

COMMENTS

ANTITRUST REGULATORS AND THE BIOPHARMACEUTICAL INDUSTRY: COMPULSORY LICENSING SCHEMES IGNORING GENE THERAPY PATIENTS' NEEDS

ATIF I. AZHER*

1. INTRODUCTION

Imagine you have a daughter inflicted with severe combined immunodeficiency disease ("SCID") who will have to be kept away from all bacteria and viruses in the environment because she does not have a functioning immune system. Your daughter's quality of life is tremendously diminished from that of other children, who can do simple things like play outside. Then along comes a breakthrough known as gene therapy,¹ where scientists can alter your child's genes, allowing her to be able to create her own immune cells and lead a normal life. Just before your daughter is to begin experimental human trials, the Food and Drug Administration ("FDA") halts all gene therapy trials because a competing firm failed to follow safety protocols. You later learn

* The Author would like to thank Professors Edward Rock and Arti Rai, Ruchi Verma, Cristina Carvajal, and Christian Shaw for their helpful remarks and criticisms of this Comment.

¹ Gene therapy is "[a]n experimental procedure aimed at replacing, manipulating, or supplementing nonfunctional or malfunctioning genes with healthy genes." Human Genome Project Information, Genome Glossary, at http://www.ornl.gov/sci/techresources/Human_Genome/glossary/glossary_g.shtml (last visited Jan. 24, 2004). A gene is "[t]he fundamental physical and functional unit of heredity. A gene is an ordered sequence of nucleotides located in a particular position on a particular chromosome that encodes a specific functional product (i.e., a protein or RNA molecule)." *Id.*

that this firm was only conducting research because antitrust regulators forced the biotechnology firm which was going to produce your daughter's therapy to offer compulsory, reasonably priced licenses to the rival firm. Your daughter's hopes of living a normal life have now been dashed because of the greed of a few researchers.

Many people have a life-threatening genetic defect with no proven cure. Modern science has progressed such that somatic cell genetic manipulations² can be performed on many of these individuals, giving them hope of leading a normal life. Concurrently, the biopharmaceutical industry³ is seeing a rapid increase in vertical integration, in the form of strategic alliances/joint ventures, patent pools, and mergers, designed to alleviate high transaction costs. As this consolidation continues, regulatory agencies in the United States and the European Union have become aware of antitrust concerns that arise from such concentrations of market power.

In the instances where vertical integrations have been approved, antitrust agencies often require compulsory, reasonably priced licenses be available to competitors in order to prevent monopolistic practices. Antitrust regulators have failed to recognize the conflicts of interest prevalent in the biopharmaceutical industry generally and the gene therapy industry specifically. These conflicts incentivize researchers to violate safety procedures, and if any adverse effects result, the FDA will halt all similar gene therapy trials, even those of the original licensor. By forcing the integrating firm/licensor to bear the externalities of the licensees, antitrust regulators are harming gene therapy patients, interfering with the free market system, and inadvertently limiting incentives for innovation.

Lost in the antitrust analysis conducted by the regulatory agencies are the end user's issues and concerns regarding access to

² "In somatic gene therapy the recipient's genome is changed, but the change is not passed along to the next generation." James M. Wilson, *Human Gene Therapy: Present and Future*, 10 HUMAN GENOME NEWS 15, 15 (1999) available at http://www.ornl.gov/sci/techresources/Human_Genome/publicat/hgn/v10n1/hgn101_2.pdf.

³ The biopharmaceutical industry is the combination of the pharmaceutical industry and the biotechnology industry. The biopharmaceutical industry has a global impact and is of great importance because "[e]conomies . . . [may realize] long-term benefits from biotechnology." JOHN E. SMITH, *BIOTECHNOLOGY* 6 (3d ed., Cambridge Univ. Press 1996) (1981).

these invaluable treatments. If all gene therapy trials in a particular research area are halted (because of failures to follow safety procedures, not because there is no scientific efficacy in the research), gene therapy patients will suffer. Therefore, antitrust regulators should continue requiring compulsory licenses. However, they should effect this by allowing the licensor to pre-approve all licensees' experimental procedures in order to limit improprieties by the licensees and subsequent clinical halts of gene therapy trials by the FDA.

To understand the gene therapy industry, it is necessary to understand the larger biopharmaceutical industry, of which the gene therapy industry is a subgroup. Section 2 of this Comment provides background information on the gene therapy and biopharmaceutical industries. Section 3 examines the current allocation of property rights, high transaction costs, and creation of the anticommons problem. Section 4 explains the rationale for vertical integration in the biopharmaceutical industry. This Section also describes the three major forms of vertical integration in the biopharmaceutical industry: strategic alliances, patent pools, and mergers. Section 5 explains the antitrust analysis of vertical integration by both American and European antitrust regulators. Section 6 examines the compulsory licensing doctrines of both the United States and Europe. The Section also discusses compulsory licensing schemes required for patent pool and merger approvals. Section 7 discusses the controversial innovation market analysis conducted by antitrust agencies when reviewing industries dependent on research and development ("R&D") such as the gene therapy industry, and uses the Ciba-Geigy and Sandoz merger as an example. Section 8 analyzes the harm of compulsory licensing to both gene therapy patients and the integrating firms. This Section addresses the increase in gene therapy trials, discusses the recent FDA halts of gene therapy experiments, and describes a possible solution to mitigate the harm to gene therapy patients and licensing firms.

This Comment concludes, in Section 9, that antitrust regulators should grant vertically integrating firms, forced to license their technology, the right to pre-approve and monitor safety procedures of its licensees. The licensors should be able to pre-approve the experimental design and protocols used by the licensee in an effort to curb potential safety violations that will not only harm the licensee, but also the licensor. In addition, the

licensor should be permitted to monitor its licensees to ensure they are continually following safety protocols.

2. BACKGROUND OF GENE THERAPY

2.1. Gene Therapy

Many diseases are the result of defective genes or their respective gene products.⁴ These diseases may be treated, cured, or modified via gene therapy.⁵ Gene therapy is a process by which a patient's expressed genetic information or deoxyribonucleic acid ("DNA")⁶ is modified by inserting the correct necessary genetic information.⁷ The two primary types of gene therapy are germ line gene therapy and somatic cell gene therapy.⁸

Germ line gene therapy modifies the DNA in the reproductive cells (sperm and egg) of an organism, so that the genetic modifications will be transferred to the next generation.⁹ This is a controversial issue and is still many years away from effective implementation.¹⁰ Somatic cell gene therapy strives to modify the

⁴ See definition of a gene, *supra* note 1.

⁵ Diseases that may be prevented by gene therapy include: cancer, human immunodeficiency virus ("HIV"), severe combined immunodeficiency disease ("SCID"), cystic fibrosis, and Epstein-Bar virus ("EBV") to name a few. See generally *Gene Therapy Clinical Trials*, J. GENE MED., at <http://www.wiley.co.uk/genetherapy/clinical/> (last visited Feb. 23, 2004) (compiling data on diseases addressed by gene therapy clinical trials worldwide).

⁶ DNA is the fundamental building block for genes. "DNA is the prime genetic molecule, carrying all the hereditary information." JAMES D. WATSON ET AL., *MOLECULAR BIOLOGY OF THE GENE* 240 (4th ed. 1987).

⁷ Human Genome Project Information, *Gene Therapy*, at http://www.ornl.gov/sci/techresources/Human_Genome/medicine/genetherapy.shtml (last visited Jan. 24, 2004).

⁸ See SMITH, *supra* note 3, at 221-22 (explaining the two types of gene therapy).

⁹ Germ line gene therapy is "[a]n experimental process of inserting genes into germ cells or fertilized eggs to cause a genetic change that can be passed on to offspring." *Genome Glossary*, *supra* note 1; see also BRUCE ALBERTS ET AL., *MOLECULAR BIOLOGY OF THE CELL* 1128 (4th ed. 2002) (explaining that germ line cells are the cells "from which the next generation of gametes [cells that fuse and proliferate to create another organism] will be derived").

¹⁰ Of the two forms, somatic cell gene therapy is more promising because research is currently being conducted regarding its therapeutic purposes. See Wilson, *supra* note 2 ("Germ line gene therapy is not being actively investigated, at least in larger animals and humans, although a lot of discussion is being conducted about its value and desirability."); see also SMITH, *supra* note 3, at 222 ("Germ line gene therapy is . . . technically extremely difficult and is ethically and socially unacceptable.").

DNA of non-reproductive cells; these changes are not passed to an organism's offspring.¹¹ Even though somatic cell gene therapy is still very experimental, it is the more promising form of gene therapy and the focus of this Comment.

2.2. Formation of the Biopharmaceutical Industry

A simple structural background of the biopharmaceutical industry is needed to understand the current landscape in gene therapy. Genetic therapies, like other drugs, are created by both biotechnology and pharmaceutical companies, collectively known as the biopharmaceutical industry.¹²

In the 1970s and 1980s, the biotechnology and pharmaceutical industries were relatively independent and conducted very different types of initial research.¹³ Biotechnology companies often conducted research using genetic, proteomic, or bioinformatics data¹⁴ in contrast to pharmaceutical companies that often conducted research with small protein libraries.¹⁵

Today, however, instead of using small libraries of proteins for research, pharmaceutical companies are expanding into the traditional realm of biotechnology firms and using genetic and proteomic data to conduct research.¹⁶ Due to this increased use, the importance of genetic and proteomic data is growing, but this information is often owned by biotechnology companies.¹⁷

¹¹ Wilson, *supra* note 2; see also ALBERTS ET AL., *supra* note 9, at 1128 (explaining that somatic cells, "which form the rest of the body [not including the gametes] . . . ultimately leave no progeny").

¹² Arti K. Rai, *Fostering Cumulative Innovation in the Biopharmaceutical Industry: The Role of Patents and Antitrust*, 16 BERKELEY TECH. L.J. 813, 814 (2001).

¹³ *Id.* at 815-16.

¹⁴ Proteomics is the "effort to identify and characterize all of the proteins encoded in an organism's genome, including their posttranslational modifications." ALBERTS ET AL., *supra* note 9, at 489. Bioinformatics can be defined as the use of computers to design and apply methods for the collection, organization, indexing, storage, and analysis of biological genetic sequences and proteins. Network Science, Terms and Definitions in Bioinformatics, at <http://www.netsci.org/Science/Bioinform/terms.html> (last visited Jan. 22, 2004).

¹⁵ See Rai, *supra* note 12, at 815-16 (explaining the history and direct functions of the biotechnology and pharmaceutical industries in the 1970s and 1980s). See generally *From Sequence to Sales, The Genomics Payoff*, MED AD NEWS, July 1, 2000 (providing anecdotal evidence by the President of Gene Logic, a large biotechnology company).

¹⁶ See Rai, *supra* note 12, at 816 ("[A]lmost all pharmaceutical research is based on genetic or proteomic information.").

¹⁷ *Id.*

Therefore, to gain access to genetic and proteomic information, pharmaceutical companies must negotiate with biotechnology companies that hold patents on this information.¹⁸ Oftentimes, instead of negotiating with the biotechnology firms for the use of this information, pharmaceutical companies have attempted vertical integrations¹⁹ in the form of strategic alliances and mergers.²⁰ Much of the vertical integration in the biotechnology and pharmaceutical industries is occurring because of the high transaction costs associated with licensing negotiations, addressed in Section 3 of this Comment. The line between biotechnology and pharmaceutical companies is becoming increasingly blurred, thus creating the biopharmaceutical industry.

