference genome. To put it simply, each piece of DNA is a jigsaw puzzle piece and the reference genome is the picture on the box. The data produced from sequencing is only as good as the reference it is compared to. Services that use incomplete reference genomes are missing an average of 1 in every 10 genes. This lack of completeness creates gaps in the

sequence information that could contain important chemotypic or phenotypic data.

Publish to the Blockchain

Some sequencing services will publish your cultivar's genetics to their website or their own database. But what if those websites and databases are hacked? What if the sequencing company you used goes out of business and the website is taken down? Suddenly the

public record of your cultivar's genetics is no longer public.

Due to their decentralized, distributed architecture, blockchains are essentially hack-proof ledgers that aren't reliant on any one server or one company's existence. This ensures that a public, time-stamped record of your cultivar's genetics will remain intact. Finally, you want to make sure your cultivar's genetic data is on a public database and that you are publishing your cultivar's genetic information to the blockchain.

Our Approach

At Medicinal Genomics, we have provided a path for cultivators to register their cultivar's genetics on the blockchain to show prior art. Our StrainSEEK™ Strain Identification and Registration Service is the most comprehensive genetic sequencing service on the market. We also have assembled the most complete cannabis reference genome, based on the Jamaican Lion cultivar. An encrypted version of the cultivar's genetic data file is submitted to the DASH blockchain.

You can view all the cultivars that have been sequenced and submitted to the blockchain on the Kannapedia.net website. In time, we hope Kannapedia can become the portal through which the public can access the world's first transparent, secure, blockchained cannabis genetic registry.

