DISCUSSION PAPER

A Plant Chemist's Perspective on the "Problem" of Derivatives

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This paper offers some practical considerations from a laboratory scientist's perspective on challenges of trying to regulate plant based "derivatives" under ABS policies. If one were to generalize about the character of medicinal plant chemistry professors at universities (acknowledging the inherent danger of generalizations), they could be considered a somewhat eccentric lot, driven by a passion to understand the chemical mysteries of plants. Medicinal plant chemists tend to be more collaborative than competitive. Not surprisingly, within the "culture" of plant chemists, an extensive system of barter has quietly evolved around plant collections, extracts and derived compounds. It is this culture of collaborative exchange that adds a layer of complexity to any ABS regime that seeks to label, track, or otherwise regulate the flow of derivatives between different individuals, laboratories, institutions and countries.

From the perspective of a medicinal plant chemist, plants are miniature chemical production factories. Plants convert simple inorganic substances (carbon, hydrogen, oxygen, nitrogen) into all sorts of complex and scientifically interesting chemical compounds, many of which are useful to humans. The job of the plant chemist is to take the plant apart, separating it into its chemical constituents (i.e., derivatives) and testing these for various medicinal properties and biological activities (e.g., anti-viral, anti-inflammatory, anti-cancer, etc.). Depending on the plant species, the specific types of chemicals being studied, and the laboratory equipment available, this kind of laboratory work can take weeks, months or even years.

Some plant chemicals are ubiquitous, found in many different species; others are novel to certain species of plant and some are only produced at certain stages of growth or under certain environmental conditions. Some plant chemicals, once identified, can be synthetically created in the laboratory; others are too technically difficult, time-consuming or expensive to synthesize and will need to be extracted from the plant. Some chemicals that fall into the latter category can be partially synthesized in the laboratory (semi-synthetic) or their biosynthetic machinery can be cloned into a simpler plant or bacterial system that can be grown in high yield in the laboratory and induced under artificial conditions to produce the chemical.

Since the biological diversity of plants is so great (over 250,000 species on earth) and the chemical repertoire of each plant species is so vast (i.e., hundreds or thousands of chemicals per plant), most medicinal plant chemistry labs specialize in certain species of plants and/or families of chemicals, and limit testing to certain categories of medicinal properties. Regardless of a lab's specialty, the most labor intensive and time-consuming part of the scientific process is generally the field collection of plants and the initial extraction of plant compounds (usually conducted by students as part of their undergraduate training or graduate research projects).

In the context of medicinal plant research, the life of a "derivative" is one of promiscuity. For example, Lab X has a collection of 600 plant extracts from location XX that it is testing for anti-viral properties. Meanwhile, Lab Y has 400 extracts from location YY that it is testing for immune-stimulating activity. The labs agree to test one others' extracts as an exchange of favours, perhaps leading to a collaboration in future if there are any results of interest. The savings in time and cost to each lab are obvious – essentially neither could do what the other lab is already set up to do. So new scientific knowledge that would not otherwise be possible is gained by the exchange. The labs exchange their samples by simply sealing small amounts of each extract in plastic vials, putting them into a nondescript envelop, and sending them off (locally or internationally) in the mail. If the package doesn't reach its destination because it is opened by postal workers or customs officials (an uncommon occurrence in this author's experience), it is usually easy to just send another package. Or a student who is making the journey for other reasons might put the samples in a pocket or suitcase and deliver them in person.

Medicinal plant laboratories are often approached by herbal, biotechnology or pharmaceutical companies looking to conduct quality control tests on the company's products, or to purchase plant extracts for testing in their company's laboratory assay systems (the graduate students having already put in the "sweat capital" into collecting the plants and creating extracts). Natural products chemistry is chronically under-funded by academic granting councils, so university researchers commonly turn to these kinds of opportunities to supplement funds for purchasing laboratory equipment and materials. Again, the derivatives quietly move between labs, institutions and sometimes countries.

Can these flows of materials, whether given, traded or sold, be tracked and regulated by an ABS regime? Perhaps, but it will take the cooperation of many individual scientists to make it happen – individuals who are not likely to be amenable to any system that they view as overly bureaucratic and burdensome to the point of interfering with conducting their science. In other words, if ABS requirements are seen as too onerous, the exchanges will simply go "underground". Thus, systems for the labeling and tracking of derivatives need to be designed with the practical realities of the "derivers" (generators and users of derivatives) in mind; these groups likely have limited time, resources and expertise to put labour intensive or technologically sophisticated systems in place.

Derivatives are a form of scientific currency that facilitates scientific discovery through a system of collaboration and reciprocal exchange. In the spirit of protecting and assigning rights to genetic resources and derivatives, an ABS regime should not inhibit scientific collaboration and discovery. Getting the users of genetic resources and generators of derivatives involved in designing systems that meet policy needs and at the same time are feasible in practical terms will be key to any effective ABS regime.