2.3. *Biopharmaceutical Industry Business Model*

Biopharmaceutical companies, like most firms, are dependent on creating and selling a product. In the case of biopharmaceutical companies, the product is a marketable drug. The first step in the biopharmaceutical business model is to obtain a potential drug product, which is done through basic research.²¹ The basic research may be conducted in-house, by acquiring a research license from a biotechnology firm, or by merging with a biotechnology firm and acquiring all of its proprietary research rights.²² The potential drug candidate is then developed and

¹⁸ See *id.* ("Because this [proteomic and genetic] information is often owned by biotechnology companies, pharmaceutical companies now need to work quite closely with biotechnology companies.").

¹⁹ A relationship is said to be "vertical" when it involves two firms who are in a buyer-seller relationship, or when it eliminates such a relationship. For example, a vertical merger occurs when a firm acquires another firm with whom it could otherwise have a buyer-seller relationship

Vertical "integration" occurs whenever vertically related firms make relatively long term arrangements for the provision . . . of some "input"

¹ HERBERT HOVENKAMP ET AL., *IP AND ANTITRUST: AN ANALYSIS OF ANTITRUST PRINCIPLES APPLIED TO INTELLECTUAL PROPERTY LAW* § 20.1, at 20-2 (2002) [hereinafter 1 HOVENKAMP, *IP AND ANTITRUST*].

²⁰ Rai, *supra* note 12, at 817-18.

²¹ Sean Nicholson, Lecture at University of Pennsylvania Law School (Nov. 18, 2002) [hereinafter Nicholson] (discussing the motivation and impact of biotechnology and pharmaceutical alliances).

²² *Id.*

manufactured, which is where the experience of large pharmaceutical companies in developing drugs, assisting in obtaining regulatory approval, and manufacturing plays a leading role.²³ The last major step in the business model involves the commercialization of the drug candidate, which includes marketing, sales, and distribution.²⁴ Pharmaceutical companies are experts in commercializing drugs, and this comparative advantage is the reason why many biotechnology companies have the incentive to form strategic alliances with pharmaceutical companies.²⁵

3. CURRENT ALLOCATION OF PATENT RIGHTS, HIGH TRANSACTION COSTS AND THE ANTICOMMONS PROBLEM

There are high transaction costs in the biopharmaceutical industry for two main reasons: (1) too many fragmented, concurrent, upstream intellectual property rights holders; and (2) inhibitive stacking licenses and reach-through licensing agreements ("RTLAs").²⁶

It is common for multiple biotechnology companies to obtain intellectual property rights on concurrent research or fragments of the same research. While biotechnology companies were busy obtaining early patents on genetic and proteomic research, often resulting in overlapping rights, they overlooked the creation of immense transaction costs for future downstream development and commercialization, which created an upstream "patent thicket."²⁷ If a downstream developer wants to conduct further

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ An RTLA gives owners of "upstream" inventions rights in discoveries or developments made by downstream licensees/developers. Professors Heller and Eisenberg use DuPont's licensing scheme as an example of an RTLA. DuPont had licensed research tools with terms requiring licensees to obtain its approval before commercializing new discoveries, which "permit[ted] DuPont to leverage its proprietary position in upstream research tools into a broad veto right over downstream research...and product development." Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698, 699-700 (1998).

²⁷ A "patent thicket" is an accumulation of upstream patent rights by disparate, individual patent holders. A patent thicket poses high transaction costs for any downstream developer who requires licenses from all the upstream patent holders to continue development because any one patent holder may hold out for a higher, supracompetitive price. Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting*, in 1 INNOVATION POLICY AND THE

research, the developer will have to individually negotiate with all upstream patent holders. The existence of the patent thicket will disincentivize the downstream developer from conducting the research, and innovation in the market place is lessened. This is known as the "tragedy of the anticommons."²⁸

One reason that there are multiple upstream patent holders is because Congress promulgated the Patent and Trademark Act Amendments of 1980, also referred to as the Bayh-Dole Act.²⁹ The Bayh-Dole Act has changed the landscape of intellectual property rights by incentivizing universities that conduct federally funded research to obtain patents on their research.³⁰ The result is that universities now patent as much technology and research as possible, and the number of patents issued to U.S. universities has risen from approximately 250 per year in the early 1970s, to 3079 in 1999.³¹ Because there are more university-owned patents, increasing the number of total patent holders with disparate goals that affects the biopharmaceutical industry, downstream developers may have to negotiate with them before conducting research.³² The increase in university-owned patents has helped

ECONOMY 119, 119 (Adam B. Jaffe et al. eds., 2001), available at <http://faculty.haas.berkeley.edu/shapiro/thicket.pdf> (last visited Jan. 21, 2004).

²⁸ See Heller & Eisenberg, *supra* note 26, at 698-99 (explaining that the proliferation of intellectual property rights will lead to an under use of scarce resources because too many owners can block all use).

²⁹ Bayh-Doyle Act, 35 U.S.C. §§ 200-12 (2000).

³⁰ Joshua A. Newberg & Richard L. Dunn, *Keeping Secrets in the Campus Lab: Law, Values and Rules of Engagement for Industry-University R&D Partnerships*, 39 AM. BUS. L.J. 187, 195-200 (2002) ("[T]he role of the research university in the national innovation system has changed significantly. Universities now patent far more technology than they did a generation ago . . .").

³¹ *Id.* at 196.

³² See Rai, *supra* note 12, at 847 (arguing that the historic heterogeneity of actors in the biopharmaceutical industry, including "academic institutions, upstream biotechnology companies, and downstream pharmaceutical companies," increases the difficulties in overcoming the transaction cost problem by inhibiting the formation of patent pools).

[U]niversities have become important commercial actors in markets for technology. Although universities continue to generate a [sic] vast amounts of research that is not at all connected to industry-university partnerships, a significant share of university research is now developed in collaborative relationships wherein universities have become - to varying degrees and in many different forms - the business partners of private firms.

See Newberg & Dunn, *supra* note 30, at 197.

create high licensing transaction costs in the biopharmaceutical industry and further hinders downstream development, despite the original intentions of the Bayh-Dole Act legislators.³³

Another reason there are extremely high transaction costs in the biopharmaceutical industry is because of the use of stacking licenses and reach through licensing agreements.

Stacking licenses occur when a downstream developer obtains a license from an upstream right holder.³⁴ Then, this developer licenses the right to another downstream developer, creating a two-tier level of licenses.³⁵ Stacking licenses are prevalent in upstream research tools and generate large transaction costs.

RTLAs allow an upstream patent holder to gain intellectual property rights on subsequent downstream research.³⁶ Any potential downstream developers will have to give up rights, perhaps royalties on sales, of their downstream discoveries, thus creating high transaction costs.³⁷

A severe anticommons problem may arise if multiple RTLAs³⁸ are combined with stacking licenses that overlap and are inconsistent, resulting in extremely large transaction costs.

³³ The legislative history pertaining to the Bayh-Dole Act explains the impetus for creating the Act .

Federal agencies are not as successful in delivering new products and inventions to the marketplace as the private sector. The result is that the public is not receiving the full benefits of the research and development efforts that it is supporting. It is in the public interest to see that new discoveries are commercialized as quickly as possible without the artificial restraints

See S. REP. NO. 96-480, at 19 (1979).

³⁴ See Linda J. Demaine & Aaron Xavier Fellmeth, *Reinventing the Double Helix: A Novel and Nonobvious Reconceptualization of the Biotechnology Patent*, 55 STAN. L. REV. 303, 415-21 (2002) (discussing how stacking licenses “set up another tollbooth on the road to product development” in the biopharmaceutical industry (quoting Heller & Eisenberg, *supra* note 26, at 699)).

³⁵ *Id.*

³⁶ See Heller & Eisenberg, *supra* note 26, at 699 (“The use of [RTLAs] on patented research tools illustrates another path by which an anticommons [problem] may emerge.”). Professors Heller and Eisenberg also point out that RTLAs are becoming more common in upstream licensing agreements in the biomedical research context. *Id.*

³⁷ *Id.*

³⁸ See Heller & Eisenberg, *supra* note 26, at 699 (“In effect, the use of [multiple] RTLAs gives each upstream patent owner a continuing right to be present at the bargaining table as a research project moves downstream toward product development.”).

4. HIGH TRANSACTION COSTS ALLEVIATED BY VERTICAL INTEGRATION

4.1. *Economic Rationale for Vertical Integration*

A major reason why there is vertical integration in the biopharmaceutical industry is that it alleviates transaction costs.³⁹ If a firm has a legal right or interest in the upstream research because it is vertically integrated, then there is no need to negotiate, which is the primary transaction cost in the biopharmaceutical industry. This is why downstream drug developers and pharmaceutical companies are seeking to alleviate transaction costs by vertically integrating.

Even if there is only one upstream patent holder, transaction costs exist and there may still be a need for vertical integration. With only one upstream patent holder, pharmaceutical companies may still conduct research on a pathway despite not having permission to do so. Should a successful product result from the research, the pharmaceutical company may then attempt to obtain a license from the upstream patent holder before commercialization and marketing. The advantage of this strategy is that if no fruitful development occurs, the pharmaceutical company will not have lost any money in acquiring the license. The downside of this development strategy is that if a successful development is made, there may be a holdup problem. The upstream patent holder will now be able to prevent the commercialization of the drug product and may demand disproportionate or supracompetitive economic rents.

Therefore, even if there is only one upstream right holder, there is an incentive for downstream developers to vertically integrate.

4.2. *Types of Vertical Integration*

To alleviate transaction costs, the biopharmaceutical industry has seen an increase in vertical integration.⁴⁰ The primary forms of

³⁹ According to Professors Sung and Pelto, the biotechnology industry in particular would benefit from a reduction in transaction costs because transaction costs funnel funds away from research and development, which slows down innovation. See Lawrence M. Sung & Don J. Pelto, *Greater Predictability May Result in Patent Pools*, NAT'L L.J., June 22, 1998, at C2.

⁴⁰ See David A. Balto & James F. Mongoven, *Antitrust Enforcement in Pharmaceutical Industry Mergers*, 54 FOOD DRUG L.J. 255, 255 (1999) ("The pharmaceutical industry is in the midst of a wave of consolidation.").

vertical integration in the biopharmaceutical industry include strategic alliances/joint ventures, patent pools,⁴¹ and mergers.

4.2.1. *Strategic Alliances/Joint Ventures*

Strategic alliances are a common form of vertical integration in the biopharmaceutical industry.⁴² Not only do they mitigate transaction costs, they are also a good source of capital investment for biotechnology firms. For example, in 1998, biotechnology companies raised \$6.2 billion through strategic alliances with pharmaceutical companies, which was three times as much as the capital raised from public and private equity markets.⁴³

Typically, alliances are structured so that the companies share responsibility in drug development.⁴⁴ Although strategic alliances can be varied in structure, generally the biotechnology company is given some form of compensation from the pharmaceutical firm in exchange for the upstream research.⁴⁵ The compensation often takes the form of an equity investment, up-front cash, a milestone payment, or a royalty scheme.⁴⁶ The pharmaceutical company will then use its expertise and infrastructure in marketing and distribution to maximize sales of the final drug product.⁴⁷

⁴¹ There are currently no existing biotechnology patent pools, but they are being widely discussed in academic literature. See JEANNE CLARK ET AL., U.S. PAT. & TRADEMARK OFF., PATENT POOLS: A SOLUTION TO THE PROBLEM OF ACCESS IN BIOTECHNOLOGY PATENTS? 4-11 (2000) (discussing patent pools and their history) [hereinafter USPTO], available at <http://www.uspto.gov/web/offices/pac/dapp/opla/patentpool.pdf>; Rai, *supra* note 12, at 846-48 (discussing the difficulty with which patent pools arise); Sara M. Biggers et al., *Intellectual Property and Antitrust: A Comparison of Evolution in the European Union and United States*, 22 HASTINGS INT'L & COMP. L. REV. 209, 210-25 (1999) (discussing changing market dynamics and impact on antitrust law).

