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Gene patents: are they socially acceptable monopolies, essential for drug discovery? ▼

Looking at the commercial realities of gene patents for the pharmaceutical industry, I conclude that, on balance, their effect is to retard, rather than to stimulate, both scientific and economic progress. The monopolies awarded by patents on genes as novel chemicals are not in the public interest and society would benefit from an immediate change in patent office policy to limit the allowance of patents on genes to specified uses with only narrow claims.

Patents with broad claims are being granted on genes mainly by the United States Patent and Trademark Office (USPTO). These broad claims might not be justified when opposed or challenged by patent holders but this will take many years. In the USA, the patentee will only challenge third parties deemed to have infringed their patent when they can see a potential for substantial financial gain in winning the challenge. Meanwhile, many more gene patents are likely to be granted, complicating the position further.

The USPTO adopts the position that, however obvious the method of isolation of a gene, the sequence determined for that gene is not obvious and, on this basis, a composition-of-matter patent is justified. Thus, 'a patent granted on an isolated and purified DNA composition confers the right to exclude others from any method of using that DNA composition for up to 20 years from the filing date'. By contrast, I hold that genes are essentially discoveries, rather than inventions, and that the discovery process is now a routine one that makes a composition-of-matter patent unjustified. However, where a useful function for a gene can be demonstrated, it might be reasonable to allow a use patent on the gene and/or its product. This leaves the way open for novel uses for the same gene to be claimed in subsequent patents.

Gene patents are not essential for drug discovery

Pharmaceutical companies need access to, but not ownership of, genes as potential drug targets. Making successful new drugs is difficult so it is in the public interest that there is extensive competition to invent the best drug(s) against each target. Thus, monopolies on gene targets are not in the public interest. Broad, non-exclusive licensing of gene patents across the industry would be one solution, but this is not the norm. Compulsory licensing is another possible solution, but it might not work in practice because industry does not favour this approach. However, the threat of compulsory licensing when non-exclusive access to a gene is deemed to be of considerable economic importance might have a beneficial effect on the behaviour of patentees in granting access.

A handful of genes will encode proteins that could be novel therapeutic agents and, like any new chemical entity (NCE), they will require patent protection before a company will undertake the long, expensive and risky process of drug development. Where the product of a gene, rather than the gene itself, has use as a therapeutic agent, a composition-of-matter patent covering that protein product (analogous to the NCE) would suffice.

Gene patents as biotechnology currency

Gene patents are being filed not only by pharmaceutical and biotechnology companies, but also by academics. There are potentially valuable commercial uses for a few genes and gene products, either as therapeutic agents or diagnostic reagents, but most genes will be used as tools in biological investigations.

For biotechnology companies and academics, gene patents are viewed as 'value generators'. The Intellectual Property (IP) portfolio of a biotechnology company can enhance the value of that company in the eyes of investors. Most academic research institutions file patents in the hope that the IP generated by their research will reap large financial rewards but, to date, this is the exception rather than the rule. The conversion of genomic data into biological information is accomplished mainly by academic research. Therefore, full and free access to genomics data, without the hindrance of patents, is essential for the most efficient pursuit of academic research.

In Europe, patenting of genes has not been readily accepted, and it has been

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claimed that this could slow the growth of biotechnology in Europe. By contrast, I suggest that withholding patents on genes could encourage the expansion, in Europe, of pharmaceutical R&D that is free of gene patents that could limit the choice of drug targets in the USA.

Society is entitled to see maximal benefit from the public funding of the Human Genome Project. Although some situations might require a much-reduced level of patenting, ideally, genes should be patent-free. [For a more extensive discussion of gene patenting from this author, see Ref. 1.]

Reference

1 Williamson, A.R. (2001) Gene patents: socially acceptable monopolies or an unnecessary hindrance to research? *Trends Genet.* 17, 670–673

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Pills and pumps: the future of insulin therapies ▼

In a recent issue of *Drug Discovery Today*, Pillai and Panchagnula provide an insightful review of the history and current research into insulin therapies[1]. Much of the research involves alternative delivery methods to injection that maintain the current safety and efficacy of the drug. Most diabetics would gladly give up syringes and needles for a pill, or something else more comfortable and convenient. However, the Pillai and Panchagnula review tends to overemphasize developments toward better insulin pumps, and gives short shrift to exciting new alternative delivery methods that avoid needles, including oral and inhaled delivery.

Insulin pumps have been around for some time, and in a small proportion of the diabetic population (particularly infants and teenagers) they have proven advantageous. However, the use of an insulin pump does not avoid needles, and actually requires closer monitoring of insulin levels throughout the day than a regimen involving multiple injections does (http://www.childrenwithdiabetes.com/d_06_f00.htm). As Pillai and Panchagnula point out, these pumps are a long way from acting as an artificial pancreas; the glucose sensing technology is simply not yet up to the task. For a majority of diabetics, the advantages will not outweigh the inconveniences until that time.

Several versions of inhaled insulin are in clinical trials, and one version recently completed Phase III trials. However, this version is currently delayed from submission to the FDA, causing some speculation about its safety (www.inhale.com). Although it is true that the lungs provide a large surface area for absorption that is relatively free of proteolytic enzymes, it is not yet clear whether this needle-free approach will pass regulatory approval.

Among the alternative delivery routes being explored, the oral route of administration is the most preferred. In addition to the convenience and higher compliance with oral administration, oral insulin administration would place the drug in the portal circulation first, thus mimicking the physiological pathway of insulin delivery, providing a direct route to the active site (liver), and would avoid some of the undesirable peripheral effects observed when insulin is injected. Of the peroral delivery methods for insulin mentioned by Pillai and Panchagnula, one involves polymer conjugates of insulin, essentially a prodrug approach (http://www.infinitypoint.com/Articles/Horizon/993756633). Another is actually based on buccal delivery, using the large number of blood vessels in the cheek tissues (http://www.pharmaceuticalonline.com). Only one, to my knowledge, has shown successful delivery of therapeutic levels of unaltered insulin through the gastrointestinal tract (http://www.hadassah.org.il/news/OralInsulinDov0701.htm). All of these peroral delivery methods are currently in Phase II clinical trials.

The dream of many diabetics is to throw away their needles and simply take a pill to get their insulin. Beyond the added comfort and convenience over needles, oral insulin would have therapeutic advantages, avoiding some of the side effects caused by delivery into the peripheral circulation. Two more phases of clinical trials are necessary, but in a few years, oral insulin could be available in some pill form. An artificial pancreas would be better still, but for the moment it appears that pills are winning the race over pumps.

Reference

1 Pillai, O. and Panchagnula, R. (2001) Insulin therapies – past, present and future. *Drug Discov. Today* 6, 1056–1061

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