POLICY FORUM: GENETIC TECHNOLOGIES

Commercialization of Genetic Research and Public Policy

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We are in the age of "*Homo economicus*" (*1*). Human genetic material is increasingly an object of commerce. For organs at least, there is some international consensus against commercial trade. However, an overview of the issues raised by human genetics reveals confusion and concern among policy-makers and the general public about the appropriateness of commercialization (*2*). For society to deal with these new technologies, it is crucial to evaluate four emerging approaches to policy-making and to look at possible strategies in dealing with specific issues.

Human Rights Approach

Through the filter of human rights codes, constitutions, and international conventions, this approach relies on the courts. It circumscribes the applications of new technologies that otherwise might encourage discriminatory or stigmatizing practices. Policy-oriented decisions of high-ranking courts are strengthened by the fact that public interest groups can obtain standing to participate and help case law reflect public values. Such cases clarify issues and set far-reaching precedents in the interpretation of, for example, the right to privacy, or discrimination resulting from application of new technologies in the areas of employment or insurance. Yet, on the whole, they are ad hoc in nature and achieved after the technology has already been integrated into research and health care. Furthermore, like all litigation, the process is a costly and lengthy one. Finally, if the court is timorous and refuses to go beyond the facts or issues, it is a limited recourse.

Statutory Approach

In this method, specific legislation crafted in response to new technologies addresses the implications of scientific advances through prohibitions, constraints, or moratoria. This method has the advantage of immediate certainty, clarification, and precision, as well as being an expression of political consensus. Furthermore, such legislation can also prospectively foreclose avenues of research by prohibiting techniques such as the creation of human chimeras. The danger of this approach is that such legislation is limited to the current issues and tends to close the public debate. Moreover, if such statutes are adopted in rapid succession, there is a risk of contradictory positions and of inadequate definitions. The latter is particularly true when terms such as "embryo" or "cloning" are defined, for example, only to find that new knowledge or different techniques escape the statutory definition. Finally, if hastily adopted because of public outcry, they will be lacking a proper foundation based on scientific risk assessment.

Administrative Approach

A third possibility is an administrative approach through governmental or professional bodies. Such an approach allows for the gradual development of self-regulatory professional codes of conduct and, where necessary, licensing, monitoring, and quality assurance. Professionally and procedurally oriented, it ensures a "buy-in" by those involved, resulting in greater effectiveness and integration into practice. These professional codes, ethical guidelines, and standards of practice, however, can be seen as self-serving and as a way to avoid either lawsuits or restrictive legislation. Furthermore, the public does not participate in the drafting of these codes. Another drawback of this incremental approach is that it "administers" technologies through codes or standards and usually fails to explicitly enunciate the value-choices underlying their acceptance or to explain why certain constraints have been instituted.

Genomic commercialization is becoming a reality. How will we deal with it?

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Market-Driven Approach

Finally, a liberal, market-driven approach maintains that proper, professional practices will ultimately "win-out" in an unfettered marketplace. This approach seems to be the most flexible and supportive of scientific research. Technological development is dependent on investment and support, either public or private. The market, however, is also subject to lobbying by special interest groups, including those who stand to gain financially from public investment or lack of public control, and those who, for a variety of reasons, see certain technologies as potentially harmful or in conflict with their particular values. The difficulty these advocacy groups have in compromising inhibits the consensus necessary for successful, albeit limited, government-initiated oversight. This leaves the development of any given technology to the vagaries of the market, the chilling effect of litigation, and consumer choice. This is evident in the proliferation of private, unregulated infertility clinics and of mail-order genetic tests.

Particular Issues and Recommendations

Status of genetic material as it relates to commercialization. The current commercialization of the genomics revolution (*3*) has led to concern that turning tissue, cell lines, and DNA into commodities "violates body integrity, exploits powerless people, intrudes on human values, distorts research agendas, and weakens public trust in scientists and clinicians" (*4*). Respect for genetic material as part of the person and of humanity is consistent with the domestic positions of most countries. For example, in UNESCO's 1997 *Universal Declaration on the Human Genome and Human Rights* (*5*), the genome is considered to be the common heritage of humanity. The Declaration takes no position on the issue of the status of individual human genetic material except to maintain that "in its natural state [it] should not give rise to financial gains" (article 4). Likewise regional instruments

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such as the European *Directive on the Legal Protection of Biotechnological Inventions* (*6*) and the *Convention on Human Rights and Biomedicine* (*7*) adopt this broad approach and consider human genetic material as part of the person and not as property.