⁴² See Nicholson, *supra* note 21 (discussing the prevalence of strategic alliances).

⁴³ Sean Nicholson et al., *Biotech-Pharmaceutical Alliances as a Signal of Asset and Firm Quality* (May 2003), at 1, available at http://hc.wharton.upenn.edu/danzon/PDF%20Files/BioPharma%20AlliancesDEALS_2003.pdf ("For example, in 1994, 1995, 1997, and 1998, when biotech stock prices were relatively low, biotech companies raised more money from pharmaceutical alliances than from all other sources combined.") (citation omitted).

⁴⁴ See Nicholson, *supra* note 21 (explaining the structure of strategic alliances in the biopharmaceutical industry).

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

An example of a biopharmaceutical strategic alliance was the Human Genome Sciences ("HGS") and SmithKline Beecham ("SmithKline") genetic platform deal in 1993. SmithKline, a large pharmaceutical company, paid HGS \$125 million over three years for an eight percent ownership of the company in addition to commercial rights to any genomics-based drugs or diagnostics it creates.⁴⁸ The strategic alliance has given HGS credibility with public investors in equity markets and has vaulted HGS's status to one of the premier biotechnology firms, not to mention an additional \$77.5 million from milestones and other clauses.⁴⁹ The alliance has also been beneficial for SmithKline as it has created a drug pipeline and has defrayed \$82.5 million from its initial \$125 million investment.⁵⁰

4.2.2. Patent Pools

Patent pools are another form of vertical integration and are much less common than strategic alliances or mergers.⁵¹ A patent pool is an agreement between two or more patent holders to license their patents to third parties.⁵² A patent pool is also defined as an agreement between multiple patent owners to aggregate intellectual property rights or patents such that each member will be subject to cross-licensing.⁵³ Patent pools are a response to "the

⁴⁸ There were three exceptions: gene therapy, antisense, and bio-transformation products were not included in the deal. Nicholson, *supra* note 21. In October of 2000, SmithKline exercised its co-right option to jointly develop and commercialize repifermin, a new growth factor discovered and developed by HGS. Press Release, Human Genome Sciences, Human Genome Sciences and SmithKline Beecham Agree to Jointly Develop and Commercialize Repifermin, an HGS Product (Oct. 16, 2000), available at http://www.hgsi.com/news/press/00-10-16_SB_repifermin.html.

⁴⁹ Nicholson, *supra* note 21.

⁵⁰ *Id.*

⁵¹ Although patent pools are rare, in the last 150 years, many American technological developments have occurred because of patent pool formation. Some examples include the Sewing Machine Combination, Manufacturer's Aircraft Association, Associated Radio Manufacturers, and the MPEG-2 patent pool. See Steven C. Carlson, Note, *Patent Pools and the Antitrust Dilemma*, 16 YALE J. ON REG. 359, 373 (1999) ("Patent Pools have played a prominent part in the legal and industrial history of the United States."); USPTO, *supra* note 41, at 4-5 (explaining the history of patent pools in the United States).

⁵² USPTO, *supra* note 41, at 4.

⁵³ *Id.* (citing Joel I. Klein, An Address to the American Intellectual Property Law Association, On the Subject of Cross-licensing and Antitrust Law (May 2, 1997), reprinted at <http://www/usdoj.gov/atr/public/speeches/1123.htm>).

lack of access to technology for the research and development of commercial products.”⁵⁴ Despite the lack of access to technology in the biopharmaceutical industry, patent pools have yet to be created, but that does not mean that one will not be formed in the near future.⁵⁵

Antitrust concerns often arise because there is a potential for market abuse, manipulation, or collusion.⁵⁶ Patent pools have both pro- and anti-competitive effects, so antitrust agencies must analyze them carefully to ensure that there are no violations.⁵⁷

Although there are currently no biotechnology patent pools, there are several potential benefits to their creation. The first benefit is that a biotechnology patent pool will mitigate problems created by blocking patents⁵⁸ and stacking licenses.⁵⁹ For example,

⁵⁴ *Id.* at 2.

⁵⁵ Note, Professor Rai has argued that patent pools are less likely to form in the biopharmaceutical industry than other industries because members in the biopharmaceutical industry do not have homogenous values and are not repeat players, but noting that there are exceptions. Compare Arti K. Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U.L. REV. 77, 133-35 (1999) (stating that “it is unlikely that collective exchange norms will emerge spontaneously in the biotechnology industry”), with Rai, *supra* note 12, at 847 (arguing that “a patent pool might be formed in cases where multiple patents are absolutely necessary to conduct basic research on a gene or a particular disease”).

⁵⁶ Potential violations of the Sherman Act and Clayton Act are always a concern, and after *Standard Sanitary Manufacturing Co. v. United States* 226 U.S. 20 (1912), patent pools were subject to antitrust laws. In *Standard Sanitary*, the Supreme Court dissolved a price fixing patent pool that also excluded unlicensed manufacturers. The 1995 DOJ/FTC Intellectual Property Licensing Guidelines lists two potential anticompetitive consequences of patent pools: (1) patent pools may be used as a mechanism for imposing a collective output or price restraint; and (2) patent pools may be used for exclusionary purposes. U.S. Dep’t of Justice & Fed. Trade Comm’n, *Antitrust Guidelines for the Licensing of Intellectual Property* § 5.5, 4 Trade Reg. Rep. (CCH) ¶ 13,132 (1995) [hereinafter IP Guidelines], available at <http://www.usdoj.gov/atr/public/guidelines/ipguide.pdf>.

⁵⁷ Throughout the century, antitrust regulators have been concerned with the higher likelihood of collusion through patent pools, which would violate the Sherman Act. See Carlson, *supra* note 51, at 373-77 (discussing the history of antitrust scrutiny of patent pools).

⁵⁸ [A blocking patent is a situation] where the second-generation inventor comes up with a patentable (that is, novel and non-obvious) improvement on the first-generation invention. Although the second-generation improvement is independently patentable, it nonetheless incorporates the first-generation invention and therefore infringes the first inventor’s patent. In order to practice its improvement, the second-generation inventor must therefore seek a license from the first-

many patents on nucleic acids and messenger ribonucleic acids ("mRNA"s)⁶⁰ are granted. In addition, if patents on the proteins coded by the nucleic acids are also granted, which often occurs, it would create a blocking patent situation should either patent holder want to develop their respective inventions further.⁶¹ If there were a patent pool containing both patents, each patent holder would be free to develop the technology, alleviating the blocking patent problem, and third parties could more easily obtain a license from the pool instead of two separate individuals, solving the stacking licenses problem as well.⁶²

The second benefit of a biotechnology patent pool is that it may reduce needless litigation over licensing agreements, another type of transaction cost.⁶³ A third party interested in obtaining a license will save time and money by getting it from a patent pool instead of negotiating with each individual patent holder.⁶⁴ This limits the number of potential parties at the bargaining table, and hopefully leads to a quicker, non-litigious resolution of licensing disputes.⁶⁵

generation inventor. (Conversely, if the first-generation inventor wants to practice the improvement, it must seek a license from the improver.) Ex post, it may be very difficult for such a licensing negotiation to go forward.

Rai, *supra* note 12, at 833; *see also* Carlson, *supra* note 51, at 379 (defining blocking patents as those "which have claims that overlap each other in a manner that the invention claimed in one patent cannot be practiced without infringing the claims of the other patent and vice versa").

⁵⁹ *See* USPTO, *supra* note 41, at 8.

⁶⁰ ALBERTS ET. AL, *supra* note 9, at 6 (explaining that mRNA, or messenger ribonucleic acid, is a string of nucleic bases that are involved in the direct synthesis of long strings of amino acids, or proteins).

⁶¹ USPTO, *supra* note 41, at 3 (discussing how patent rights can lead to exclusion of downstream development).

⁶² *Id.*

⁶³ *Id.*; *see also* Carlson, *supra* note 51, at 380 ("Rather than risk the time, cost, and uncertainty of patent litigation, firms frequently choose to settle their disputes through the creation of patent pools or cross-licensing arrangements. This option may be especially attractive for smaller firms that do not have the resources to litigate an infringement trial, and for patentees who fear that their patents may be invalidated in court.") (footnotes omitted).

⁶⁴ USPTO, *supra* note 41, at 9; *see also* Robert P. Merges, Institutions for Intellectual Property Transactions: The Case of Patent Pools 25 (August 1999) (discussing the benefit of limiting the number of licensors from which a license may be obtained), available at <http://www.law.berkeley.edu/institutes/bclt/pubs/merges/pools.pdf> (last visited, Mar. 13, 2003).

⁶⁵ *See* USPTO, *supra* note 41, at 9 ("Without a patent pool, a company would have to obtain licenses separately from each holder of the essential patents . . . [and] it establishes a motivation for some patent owners to hold out on licensing

The third benefit of a biotechnology patent pool is that it will distribute risk to all of its members.⁶⁶ If a pool were designed so that all of its members were to receive equal royalties from the developed technologies, then each member would share the risk and recover some, if not all, of its costs of research and development.⁶⁷ If all members in a patent pool have access to the technology of the pool, it may improve the commercial potential of any patented invention of a pool member.⁶⁸

The fourth benefit of a biotechnology patent pool is that it provides a formal setting for the exchange of technical information.⁶⁹ Instead of relying on trade secrets, technical information may be freely exchanged for the benefit of pool members. By exchanging information, the pool may help limit duplicative research, which is especially important to the biotechnology industry.⁷⁰

Given the many benefits of patent pools, it is clear that they would likely be a solution to the problems plaguing the biopharmaceutical industry.⁷¹ But, patent pools create antitrust concerns, so American and European agencies must examine them closely.

4.2.3. *Mergers*

Lastly, vertical integration may also take the form of a merger. There have been many mergers in recent years and often they may only include the purchase of a pipeline of drugs.⁷² The rationales

their patents.”).

⁶⁶ *Id.*

⁶⁷ *Id.*; see also Carlson, *supra* note 51, at 381-82 (“Pooling spreads royalties among the various firms that invest to produce a successful invention. The pools increase the probability that each participant will recoup investments made in the development of its respective technologies.”) (footnotes omitted).

⁶⁸ USPTO, *supra* note 41, at 8 (citing Sung & Pelto, *supra* note 39).

⁶⁹ *Id.* at 10.

⁷⁰ *Id.* (examining the benefits of institutional information exchange via a patent pool).

⁷¹ But, critics have the following three major concerns of patent pools: that they may inflate prices of competitive goods, shield invalid patents, and encourage collusion or price fixing. USPTO, *supra* note 41, at 10-11. For a recent example of Agency denial of a proposed pool, see Fed. Trade Comm’n, Analysis of Proposed Consent Order To Aid Public Comment: Summit Technology Inc., [hereinafter Summit Technology Analysis], available at <http://www.ftc.gov/os/1998/08/d09286ana.htm>.

