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## Knowledge Management and Intellectual Property Issues in Aquaculture

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One particular point of pride in the aquaculture world today is the extent to which the science is driven and how knowledge-intensive the enterprise has become. We are all talking about the blue revolution and how the use of aquatic resources has a significant potential in a number of fields ranging from pharmaceuticals, diagnostic and analytical reagents to excipients in the cosmeceutic and nutraceutic markets.

The fast developing cosmeceutic and nutraceutic industries are forcing ingredient manufacturers to focus on developing better and better ingredients since consumers are looking for better performing and scientifically proven products and are keen to pay the extra money. The sea is thus providing the perfect solution with its multitude sources of active ingredients. And yet, are we really protecting all intellectual property arising from our aquaculture research?

A quick comparative search for patent applications and patents granted on the United States Patent and Trademark Office (USPTO) website from 1976 till today for various key words turned out to be deceptive when the aquaculture world was compared to the agriculture world. The table below shows the comparison:

Key Word	Hits	Ratio $x_1/x_2$
$x_1$ : corn	112592	1,01
$x_2$ : fish	111249	
$x_1$ : corn oil	20561	3,39
$x_2$ : fish oil	6066	
$x_1$ : agriculture	29255	11,28
$x_2$ : aquaculture	2594	
$x_1$ : agriculture equipment	46	5,11
$x_2$ : aquaculture equipment	9	

Could this be because of the misconception about intellectual property and what it entails especially in the aquaculture field? It is indeed true that any living form that has existed in nature does not qualify for a patent. However, anything created by human ingenuity and application of the human intellect, if 'new', 'has utility' and 'non obvious', is in principle patentable. The aquaculture world includes all sorts of technologies: be it a process or machine for the making/extraction of products and byproducts (e.g. fish meal, fish oil, fish protein concentrate, fish offal, meat analogues, products like carrageenan, chitin, pigments, alkaloids, algae production) to preservation, sterilizing and packaging methods as well as fishing equipment like

hooks, rods, reels. There is still a wide array of technologies that we cannot even start to list here.

This is all to say that intellectual property can take several forms depending on the nature of the technology. It could be under the form of breeder's rights, patents, trademarks, copyright, industrial design or a combination thereof. A patent itself can be on the process, the design of the machine used, on the manufacture of the product or its composition or obviously a combination thereof.

Having a solid intellectual property helps attract industrial partners. The importance of intangible assets is growing, often equaling or surpassing the value of physical assets for a company. The state of the intellectual property of a company determines its share and corresponding influence on the market. There is a direct correlation between the size and quality of the intellectual property portfolio and the return on investment. Today, intangible assets make up 80% of the value of the company and only 20% being made up of tangible assets, whilst the exact opposite was seen in the 70s (Donal O'Connell, Adjunct Professor, Imperial college London). Needless to say, that therefore, having the intellectual property coming out of our academic inventions protected will help us bring these technologies to the market.

We certainly can only hope that with the increasing knowledge in this fast coming field, that there will be more protection of the intellectual property in the future. In fact, this should be made easier at least for protection in Canada. The Canadian Intellectual Property Office (CIPO) now has an initiative to expedite the examination of patent applications related to green technology that came into force in March 2011. Many technologies in the aquaculture field tend to be green and environment friendly. This is because several marine species are protected and hence technologies being implemented in this field have to follow the framework of conservation laws and regulations. The advantage then is that it positions such technologies for an accelerated prosecution within the Canadian intellectual property system. This therefore will foster investment and expedite commercialization of such technologies that could help to resolve or mitigate environmental impacts or to conserve the natural environment and resources.

Looking forward to see more intellectual property coming out of our blue technologies.

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