Most countries avoid the issue of the property-person characterization. Indeed, a legislative approach as been eschewed in favor of administrative (professional) guidelines (*2*). The result of the administrative approach is a plethora of conflicting (if not confusing) DNA "banking" standards (*10*) with little or no guidance on commercialization. Moreover, as noted by a National Bioethics Advisory Committee (NBAC) report (*8*), DNA can be extracted from such materials, stored indefinitely and plumbed for information "to reveal something not only about the individual from whom the tissue was obtained, but possibly about entire groups of people...." (*9*).

The NBAC report serves to illustrate the array of different choices that have to be made in relation to the possible research uses of tissues obtained during routine care or specifically for research (and this beyond the lifetime of the person). No agreement exists as to whether participants should simply be notified of possible commercial uses, or can veto such use, or should not be told anything. NBAC has made no recommendation on either the issue of status or of commercialization but does say that the topic deserves fuller consideration.

Policy-makers should be sensitive to specific social, legal, and policy implications. Government inactivity could be perceived as endorsing a laissez-faire and market-driven approach. This would violate important societal values in most countries. Yet, in the face of the current trend toward commercialization of genetic research, extensive legislative interference could dry up the largely private sponsorship of genetic research.

Furthermore, the increasingly multicentered and international nature of human genetic research and pharmacogenomics suggests that the time is ripe for international harmonization. Although the Human Genome Organization (HUGO) has begun this effort (*11*), regional and international bodies such as the Council of Europe and the World Health Organization (WHO) would do well to develop a model professional code of DNA banking practices. The continued absence of common international, professional standards on the basic choices to be offered research participants will result in the continuation of contradictory approaches and undermine the possibility of procuring fundamental population data necessary to good science and so, good ethics.

Patents. Two approaches have appeared with regard to the issue of the patentability of human genetic material. The first, largely confined to Europe, and exemplified by the 1998 European Directive maintains that the human body or the simple discovery of some component (including gene sequences or partial sequences) are not patentable inventions [article 5(a) in (*6*)]. The second is market driven and leads to a situation of fragmentary and overlapping patents (*12*). This occurs whether the patent rights granted are broad or limited to partial sequences. According to HUGO, this has resulted in problems because, whether broad or narrow, these rights, preclude patenting of innovative disease gene discoveries, act as obstacles to investment, and are deterrents to deposition of information into databases (*13*).

One way to stop proliferation of fragmentary, counterproductive patents might be for policy-makers to "activate" the public order and morality exclusion on the exploitation of patents as found the European Patent Convention (article 6.2 in *14*) by incorporating this ethical filter into national legislation. This would provide a basis for refusing to grant a patent on an invention if its exploitation would be contrary to public policy. Like the recent requirement of prior environmental impact assessment (the precautionary principle), a renaissance of this public policy filter especially in the upcoming renegotiation of the TRIPs (Agreement in Trade-Related Aspects of Intellectual Property Rights) could reinforce the exclusion from patentability of our "genetic heritage." Moreover, the European Directive (*6*) has advanced the debate in that it requires an informed consent to patentability from the person whose biological material is being used. This approach could be incorporated as a core element in the international harmonization of practices mentioned earlier.

In the long run, it remains for national patent offices to take leadership in a way that inhibits a totally market-driven approach from impeding international, scientific collaboration. Failure to do so will eventually lead to costly litigation and loss of potential therapeutic advances.

Conflicts of interest. During the past 15 years, universities and health-care institutions have looked increasingly at private sources to pay expenses associated with research. Academic health-care centers conduct some kinds of research that may generate unique concerns. Principal among these is the development or evaluation of products intended for clinical application that could have great commercial value. Concern grows as the boundary is increasingly blurred between the basic research conducted in the academic health center laboratories and the derivative product development that is often in the commercial sector (*16*).

Commercial partnerships represent unfamiliar terrain for many university and health research institutions. They increase institutional obligations to minimize or even eliminate the potential for conflicts of interest that arise when private financial gain becomes part of the research equation. Universities and health-care institutions require strong and clear policies to deal with conflicts of interest, as well as effective ethics review bodies to evaluate human subjects research. Because research institutions themselves face potential conflicts of interest, policy-making is best handled by legislative action that would establish standards and require local institutions, both public and private, to adopt appropriate policies and review mechanisms. It should also ensure that those responsible for conflict of interest and research ethics review have adequate funding as well as sufficient autonomy.

Conclusion

Each approach has advantages and disadvantages. The choice between them, or a mix thereof, depends on the degree of public trust in their credibility and effectiveness and on the state of the particular debate. Policy-makers should frame their decisions according to the values and needs of the persons and populations who contributed to genetic research and have legitimate expectations of participating in the benefits thereof.

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