⁷² By purchasing a pipeline of drugs from a biotechnology company instead

for formally merging two firms are often the same in the biopharmaceutical industry as in any other, namely, economies of scope, economies of scale, and exploiting synergies. But, in a biopharmaceutical merger, the most important issue is the retention of key scientists along with eliminating unnecessary costs.⁷³

The largest biotechnology merger to date is Applied Molecular Genetics Incorporated's ("Amgen") acquisition of Immunex Corporation ("Immunex") in 2002. Amgen, a biotechnology company, acquired Immunex, another biotechnology company, in a \$16 billion deal that was to result in synergy savings of \$200 million in 2003 and approximately \$250 million in 2004.⁷⁴ Not only did Amgen acquire the expertise Immunex possessed in inflammation, immunology, oncology, and vascular biology, but it also gained its blockbuster drug Enbrel with estimated sales of \$3 billion by 2005.⁷⁵

This merger was not between a biotechnology company and a pharmaceutical company, but instead, is an example of the increasing blurriness within the biopharmaceutical industry. Amgen is known as a large biotechnology firm, but is also skilled in traditional pharmaceutical areas such as drug development, obtaining regulatory approval, marketing, and distribution.⁷⁶

of purchasing the entire biotechnology company itself, pharmaceutical companies do not take on the additional risks associated with the operational management of the biotechnology company. They only take on the risks of the particular drug pipeline. Nicholson, *supra* note 21; *see also* Balto & Mongoven, *supra* note 40, at 255-58 (explaining the merger wave in the pharmaceutical industry); Media Release, The Boston Consulting Group, Biotechnology Mergers Expected to Increase, BCG's Tollman Says: Success Depends on Sound Strategy Fit and Effective Post Merger Integration (June 11, 2002) [hereinafter BCG Media Release] (observing that the "pharmaceutical industry is consolidating" and speculating that biotechnology consolidation is also "highly likely"), available at http://www.bcg.com/media_center/media_press_releases.jsp?id=927.

⁷³ *See* BCG Media Release, *supra* note 72 ("It is important to identify and retain key capabilities and talent. For example, the loss of key scientists can be devastating.").

⁷⁴ Press Release, Amgen, Amgen to Acquire Immunex for \$16 Billion in Stock and Net Cash (Dec. 17, 2001), available at <http://amgen.acquisitioninformation.com/mediacenter/121701.html>.

⁷⁵ *Id.*

⁷⁶ *See id.* (describing the strengths of the two firms and their respective contributions to the merger).

5. AGENCY ANALYSIS OF ANTITRUST ISSUES⁷⁷5.1. *Evolution of Cooperation between American and European Antitrust Regulators*

Robert Pitofsky, the former Chairman of the Federal Trade Commission ("FTC") once said, "[i]nternational joint ventures and strategic alliances are almost as common today as interstate alliances were 50 years ago."⁷⁸ Although, European and American antitrust agencies have not always seen eye to eye, as the world increasingly globalizes, there is an increasing need for regulators on both sides of the Atlantic to collaborate and create similar, if not uniform, antitrust policies for businesses to operate efficiently.⁷⁹

⁷⁷ This Comment only discusses antitrust analysis of patent pools. Antitrust analysis of strategic alliances/joint ventures and mergers is a lengthy endeavor and beyond the scope of this Comment. For a detailed discussion of antitrust analysis of strategic alliances/joint ventures, see 2 HERBERT HOVENKAMP ET AL., IP AND ANTITRUST: AN ANALYSIS OF ANTITRUST PRINCIPLES APPLIED TO INTELLECTUAL PROPERTY LAW §§ 36, 45 (2002) [hereinafter 2 HOVENKAMP, IP AND ANTITRUST] (giving a detailed analysis of joint ventures and an analysis of European antitrust regulation of intellectual property regimes). See generally Howard H. Chang et al., *Some Economic Principles for Guiding Antitrust Policy Towards Joint Ventures*, 1998 COLUM. BUS. L. REV. 223; Thomas L. Greaney, *Not for Import: Why the EU Should Not Adopt the American Efficiency Defense for Analyzing Mergers and Joint Ventures*, 44 ST. LOUIS U. L.J. 871 (2000); Herbert Hovenkamp, *Exclusive Joint Ventures and Antitrust Policy*, 1995 COLUM. BUS. L. REV. 1 [hereinafter Hovenkamp, *Joint Ventures*]; Symposium, *Antitrust Scrutiny of Joint Ventures*, 66 ANTITRUST L.J. 641 (1998). For a detailed discussion of antitrust analysis of mergers, see Balto & Mongoven, *supra* note 40 (giving an analysis of antitrust enforcement in the pharmaceutical industry). See generally ANDREW I. GAVIL ET AL., ANTITRUST LAW IN PERSPECTIVE: CASES, CONCEPTS, AND PROBLEMS IN COMPETITION POLICY ch. 5 (2002) (discussing American antitrust law of mergers); 1 HOVENKAMP, IP AND ANTITRUST, *supra* note 19, §§ 14, 20 and 2 HOVENKAMP, IP AND ANTITRUST, *supra* § 45 (discussing horizontal merger analysis, vertical merger analysis, and European analysis of mergers in an intellectual property context); Biggers et al., *supra* note 41, at 225-66 (comparing the evolution of intellectual property and antitrust enforcement on in the European Union and United States); Sarah Stevens, *The Increased Aggression of the EC Commission in Extraterritorial Enforcement of the Merger Regulation and Its Impact on Transatlantic Cooperation in Antitrust*, 29 SYRACUSE J. INT'L L. & COM. 263 (2002) (examining the causes and implications of the trend towards aggressive enforcement of extraterritorial merger control by the European Commission).

⁷⁸ Robert Pitofsky, *An Antitrust Progress Report for the FTC: Past, Present and Future*, Remarks at the Antitrust 1996 Conference (Mar. 4, 1996), available at <http://www.ftc.gov/speeches/pitofsky/speech4.htm>.

⁷⁹ See Biggers et al., *supra* note 41, at 215-21 (arguing the need for American and European regulators to cooperate in antitrust enforcement to reduce inefficiency as economic globalization continues).

The climate and cooperation of American and European antitrust agencies is evolving, and there have been three recent developments bringing American and European regulators together.⁸⁰

First, American and European antitrust agencies have collaborated since the "revival" of the European Union-United States Antitrust Cooperation Agreement of 1991 ("Agreement").⁸¹ Although the Agreement prohibits the transfer of confidential information to outside agencies without the consent of the business under review, it still has utility.⁸² A recent Microsoft case⁸³ is an example of the benefit of this Agreement since the resulting consent agreements that Microsoft entered into with the United States and Europe were very similar.⁸⁴

Second, the International Antitrust Enforcement Assistance Act ("IAEAA") helped to create a collaborative front between the transatlantic agencies.⁸⁵ The IAEAA mandates the FTC and Department of Justice ("DOJ") to complete bilateral agreements

⁸⁰ See *id.*, at 215-25 (discussing the three developments in United States and European Union antitrust relations).

⁸¹ Agreement Between the Government of the United States of America and the Commission of the European Communities Regarding the Application of Their Competition Laws, Sept. 23, 1991, 30 I.L.M. 1487, 1491; see also Biggers et al., *supra* note 41, at 216-19 (discussing the Agreement and its ramifications); Brian Peck, Comment, *Extraterritorial Application of Antitrust Laws and the U.S.-EU Dispute Over the Boeing and McDonnell Douglas Merger: From Comity to Conflict? An Argument for a Binding International Agreement on Antitrust Enforcement and Dispute Resolution*, 35 SAN DIEGO L. REV. 1163, 1167-70 (1998) (explaining how the U.S./EC Agreement on Antitrust Cooperation and Coordination did not lead to cooperation as intended).

⁸² The utility of the Agreement is that it helps antitrust regulators on both sides of the Atlantic coordinate efforts and limit conflicting antitrust requirements. See Biggers et al., *supra* note 41, at 216-21 (discussing statements made by FTC Commissioner Roscoe Starek and the European Commission regarding the usefulness of the EU-U.S. Antitrust Cooperation Agreement of 1991, despite the proscriptions on exchange of confidential information).

⁸³ *United States v. Microsoft Corp.*, 253 F.3d 34 (D.C. Cir. 2001).

⁸⁴ Both in the United States and the EU, Microsoft's competitors lodged complaints about their licensing restrictions They argued these restrictions foreclosed the market to competitors. In order to promulgate a consistent, expedient conclusion to the dual investigations, Microsoft consented to the exchange of information between the European Commission and the DOJ and entered into trilateral talks that resulted in consent decrees on identical terms.

Biggers et al., *supra* note 41, at 218.

⁸⁵ *Id.* at 219-21.

with foreign antitrust agencies to exchange confidential information in certain circumstances.⁸⁶

Third, in 1995, the DOJ and FTC issued revised antitrust guidelines regarding international operations ("International Guidelines") that were "intended to provide antitrust guidance to businesses engaged in international operations on questions that relate specifically to the Agencies' international enforcement policy."⁸⁷ The International Guidelines give explanations of U.S. antitrust policy, the Agencies' jurisdiction over conduct and business outside of the United States, and "mutual assistance in international antitrust enforcement . . ."⁸⁸ The International Guidelines reinforce the notion that an international collaborative effort is necessary.⁸⁹

5.2. U.S. Analysis of Intellectual Property and Antitrust

While the FTC and DOJ International Guidelines established the jurisdictional boundaries of and potential collaborations with international antitrust agencies, on the following day the FTC and DOJ issued the "Antitrust Guidelines for the Licensing of Intellectual Property - 1995" ("IP Guidelines").⁹⁰

The IP Guidelines were drafted to assist firms' ability to predict whether antitrust regulators will challenge practices as being anticompetitive.⁹¹ The IP Guidelines are intended for internal use and are based on three principles taken from the earlier 1988 Guidelines: (1) for the purposes of antitrust analysis, the Agencies regard intellectual property the same as any other form of property; (2) the Agencies do not presume that intellectual property creates market power; and (3) the Agencies acknowledge that intellectual property licensing allows firms to combine complementary factors of production, resulting in procompetitive benefits.⁹²

⁸⁶ *Id.* at 219.

⁸⁷ U.S. Dep't of Justice & Fed. Trade Comm'n, Antitrust Enforcement Guidelines for International Operations, 4 Trade Reg. Rep. (CCH) ¶ 13,107 (1995) [hereinafter International Guidelines], available at <http://www.usdoj.gov/atr/public/guidelines/internat.htm>.

⁸⁸ *Id.* § 1.

⁸⁹ See generally *id.* (promulgating antitrust enforcement guidelines for international operations).

⁹⁰ IP Guidelines, *supra* note 56.

⁹¹ *Id.*

⁹² *Id.* § 2.0.

5.2.1. *American Analysis of Patent Pools Using IP Guidelines*

Patent pools are an effective mechanism to alleviate transaction costs in the biopharmaceutical industry and will undergo antitrust scrutiny for collusive anticompetitive effects. Therefore, antitrust agencies' assessments of the lawfulness of such measures must be considered.

After the IP Guidelines were issued, the FTC and DOJ assessed the lawfulness of various patent pools.⁹³ All proposed patent pools are reviewed by antitrust regulators and may provide the following procompetitive characteristics: (1) integration of complementary technologies; (2) reduction of transaction costs; (3) clearing of blocking positions; (4) avoidance of expensive infringement litigation; and (5) promotion of the dissemination of technology.⁹⁴

Regulators consider the following patent pool characteristics anticompetitive: (1) excluded firms from the patent pool cannot compete in the goods market for the good incorporating the licensed technologies; (2) the pool participants collectively possess market power in the relevant market; and (3) any limitations on participation are not reasonable to the efficient development of the patent pool.⁹⁵

⁹³ See, e.g., *In re Summit Tech., Inc.*, FTC Docket No. 9286 (Mar. 24, 1998) (complaint) [hereinafter *Summit Technology Complaint*] (alleging the pooling of patents of VISX, Inc. and Summit Technology Inc. violated the Federal Trade Commission Act); see also Letter from Joel I. Klein, Assistant Attorney General, DOJ, Antitrust Division, to Gerrard R. Beene, Esq., Sullivan & Cromwell (June 26, 1997) [hereinafter *Klein (June 26, 1997)*], available at <http://www.usdoj.gov/atr/public/busreview/1170.htm> (examining the pooling arrangement of MPEG-2 patents and deciding against the initiation of antitrust enforcement action); Letter from Joel I. Klein, Assistant Attorney General, DOJ, Antitrust Division, to Gerrard R. Beene, Esq., Sullivan & Cromwell (Dec. 16, 1998) [hereinafter *Klein (Dec. 16, 1998)*] (examining the pooling arrangement of DVD and DVD player patents and deciding against the initiation of antitrust enforcement action), available at <http://www.usdoj.gov/atr/public/busreview/2121.htm>.

⁹⁴ IP Guidelines, *supra* note 56, § 5.5. The Justice Department has, however, applied additional conditions in considering the approval of patent pools: (1) the patents in the pool must be valid and unexpired; (2) there cannot be an aggregation of competitive technologies, and there cannot be a set single price for them; (3) an independent expert should be consulted to determine whether a patent is essential to the pool; (4) the patent pool must not disadvantage downstream product markets; and (5) the participants in the pool may not collude on prices of products outside of the pool. See USPTO, *supra* note 41, at 7 (citing *Klein (June 26, 1997)*, *supra* note 93).

⁹⁵ IP Guidelines, *supra* note 56, § 5.5, at 105-06.

While the IP Guidelines recognize the procompetitive benefits of patent pools,⁹⁶ there are four patent pool licensing schemes that will be reviewed for antitrust violations:

1) collective price or output restraints in pooling arrangements that do not contribute to an efficient integration of economic activity; 2) settlement agreements that combine intellectual property assets of horizontal competitors and that have the effect of diminishing competition; 3) exclusion of competitors from a patent pool when the excluded firms cannot effectively compete in the relevant market, and when the pool participants collectively possess market power; and, 4) pooling arrangements that deter research and development.⁹⁷

Today, the patent pool licensing analysis is broken down into the following two questions: "(1) 'whether the proposed licensing program is likely to integrate complementary patent rights,' and (2) 'if so, whether the resulting competitive benefits are likely to be outweighed by competitive harm posed by other aspects of the program.'"⁹⁸

The Justice Department has set forth the following additional guidelines regarding patent pools:

(1) the patents in the pools must be valid and unexpired; (2) the pool may not aggregate competitive technologies nor create a single price for them; (3) an independent expert should be enlisted to determine whether a patent is essential to the pool and complements the technologies of the pool; (4) the patent pool agreement must not disadvantage competitors in downstream markets; and (5) the pool members must not engage in price collusion of

⁹⁶ *Id.*

⁹⁷ Carlson, *supra* note 51, at 377-78 (footnotes omitted) (citing to IP Guidelines, *supra* note 56, § 5.5, at 105-06).

⁹⁸ USPTO, *supra* note 41, at 7 (quoting Letter from Joel I. Klein, Assistant Attorney General, DOJ, Antitrust Division, to Carey R. Ramos, Esq., Paul, Weiss, Rifkind, Wharton & Garrison (June 10, 1999), available at <http://www.usdoj.gov/atr/public/busreview/2485.htm>).

goods outside the pool.⁹⁹

Although American antitrust regulators have created a very difficult path, if a group of firms demonstrates a procompetitive benefit such as the removal of blocking patents (prevalent in the biotechnology industry), avoids the four pitfalls, and ensures that the members of the pool are contributing only blocking patents and not competing patents, then the FTC and DOJ should look favorably upon the pool.¹⁰⁰ Therefore, if the biotechnology industry carefully creates a patent pool that limits transaction costs and increases efficiencies, the American antitrust regulators will likely approve it.

5.3. *European Analysis of Intellectual Property and Antitrust*

On April 1, 1996, the European Union issued "Commission Regulation (EC) No. 240/96 of 31 January 1996 on the Application of Article 85(3) of the Treaty to Certain Categories of Technology Transfer Agreements" ("Regulation 240/96").¹⁰¹ Regulation 240/96 is intended to increase innovation and disperse technology within the EU more quickly.¹⁰² The Regulation created a bright line rule that lists practices unlikely to create anticompetitive effects, and also lists practices that will likely be challenged.¹⁰³

Although Regulation 240/96 only covers two-party agreements, Article 5 of the Regulation outlines additional restrictions regarding patent pools, joint ventures, competitor cross-licensing, and non-patent intellectual property sales agreements.¹⁰⁴

⁹⁹ USPTO, *supra* note 41, at 7 (citing Klein (June 26, 1997), *supra* note 93).

¹⁰⁰ Carlson, *supra* note 51, at 377-99 (explaining antitrust agency analysis of patent pool formation).

¹⁰¹ Commission Regulation 240/96 of 31 January 1996 on the Application of Article 85(3) of the Treaty to Certain Categories of Technology Transfer Agreements, 1996 O.J. (L 31) 2 [hereinafter Regulation 240/96].

¹⁰² Biggers et al., *supra* note 41, at 230.

¹⁰³ The category of practices that will likely be challenged include: (1) direct or indirect price restrictions; (2) territorial restrictions exceeding permissible duration; (3) customer allocation by competitors in the same technological field of use or the same product market; (4) output restrictions, unless they are pursuant to a certain "use license"; (5) non-compete agreements and obligations; and (6) grant-backs. GAVIL ET AL., *supra* note 77, at 1125.

¹⁰⁴ Regulation 240/96, *supra* note 101, art. 5.

5.3.1. *European Analysis of Patent Pools*

While there are differences from their American counterparts, European antitrust regulators will primarily analyze patent pools in the same way as American regulators.¹⁰⁵ A major difference between European and American patent pool approval is that European regulators will likely require that patent pools offer a compulsory licensing scheme, even if the pool is not overtly restrictive.¹⁰⁶ If a third party attempts to acquire a license from a patent pool, there are three circumstances in which a compulsory license may be compelled: (1) if the intellectual property right holder is a member of a standard setting organization or patent pool and “readiness to license” is necessary to get past the Treaty Establishing the European Community’s Article 81(3)’s¹⁰⁷ antitrust requirements; (2) if the intellectual property right holder is a member of a standard setting organization or patent pool and “the readiness to license is a condition for exemption [from antitrust violations] of a de facto standards arrangements between jointly dominant firms, even in the absence of any restrictive provisions;” and (3) if there are exceptional circumstances under Article 82, both patent pool members and non-members may be compelled to license should there be an abuse of dominance.¹⁰⁸

Despite the procompetitive benefits of patent pools, European regulators will likely require the pool members to grant licenses to third parties.¹⁰⁹ This intuitively makes sense since the economic justification of patent pools is that they create a single entity, instead of many self-interested entities, from which a third party may obtain a license.

¹⁰⁵ See generally Maurits Dolmans, *Standards for Standards*, 26 FORDHAM INT’L L.J. 163 (2002) (discussing the application of European competition law to standardization activities).

¹⁰⁶ *Id.* at 192-99.

¹⁰⁷ TREATY ESTABLISHING THE EUROPEAN COMMUNITY, Nov. 10, 1997, O.J. (C 340) 3 (1997).

¹⁰⁸ Dolmans, *supra* note 105, at 192-93.

¹⁰⁹ European regulators see pools as an accumulation of market power, and any practices that abuse this dominant position will be inherently suspect. Therefore, EU regulators will require the pools to offer reasonably priced licenses. *Id.* at 193-95.

5.4. Summary

Patent pools are a likely solution to alleviate the high transaction costs in the biopharmaceutical industry, but will undergo antitrust scrutiny in the United States and Europe. Although both the United States and European antitrust regulators analyze patent pools under similar rubrics, the big difference in the analysis is that European regulators will likely require a compulsory licensing scheme. The compulsory licensing requirement in both Europe and the United States is further detailed in the next Section.

6. COMPULSORY LICENSING AND VERTICAL INTEGRATION

In Europe and the United States, the general rule is that a firm may unilaterally refuse to license to competitors, although this rule has recently been eroding.¹¹⁰

¹¹⁰ Even if a firm acts unilaterally, it may nonetheless be compelled to offer licenses to its competitors. See John M. Taladay & James N. Carlin, Jr., *Compulsory Licensing of Intellectual Property Under the Competition Laws of the United States and European Community*, 10 GEO. MASON L. REV. 443, 445-50 (2002) (discussing two different approaches regarding compulsory licensing). In the United States, there is a circuit split regarding the issue of court compelled licensing schemes. Compare *Image Technical Servs., Inc. v. Eastman Kodak Co.*, 125 F.3d 1195 (9th Cir. 1997) (holding Kodak in violation of section 2 of the Sherman Act for attempting to monopolize the service market for copiers and compelling Kodak to sell servicing parts to Independent Service Operators), with *CSU, L.L.C. v. Xerox Corp.*, 203 F.3d 1322, 1328 (Fed. Cir. 2000) (holding that "Xerox was under no obligation to sell or license its patented parts and did not violate the antitrust laws by refusing to do so"). The split has led to an academic debate and raised the issue of forum-shopping. See Peter M. Boyle et al., *Antitrust Law at the Federal Circuit: Red Light or Green Light at the IP-Antitrust Intersection?*, 69 ANTITRUST L.J. 739, 751 (2001) ("[T]he clear, overarching message from Xerox is that intellectual property rights trump the antitrust laws if a conflict arises between them."); Scott A. Stempel & John F. Terzaken III, *Casting a Long IP Shadow Over Antitrust Jurisprudence: The Federal Circuit's Expanding Jurisdictional Reach*, 69 ANTITRUST L.J. 711, 731-33, 737-38 (2001) (arguing that the Federal Circuit is expanding its antitrust jurisprudence regarding intellectual property issues and potential plaintiffs will compose well-pleaded complaints, ensuring no intellectual property issue is involved to have the case heard in a regional court); Taladay & Carlin, *supra*, at 449-50 (discussing the circuit split and the resulting uncertainty). Note, there is an entirely different doctrine known as the "essential facilities" doctrine. The essential facilities doctrine requires compulsory licensing if a holder of an input or factor of production commands market power over another market. See Taladay & Carlin, *supra*, at 450-51 ("The essential facilities doctrine is a specific type of refusal to deal characterized by a monopolists' control of an essential facility, or bottleneck, that can extend monopoly power from one stage of production to another or from one market to another."). In the biotechnology context, the essential facilities doctrine has resulted in academic proposals of a

But, if multiple firms collectively refuse to license as they seek vertical integration, then American and European antitrust agencies will review the actions for anticompetitive effects. In the antitrust review, the agencies may require the new entity to offer reasonably priced licenses to third parties. This is especially true when the agencies approve a patent pool.¹¹¹

6.1. Patent Pools and Compulsory Licensing

Patent pools often negotiate terms and requirements with antitrust agencies *ex ante* to preempt regulators from filing antitrust actions *ex post*.¹¹² One of these requirements is that “the [patent] pool agreement must not disadvantage competitors in downstream product markets.”¹¹³ If the patent pool consists of an accumulation of upstream or undeveloped technology, then it will, by definition, affect a downstream market. So, antitrust regulators

formal compulsory licensing scheme, irrespective of the type of input for DNA sequences and avoiding the need for vertical integration.

Congress ought to enact a compulsory-licensing statute and an experimental-use exemption. A compulsory-licensing scheme, with fees set on a sliding scale depending upon the commercial value of the invention, would ensure royalties for inventors while allowing further research on the patented DNA sequences. In addition, an experimental-use exemption would promote innovation by protecting from infringement liability public-sector and nonprofit scientists engaged in noncommercial research.

Donna M. Gitter, *International Conflicts Over Patenting Human DNA Sequences in the United States and the European Union: An Argument for Compulsory Licensing and a Fair-Use Exemption*, 76 N.Y.U. L. REV. 1623, 1691 (2001). European courts and regulators also compel licenses. See Taladay & Carlin, *supra*, at 450 (“European courts and regulators are prepared to compel a firm to grant access to its IP, even where the firm has not engaged in a past course of conduct to license such property. One underlying feature of these decisions is the EC’s reliance on the essential facilities doctrine.”). See, e.g., Joined Cases C-241/91 P & C-242/91 P, *Radio Telefis Eireann v. Commission*, 1995 E.C.R. I-743 (finding that the primary broadcasting companies in the UK and Ireland abused their dominant market positions by refusing to license copyrighted material); Case T-184/01 R, *IMS Health v. Commission*, 2001 ECJ CELEX LEXIS 3247 (Ct. First Instance Oct. 26, 2001) (holding that IMS had violated Article 82 in refusing to license its database system to competitors).

¹¹¹ See *supra* Section 4 (discussing the alleviation of high transaction costs via vertical integration).

¹¹² See *supra* note 94 and accompanying text regarding the characteristics of patent pools.

¹¹³ USPTO, *supra* note 41, at 7 (citing Klein (June 26, 1997), *supra* note 93).

will often require such patent pools to grant licenses with reasonable royalty schemes.¹¹⁴

Generally, patent pools must grant licenses to third parties that contain reasonable terms on a nondiscriminatory basis.¹¹⁵ But, the reasonableness of a license is disputable. Regardless, many patent pools are created to provide "one stop shopping" for those seeking to license from multiple patent holders.¹¹⁶

6.2. Mergers and Compulsory Licensing

Merger approval often results in an agency issuing a consent order to offer a compulsory licensing scheme.

An example of a merger where American agencies mandated a compulsory licensing scheme was the Ciba-Geigy and Sandoz merger in 1997. In analyzing the merger for potential anticompetitive effects, the FTC required Novartis, the surviving company, to offer nondiscriminatory licenses of its gene therapy patents.¹¹⁷

The merger involved a \$63 billion horizontal combination of two large pharmaceutical companies and would create the firm Novartis.¹¹⁸ The FTC felt it threatened to create a monopoly¹¹⁹ in key technologies used in the development of gene therapy products for cancer and AIDS.¹²⁰ Although gene therapy treatments are promising, both Ciba-Geigy¹²¹ and Sandoz were

¹¹⁴ See Rai, *supra* note 12, at 846 (citing Klein (June 26, 1997), and Klein (Dec. 16, 1998), *supra* note 93). Many firms may claim to offer fair licenses, but they may carry unreasonable conditions such as high royalty rates. A patent holder may generally create a royalty rate at whatever the market will bear, but courts have found antitrust violations when the patent holder attempts to use the royalties as a "device for leveraging additional profits from unlicensed products." HERBERT HOVENKAMP, *FEDERAL ANTITRUST POLICY: THE LAW OF COMPETITION AND ITS PRACTICE* 244 (2d ed. 1999).

¹¹⁵ See Rai, *supra* note 12, at 846.

¹¹⁶ Shapiro, *supra* note 27, at 134.

¹¹⁷ *In re Ciba-Geigy Ltd.*, 123 F.T.C. 842, 873-77 (1997).

¹¹⁸ *Id.* at 844; see also William J. Baer & David A. Balto, *New Myths and Old Realities: Recent Developments in Antitrust Enforcement*, 1999 COLUM. BUS. L. REV. 207, 222-23 (1999) (discussing the FTC's innovation market analysis of the Ciba-Geigy/Sandoz merger).

¹¹⁹ *In re Ciba-Geigy*, 123 F.T.C. at 851 (citing to § 7 of the Clayton Act, as amended, 15 U.S.C. § 18 (2003), and § 5 of the Federal Trade Commission Act, as amended, 15 U.S.C. § 45 (2003)).

¹²⁰ *Id.* at 845.

¹²¹ Ciba-Geigy did not itself own gene therapy patents, but rather was the largest shareholder in Chiron, which held these patents. As of 1996, when this

only in development stages of treatments and no such products had yet been approved by the FDA.¹²² In addition, there were “relatively few potential competitors for this technology because the merging firms controlled critical patents.”¹²³ The rationale was that the merger would reduce incentives to develop competing products in the potential gene therapy markets.¹²⁴

The FTC issued a consent order requiring the new entity to license certain technology and patent rights to Rhone-Poulenc Rorer, making certain that it can compete with the merged firm in the R&D market.¹²⁵ The FTC further ordered “that the merged firm license specific patents of Ciba and Sandoz to any interested person at a reasonable royalty.”¹²⁶ The antitrust analysis of the Ciba-Geigy and Sandoz merger in the United States and Europe is discussed in further detail in Section 7.

Many corporations dependant on intellectual property may undergo antitrust scrutiny if they are undertaking a consolidation or if a suit is brought against them. While cooperating with regulators, they will have to consider both American and European antitrust laws if there are global issues.¹²⁷ If Europe has a more stringent compulsory licensing standard or requires it more frequently, then its regulations may well become the international standard due to the globalization of the biopharmaceutical industry.

action began, Ciba-Geigy owned 46.5 percent of Chiron capital stock, funded Chiron research, had the right to appoint members of the Chiron board of directors, and had the right to veto Chiron’s actions. *See In re Ciba-Geigy*, 123 F.T.C. at 852.

¹²² *See* Richard J. Gilbert & Willard K. Tom, *Is Innovation King At the Antitrust Agencies? The Intellectual Property Guidelines Five Years Later*, 69 ANTITRUST L.J. 43, 55-58 (2001) (analyzing the Commission’s decision in the Ciba-Geigy/Sandoz merger).

¹²³ Baer & Balto, *supra* note 118, at 222.

¹²⁴ *Id.*

¹²⁵ The FTC ensured that Rhone-Poulenc Rorer could continue developing its HSV-tk gene therapy products for cancer and graft versus host disease. *See In re Ciba-Geigy*, 123 F.T.C. at 873-74.

¹²⁶ Separate Statement of Chairman Robert Pitofsky and Commissioners Janet D. Steiger, Roscoe B. Starek, III, and Christine A. Varney, *In re Ciba-Geigy*, 123 F.T.C. at 897.

¹²⁷ *See* Taladay & Carlin, Jr., *supra* note 110, at 457 (concluding that “[t]he different approaches taken by U.S. and EC courts require practitioners to consider a variety of factors in weighing the risks of licensing practices”).

7. ANTITRUST AGENCIES AND INNOVATION MARKET ANALYSIS

A relatively new and controversial¹²⁸ development in antitrust analysis is the scrutiny of innovation markets.¹²⁹ According to the DOJ and FTC, an innovation market “consists of the research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development.”¹³⁰ Innovation market analysis is applicable to mergers, joint ventures, or other forms of intellectual property licensing.¹³¹ Before a consumer or excluded rival may allege anticompetitive conduct in an innovation market, they must overcome the hurdle of demonstrating standing, which includes proof of an injury and causation; therefore most innovation market challenges come from antitrust agencies.¹³² This standing issue is not applicable to governmental agencies.

7.1. Innovation Market Analysis of the Ciba-Geigy and Sandoz Merger

Both EU and American antitrust regulators approved the Ciba-Geigy and Sandoz merger in 1997. While the American antitrust regulators analyzed the merger through an innovation market lens,

¹²⁸ This concept is controversial in part because it deals with a research ‘product’ that has yet to—and may never—come to market and whose price and value are therefore difficult to establish, and in part because it is uncertain whether the analysis can successfully capture all of the locations where relevant research may be occurring.

Michael S. Jacobs, *Lessons From the Pharmaceutical Antitrust Litigation: Indirect Purchasers, Antitrust Standing, and Antitrust Federalism*, 42 ST. LOUIS U. L.J. 59, 59 n.2 (1998) (citing to Jonathan B. Baker, *Fringe Firms and Incentives to Innovate*, 63 ANTITRUST L.J. 621 (1995) and Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569 (1995)). See generally Richard J. Gilbert & Steven C. Sunshine, *The Use of Innovation Markets: A Reply to Hay, Rapp, and Hoerner*, 64 ANTITRUST L.J. 75, 78-80 (1995) (discussing the existence of an innovation market under section 7); Robert J. Hoerner, *Innovation Markets: New Wine in Old Bottles?*, 64 ANTITRUST L.J. 49, 50-55 (1995) (contending that innovation is not a “line of commerce” for section 7 analysis purposes); Richard T. Rapp, *The Misapplication of the Innovation Market Approach to Merger Analysis*, 64 ANTITRUST L.J. 19, 20-22 (1995) (describing the origins and early applications of innovation market analysis).

¹²⁹ Baer & Balto, *supra* note 118, at 221.

¹³⁰ IP Guidelines, *supra* note 56, § 3.2.3.

¹³¹ *Id.* (using examples to demonstrate the antitrust analysis).

¹³² See 1 HOVENKAMP, IP AND ANTITRUST, *supra* note 19, § 4.3d n.30 (citing to *Ford Motor Co. v. Lane*, 86 F. Supp. 2d 711 (E.D. Mich. 2000) as an example where the owner of a Ford automobile did not have standing to challenge an alleged agreement by automobile manufacturers to produce fuel inefficient cars).

the European regulators reviewed it in a future markets context.¹³³ Despite using different analytical frameworks, both agencies ultimately approved the merger with the condition that the resulting company, Novartis, offer compulsory, reasonably priced, non-exclusive licenses to third party developers of gene therapies.

7.1.1. *European Analysis of Ciba-Geigy and Sandoz Merger*

In conducting an analysis of the Ciba-Geigy and Sandoz merger, the European Commission did not attempt to classify its investigation as an innovation market analysis. The regulators instead looked at the “future market” of goods for gene therapy products.¹³⁴

As the European Commission analyzed the future gene therapy market, they realized that there were too many “uncertainties surrounding any future product market,” and “there was not a sufficient probability that the merger would lead to the creation or strengthening of a dominant position.”¹³⁵ Without definitive evidence of a dominant position, the Commission held that the merger did not inhibit competition. But, it can be argued that the Commission came to its result because the parties had already accepted that Novartis would allow Chiron Corporation to issue non-exclusive licenses for gene therapy in the European Union.¹³⁶

Fortunately, the European Commission did not feign an innovation market analysis. It simply conducted a future market analysis and determined that an open licensing scheme would prevent any concentration of the R&D market for gene therapy treatments.

¹³³ See Lawrence B. Landman, *Did Congress Actually Create Innovation Markets?*, 13 BERKELEY TECH. L.J. 721, 758-60 (1998) (outlining the similarities between the European Commission decisions and the American agencies decisions); Thomas B. Marcotullio, *The Battle Against Drug-Makers: An Analysis of European Union and United States Merger Enforcement in the Pharmaceutical Industry 1995-1999*, 32 LAW & POL'Y INT'L BUS. 449, 478-82 (2001) (analyzing the international response to the Ciba-Geigy/Sandoz merger and noting the “congruity between the authorities’ analysis, particularly in the choice of markets and the remedies imposed”).

¹³⁴ Commission Decision 97/469 on Ciba-Geigy/Sandoz, 1997 O.J. (L 201) 1 [hereinafter Ciba EU decision].

¹³⁵ Marcotullio, *supra* note 133, at 478-79 (citing the Ciba EU decision and analyzing the Ciba-Geigy and Sandoz merger).

¹³⁶ See Marcotullio, *supra* note 133, at 479 (“Knowing it could rely on these provisions, the Commission may have felt more comfortable in finding that there was no competitive harm.”).

7.1.2. U.S. Analysis of the Ciba-Geigy and Sandoz Merger

The FTC claimed to have conducted an innovation market analysis of the Ciba-Geigy and Sandoz merger.¹³⁷ The FTC alleged that the merger would result in harm to competition in a broad gene therapy R&D market,¹³⁸ and four specific gene therapy future goods markets: (1) herpes simplex virus-thymidine kinase ("HSV-tk") gene therapy for the treatment of cancer; (2) HSV-tk gene therapy for the treatment of graft versus host disease; (3) gene therapy for the treatment of hemophilia; and (4) chemoresistance gene therapy.¹³⁹

The FTC admitted that the earliest a gene therapy product could be sold was 2000, and that regulatory agencies would not allow entry into the markets before then.¹⁴⁰ But, once the first gene therapy treatment is introduced into the market, the FTC felt the market for gene therapy treatments would grow significantly.¹⁴¹

In this case, instead of performing an innovation market analysis, the FTC conducted a future goods market analysis, evidenced by the specific markets it had identified. The FTC admitted that the gene therapy development efforts by Novartis would eventually result in efforts to manufacture and sell treatments. The FTC was not only analyzing the R&D efforts of the parties, but also Novartis' potential ability to sell goods.¹⁴² In the end, the FTC alleged the merger would harm competition, not in an R&D (innovation) market, but rather in the future gene therapy treatment (future goods) market.¹⁴³

The FTC recognized that it could not predict which patents Novartis would hold, yet it somehow concluded that the firm could use its intellectual property to create barriers to entry in the

¹³⁷ See *In re Ciba-Geigy*, 123 F.T.C. 842, 844-46.

¹³⁸ The FTC estimates that the yet-to-be developed market will have an annual value of \$45 billion by the year 2010. *Id.* at 845.

¹³⁹ Landman, *supra* note 133, at 788; *In re Ciba-Geigy*, 123 F.T.C. at 844-45.

¹⁴⁰ See *In re Ciba-Geigy*, 123 F.T.C. at 850 ("The most significant barriers to entry include technical, regulatory, patent, clinical and production barriers. The FDA must approve all phases of gene therapy development, including extensive preclinical and clinical work."); see also Landman, *supra* note 133, at 788 ("The FTC did not expect the regulatory authorities to allow firms to sell any gene therapy products until the year 2000 . . .").

¹⁴¹ Landman, *supra* note 133, at 788.

¹⁴² *Id.*

¹⁴³ *Id.*

gene therapy market.¹⁴⁴ Although a refusal to license is not usually an antitrust violation,¹⁴⁵ the FTC was concerned that Novartis would refuse to license its gene therapy patents in hopes of garnering a monopoly position.¹⁴⁶ Therefore, the FTC ordered the parties to offer non-exclusive licenses of essential gene therapy intellectual property.¹⁴⁷ But the FTC did not need, nor did it conduct, an innovation market analysis to require the open licensing scheme.¹⁴⁸

7.2. Summary

Using the claimed innovation market analysis, the FTC ordered the parties to grant non-exclusive licenses to third parties for its gene therapy intellectual properties. This compulsory licensing scheme convinced the European regulators to cease further inquiry into the matter. The result is that Novartis, which held four primary upstream patents on gene therapy research, must open the market to its competitors seeking licenses.

European regulators are comfortable ordering compulsory licenses under specific conditions. The United States, on the other hand, allows its antitrust agencies to order licenses in exchange for merger and patent pool approvals and the courts to order compulsory licensing.¹⁴⁹ Despite the inconsistencies, most businesses should be concerned with the antitrust authorities because they enforce the laws, whereas the court system may be susceptible to some degree of forum shopping.

¹⁴⁴ *Id.* at 789.

¹⁴⁵ *See supra* note 110 and accompanying text.

¹⁴⁶ *See* Landman, *supra* note 133, at 789 (noting that “Novartis would lead the gene therapy R&D effort, and, the FTC reasoned, would not want other firms to close the R&D gap”).

¹⁴⁷ *In re Ciba-Geigy*, 123 F.T.C. at 873; *see also* Baer & Balto, *supra* note 118, at 223 (“Competitors already had (to varying degrees) the hard assets, e.g., production facilities, researchers and scientists, needed to compete. Rivals and other scientists confirmed that licensing would enable them to develop gene therapy products and replace the competition lost due to the merger.”).

¹⁴⁸ Landman, *supra* note 133, at 789-90.

¹⁴⁹ *See, e.g.*, *Image Technical Servs. v. Eastman Kodak Co.*, 125 F.3d 1195, 1224, 1226-27 (9th Cir. 1997) (holding that Kodak violated section 2 of the Sherman Act for attempting to monopolize the service market for copiers and compelled Kodak to sell servicing parts to Independent Service Operators).

8. INCREASED COMPETITION MAY BE HARMFUL TO CURRENT GENE THERAPY PATIENTS

8.1. *Gene Therapy*

The gene therapy industry is a subset of the biopharmaceutical industry and therefore, encounters the same high transaction costs. As the gene therapy industry attempts to alleviate these transaction costs through vertical integrations, it will undergo antitrust scrutiny, as was seen in the Ciba-Geigy and Sandoz merger discussed in Section 7.1. Antitrust regulators will likely require a compulsory licensing scheme as was demonstrated in the Ciba-Geigy and Sandoz merger. As these vertically integrated companies and their competitors increase the number of gene therapy trials, compulsory licensing and scientific failures may have an adverse impact on R&D of gene therapies and the patients who need them.

8.2. *Gene Therapy Trials Increasing*

The licensing scheme expressly mandated by the FTC and implicitly by the European Commission in its approval of the Ciba-Geigy and Sandoz merger, which requires reasonably priced, non-exclusive licenses, will undoubtedly increase the number of gene therapy research experiments. Because of the ease in obtaining upstream patent rights, many more gene therapy experiments may potentially be undertaken, and the fear is that, at some point, gene therapy experiments will go wrong or fail.¹⁵⁰ If the failure is in the form of inflicting patients with additional illnesses or even death, all gene therapy trials will likely be halted by regulators. If this occurs, it will have disastrous effects on current patients awaiting potential lifesaving gene therapies.

¹⁵⁰ Additional experiments do not necessarily have a higher likelihood of success or failure (holding each individual experiment's probability of success constant). But, if there are more total gene therapy experiments (with the same probability of success/failure) being tested on humans, then there is a higher likelihood that at least one of the experiments will fail according to the law of large numbers. The law of large numbers says that if a series of events occurs many times, there is a higher likelihood that the actual number of occurrences will be equal to the probability. See IRVING ADLER, PROBABILITY AND STATISTICS FOR EVERYMAN 188-90 (1963) (discussing probabilities for long run frequencies). For example, if an event has a probability of 1:100, and if the experiment is conducted 1000 times, then there will likely be ten occurrences of the event. *Id.*

8.3. Gene Therapy Trials Halted

In the United States, the FDA and National Institute of Health ("NIH") regulate gene therapies. The FDA oversees the development of novel drugs including biologics-based products,¹⁵¹ such as gene therapies,¹⁵² by its Center for Biologics Evaluation and Research ("CBER").¹⁵³ The NIH, although not a formal regulatory agency, has established the Recombinant DNA Advisory Committee ("RAC"),¹⁵⁴ which also oversees gene therapy research on human subjects.¹⁵⁵

Gene therapy products cannot be sold unless they pass three phases of human clinical trials.¹⁵⁶ As trials are conducted, the FDA may halt experiments if they are unsafe. Since January 2000, the FDA has halted many gene therapy trials creating an ongoing debate as to the resulting effects on gene therapy patients.

On September 17, 2000, Jesse Gelsinger, eighteen years of age, died at the University of Pennsylvania Hospital while undergoing a gene therapy treatment.¹⁵⁷ Mr. Gelsinger died of multiple organ failure caused by a severe immune reaction to his gene therapy treatment designed to correct a metabolic problem with his liver.¹⁵⁸ Because Mr. Gelsinger's condition had been kept in check before

¹⁵¹ A biologic-based product is a drug or chemical that is derived from a living source, as opposed to being chemically synthesized.

¹⁵² 42 U.S.C. § 262(i) (2003); *see also* Food and Drug Administration, Products FDA Regulates, (listing biologics among the products regulated by the FDA), at <http://www.fda.gov> (last visited Jan. 31, 2004).

¹⁵³ The FDA has authority to regulate and review the clinical research and marketing of: drugs, biologics, food, food additives, medical devices, and animal drugs under authority of the Federal Food, Drug, and Cosmetics Act ("FFDCA") and the Public Health Service Act ("PHSA"). 42 U.S.C. § 262 (2003). CBER has authority to regulate biologics under section 351 of the PHSA and also from specific sections of the FFDCA.

¹⁵⁴ RAC was established by the Department of Health, Education, and Welfare (now Health and Human Services) and is now under the auspices of the National Institute of Health ("NIH"). Joseph M. Rainsbury, *Biotechnology on the RAC – FDA/NIH Regulation of Human Gene Therapy*, 55 FOOD & DRUG L.J. 575, 576 (2000).

¹⁵⁵ *Id.* at 580.

¹⁵⁶ 21 C.F.R. § 312.21 (2003).

¹⁵⁷ *See* Sheryl Gay Stolberg, *Gene Therapy Ordered Halted At University*, N.Y. TIMES, Jan. 22, 2000, at A1 (reporting on FDA investigations of researcher conduct associated with the death of Jesse Gelsinger).

¹⁵⁸ Jesse Gelsinger had a mild form of ornithine transcarbamylase deficiency, an inherited disorder in which the liver cannot process ammonia, a toxic breakdown product of protein. *Id.* at A12.

the gene therapy treatment through a restrictive diet and drugs, his death created a large controversy.¹⁵⁹

After an investigation into Mr. Gelsinger's death, the FDA placed a "clinical hold" on eight experiments, five of which had active clinical trials in diseases ranging from cystic fibrosis to breast cancer.¹⁶⁰ The investigators found that Mr. Gelsinger may not have even been eligible for the trials.¹⁶¹ The investigators also found that all eighteen enrolled patients in the trials had not filled out or signed eligibility forms.¹⁶² Lastly, Mr. Gelsinger's family was not informed that "one of the principal investigators held a thirty percent equity position in Genovo, the biotechnology firm supplying the viral vector—an equity interest that would ultimately net the researcher over \$ 13 million dollars when it was sold to a larger firm."¹⁶³ While Mr. Gelsinger's death has set the gene therapy industry back many years, the FDA, RAC, and academics are becoming increasingly concerned with researchers' ethics and conflicts of interest in conducting human trials.¹⁶⁴

¹⁵⁹ *Id.* But, "[t]here is speculation that Gelsinger's prior exposure to the human parvovirus rendered him peculiarly sensitive to the adenovirus [used in his gene therapy]." Rainsbury, *supra* note 154, at 593 n.150.

¹⁶⁰ Stolberg, *supra* note 157, at A1; see also Eliot Marshall, *FDA Halts All Gene Therapy Trials at Penn*, SCIENCE, Jan. 28, 2000 at 565 (explaining that seven gene therapy trials at the University of Pennsylvania were halted by the FDA).

¹⁶¹ Dr. James M. Wilson was the head researcher for the trials that resulted in Jesse Gelsinger's death. See, e.g., Letter from the Department of Health and Human Services, FDA, to Dr. James M. Wilson, Institute for Human Gene Therapy (Nov. 30, 2000) (concluding that Wilson deliberately violated federal regulations in regards to investigating new drugs), available at <http://www.fda.gov/foi/nidpoe/n12l.pdf>.

¹⁶² Stolberg, *supra* note 157, at A12.

¹⁶³ Patricia C. Kuszler, *Curing Conflicts of Interest in Clinical Research: Impossible Dreams and Harsh Realities*, 8 WIDENER L. SYMP. J. 115, 132 (2001).

¹⁶⁴ There are increasingly large conflicts of interests between researchers and patients. Researchers often have a considerable financial stake in the success of the trials. This may lead them to underreport adverse results, sign up patients without properly informing them of the risks of the experiment, skew data in favor of desired results, or even manipulate the experimental design to obtain favorable results. *Id.* at 138; see also Michael Baram, *Making Clinical Trials Safer for Human Subjects*, 27 AM. J.L. & MED. 253, 268 (2001) ("[F]inancial interest is seen as undermining trial management and adverse event reporting, and thereby impairing the safety system for protecting human subjects."); S. Van McCrary et al., *A National Survey of Policies on Disclosure of Conflicts of Interest in Biomedical Research*, 343 NEW ENG. J. MED. 1621, 1624-25 (2000) (discussing the variations in conflicts of interest at research institutions and suggesting that the current standards of disclosure are inadequate to maintain a high level of scientific integrity); Pilar N. Ossorio, *Pills, Bills and Shills: Physician-Researcher's Conflicts of*

Then, on October 3, 2002, it was made public that a three year old child who was successfully treated with gene therapy to cure SCID, also known as “bubble baby syndrome,” contracted a disease similar to leukemia.¹⁶⁵ The gene therapy treatments were being conducted by Dr. Alain Fischer and his colleagues at the Necker Children’s Hospital in Paris.¹⁶⁶ Although the child’s development of a cancer-like disease was made public in October, similar gene therapy trials in France and three in the United States had already been halted after Dr. Fischer’s discovery.¹⁶⁷ The FDA had immediately placed a “clinical hold” on the three similar trials underway in the United States when it learned of Dr. Fischer’s findings.¹⁶⁸

Finally, on January 14, 2003, the FDA suspended¹⁶⁹ twenty-seven gene therapy trials involving hundreds of patients after discovering that a second child in France had contracted a leukemia-like disease.¹⁷⁰ Although of the eleven children being treated for SCID there have been nine successes, the two failures have raised concerns regarding the safety of the experiments.¹⁷¹

In both SCID cases, the gene therapy involved the insertion of the treatment into stem cells that landed on or near LMO-2, a

Interest, 8 WIDENER. L. SYMP. J. 75, 102 (2001) (“Concern over conflicts of interest in biomedical research is growing as the financial and human subjects stakes increase.”); Liz Kowalczyk, *New Steps Urged on University Research Bias*, BOSTON GLOBE, Feb. 21, 2001, at A1, D6 (“[F]inancial bias could lead a university or teaching hospital to slant a clinical trial in favor of a company’s drug, or to downplay negative side effects on patients.”).

¹⁶⁵ French researchers did not characterize the disease as leukemia but instead described it as a “lymphoproliferation” or proliferation of uncontrollably growing cells. See Sheryl Gay Stolberg, *Trials Are Halted on a Gene Therapy*, N.Y. TIMES, Oct. 4, 2002, at A1 (reporting on the FDA’s order to halt SCID gene therapy trials).

¹⁶⁶ *Id.* at A25.

¹⁶⁷ Dr. Fischer notified the FDA, French authorities, and researchers in the field of the proliferation of cells, “right after Labor Day, as soon as he knew the problem was serious.” *Id.*

¹⁶⁸ Two experimental trials were being done at Children’s Hospital in Los Angeles, California, and the other was at the National Institute of Health Study in Bethesda, Maryland. *Id.*

¹⁶⁹ Food and Drug Administration, FDA Talk Paper, FDA Places Temporary Halt on Gene Therapy Trials Using Retroviral Vectors in Blood Stem Cells, (Jan. 14, 2003), available at <http://www.fda.gov/bbs/topics/ANSWERS/2003/ANS01190.html>.

¹⁷⁰ Andrew Pollack, *FDA Halts 27 Gene Therapy Trials After Illness*, N.Y. TIMES, Jan. 15, 2003, at A1.

¹⁷¹ *Id.*

cancer-promoting gene, or oncogene.¹⁷² Although the probability of turning on the oncogene is 1 in 100,000, the fact that millions of gene therapy cells are inserted into the patients increases the probability that at least one cell landed on the oncogene.¹⁷³ The researchers were aware of this possibility, but in no human model has a single activated oncogene alone caused cancer.¹⁷⁴

The most recent halt of twenty-seven gene therapy experiments, which use retroviruses to insert DNA into blood stem cells,¹⁷⁵ is an example of how one failure can end all research in that area. The current halt of experiments represents fifteen percent of the approximately 200 gene therapy trials underway in the United States.¹⁷⁶

8.4. Antitrust Regulators' Impact on Gene Therapy Research

As the gene therapy industry vertically integrates to alleviate high transaction costs, it will undergo antitrust scrutiny. If the industry integrates via a merger or patent pool, antitrust regulation will likely require it to offer reasonably priced licenses. What the antitrust regulators have failed to consider is that there are large conflicts of interest in the scientific community,¹⁷⁷ incentivizing researchers to violate safety protocols.¹⁷⁸ Any violations,

¹⁷² Andrew Pollack, *2nd Cancer Is Attributed to Gene Used in F.D.A. Test*, N.Y. TIMES, Jan. 17, 2003, at A24.

¹⁷³ *Id.* (quoting Dr. von Kalle, a scientist collaborating with the French researchers).

¹⁷⁴ *Id.*

¹⁷⁵ Jennifer Warner, *FDA Temporarily Halts Some Gene Trials: Action Comes After French Child Develops Leukemia-like Condition*, WebMD Health (Jan. 14, 2003), at <http://my.webmd.com/content/Article/59/66687.htm>.

¹⁷⁶ National Hemophilia Foundation, *FDA Suspends 27 Gene Therapy Trials After Second Child in France Falls Ill: Hemophilia Trials Not Affected* (Jan. 21, 2003), at http://www.hemophilia.org/news/medicalnews/mn_01_21_03.htm.

¹⁷⁷ See *supra* text accompanying note 164.

¹⁷⁸ Although the FDA regulates gene therapy, it "do[es] not review research proposals. Instead, the federal regulations delegate authority for the review, approval, and monitoring of biomedical research studies to IRBs [institutional review boards], which are committees designated by individual institutions." Sharona Hoffman, *Continued Concern: Human Subject Protection, the Institutional Review Board, and Continuing Review*, 68 TENN. L. REV. 725, 731 (2001). Federal regulations govern IRBs as well as their safety protocols. See 21 C.F.R. § 56.101(a), 102(g) (2003) (establishing the scope and definition of IRBs); see also 21 C.F.R. § 56.111 (2003) (laying out the safety protocols and criteria for IRB approval); 45 C.F.R. § 46.103(b) (2003) (regulating that all departments or agencies that fund research must ensure that the research passes through IRB review); 45 C.F.R. § 46.111 (2003) (listing criteria for IRB approval).

irrespective of the potential scientific efficacy of the gene therapy experiments, could lead to a halt on gene therapy trials, even those of the original licensor. Not only does the halt on trials harm licensors and licensees, but it also harms gene therapy patients. In addition, the potential halts on gene therapy trials will limit future incentives to innovate.

8.5. Proposed Solution¹⁷⁹

Therefore, compulsory licensing is not the solution; original licensors, even those firms that vertically integrate, must be able to dictate the experimental design and protocols of licensees to limit negative externalities.¹⁸⁰

If licensors were allowed to determine the experimental designs and protocols used by their competitors/licensees, they could limit the externalities that might occur if the licensee attempted to circumvent safety protocols. For example, the licensor could require that the licensee affirmatively demonstrate informed consent from all patients, pre-approve experimental design, and receive experimental results contemporaneously with the FDA. These requirements would ensure that any experimental impropriety of the licensee will be caught by the licensor. It will also limit the possibility of a potential halt on gene therapy trials being conducted by the licensor because of a failure of the licensee to follow safety protocols.

The licensor has the greatest incentive to ensure that the licensees follow all safety protocols. After all, licensees will be conducting similar gene therapy research as the licensor and if any misuse occurs resulting in an FDA halt on similar gene therapies, then both the licensee and licensor will suffer.

One counterargument is that by allowing the licensor to regulate the use of its license, antitrust regulators will be

¹⁷⁹ Note, another concept that may be applied to this situation is the use of pliability rules. See Abraham Bell & Gideon Parchomovsky, *Pliability Rules*, 101 MICH. L. REV. 1, 5 (2002) (discussing how pliability rules, having a dynamic nature, “are contingent rules that provide an entitlement owner with property rule or liability rule protection as long as some specified condition obtains; however, once the relevant condition changes, a different rule protects the entitlement—either liability or property, as the circumstances dictate”).

¹⁸⁰ The negative externality is that the licensees do not bear all the costs in acquiring the license and instead, the cost is borne by the licensor if the FDA halts all similar gene therapy trials; not because the potential gene therapy was not scientifically viable, but rather because a licensee violated safety protocols.

condoning anticompetitive conduct. Under the proposal offered here, it can be argued that the licensor will only approve competitors' experiments that offer potentially minimal profits or experiments that do not conflict with its own research. However, the licensor will not be given the power to deny experimental use, but rather the power to offer modifications to the experimental procedures proposed by licensees. In addition, an administrative body, such as the FDA, may be given the authority to create a committee to hear licensees' appeals of anticompetitive abuse by licensors.¹⁸¹

Another counterargument is that the gene therapy trials have been halted simply because there was no real scientific merit to the experiments to begin with; that they failed, like other potential therapies fail, while still in the clinical trial phase. However, gene therapy trials have been halted not for failure to demonstrate scientific efficacy, but rather for failure to follow safety procedures, as in the Gelsinger case.¹⁸² The safety failures range from underreporting adverse data and failing to inform patients of potential experimental risks to skewing the experimental design to achieve favorable results or skewing experimental data altogether.¹⁸³ Because there are conflicts of interest, as seen in the Gelsinger case, resulting in his untimely death and a halt on all similar gene therapy trials, it is short-sighted to say that these gene therapy trials failed simply because they had no scientific merit.

9. CONCLUSION

The gene therapy industry faces the same high transaction cost problems that plague the biopharmaceutical industry. Given the structural problems associated with the pharmaceutical and biotechnology industries, there is clearly a movement towards vertical integration. In response, antitrust regulators will evaluate any resulting anticompetitive effects from vertically integrating transactions, and will likely require a compulsory licensing scheme, as exemplified by the Ciba-Geigy and Sandoz merger. But

¹⁸¹ In addition, a procedure would have to be created that would guide the interim research rights and protocols while the appeals are heard.

¹⁸² It can be argued that the gene therapy trials were halted after Jesse Gelsinger's death. But his death would not have occurred had the researchers followed the proper safety protocols.

¹⁸³ See Kuszler, *supra* note 163, at 135-40 (discussing financial and non-financial conflicts of interest).

there is a flaw in their analysis: antitrust regulators know, *ex ante*, that there are large conflicts of interest in the scientific community which incentivizes researchers to circumvent safety protocols. Oftentimes, these safety protocol evasions have led to patient harm, which resulted in a FDA halt of all similar gene therapy trials.

If a potential competitor acquiring a reasonably priced license from a newly merged firm, such as Novartis, begins gene therapy trials on similar research paths, and then commits serious failures because of its attempts to bypass safety protocols such that the FDA suspends all similar research trials, the licensor is unjustly harmed. None of these competitors would exist *but for* the compulsory licensing requirement. These externalities associated with failing to follow safety procedures will be unjustly borne by the licensor, Novartis, as well as gene therapy patients. Gene therapy patients awaiting the treatments will be left with no alternatives. Thus, the compulsory license required by antitrust regulators may actually harm patients needing experimental gene therapies.

Therefore, to mitigate the externalities borne by licensors compelled to offer reasonably priced licenses to their competitors, licensors should be permitted to screen experimental protocols of their licensees and monitor licensees' research trials. Should the licensors abuse their pre-approval privileges, an FDA review committee could be created to consider licensees' appeals. This proposal would maintain incentives to innovate within the biotechnology industry, permit antitrust review of vertically integrative transactions to limit monopoly concentrations, and limit harm to gene therapy patients while still maximizing the benefit that they may potentially receive.