PATENT PROTECTION FOR ESSENTIAL BIOMEDICAL INVENTIONS AND ITS IMPACTS ON THE IMPLEMENTATION OF PUBLIC HEALTH

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ABSTRACT

The widespread application of biomedical innovations, especially genetic testing, has gained increasing importance in recent years. Even though biomedical treatment methods are not patentable in most countries, medical practices and activities can still be hampered by patents since inventors can, on one hand, lawfully obtain patents on genes, related medicaments and medical kits, and on the other hand, design around the prohibition of patentability of medial methods ruled by patent law without difficulty. The BRCA 1 genetic testing is a good example. This paper asserts that it is the right time to reconsider whether and how patent law should be changed in a way that enhances both innovation and public health in the biomedical arena.

KEYWORDS: *method of medical treatment, genetic testing, patent right, public health, BRCA 1*

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I. INTRODUCTION

Biotechnology has become the mainstream in this century, particularly after its research results have been applied to medical fields and after the Human Genome Project was completed. Nowadays, some genes are identified, which may be associated with the development and progression of diseases. For example, with the help of biotechnology, the diabetes gene (AGT gene)[1] and depression gene (APAF1 gene)[2] have been found. Also, it has been confirmed that lung cancer (adenocarinoma of the lung) arises from an aberrantly active epidermal growth factor receptor. While the available genetic information is being converted into medical innovation, biomedicine is a fast evolving field that promises to bring about a variety of innovations in clinical practice, such as genetic testing and gene therapy. The application of gene therapy still has many safety concerns and its ethical issues are controversial, while genetic testing is commonly used in health care. Once a link between a disease and precise genetic defect has been established, a diagnostic test can be easily developed.[3] The ease of developing genetic tests has allowed diagnostic laboratories to rapidly provide appropriate services. It is estimated that there were more than 870 thousand cases of clinical utility in Europe and the U.S. in 2000 and the number increased dramatically to 1,004,000 in 2002.[4]

The yearly increase in the clinical utility of genetic tests and their crucial role in health care mean huge profits for inventors. To remain competitive and highly profitable, biomedical industries pursue widespread patent protection for inventions relating to genetic testing, not only in vitro diagnostic procedures but also kits used as diagnostic tools. Apart from that, genes contributing to respective diseases are protected by patents. The BRCA1 genetic testing invention is a good example. In 1994, a U.S. private biotechnology company, Myriad Genetics, and the University Research Foundation [hereinafter Myriad] successfully isolated the location of the genes BRCA1 and BRCA2 with the help of the genealogical records of the Utah Mormons. According to the research results, women have a 12% chance of developing breast cancer in their lifetime. The risk jumps to

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[1] That is to say, mutant alleles of the angiotensinogen (AGT) genes cause susceptibility to insulin-dependent diabetes mellitus (IDDM). *See* U.S. Patent No. 7,374,884 (filed May 13, 2004).

[2] Namely, mutations of the apoptotic protease activating factor 1 (APAF1) genes are associated with predisposition to depression. *See* U.S. Patent No. 7,052,853 (filed Aug. 21, 2003).

[3] Sirpa Soini et al., *Patenting and Licensing in Genetic Testing: Ethical, Legal and Social Issues*, 16 EUR. J. HUM. GENETICS 10, 13 (2008), *available at* http://www.nature.com/ejhg/journal/v16/n1s/index.html (last visited Mar. 16, 2010).

[4] Chin-yuan Tzen, *Fen Tzu Chi Yin Chien Tse Pi Hsu Mien Tui Te Wen Ti* [*The Challenge faced by Molecular Genetic Tests*], 1(2) BIOMEDICINE 109, 109 (2008).

85% if a woman is genetically predisposed to have a BRCA1 or BRCA2 gene.[5] Myriad filed and has obtained patents based on these research results. Although these inventions mean an important milestone for biomedicine, Myriad's patent strategy and the way Myriad enforces its patent rights have stirred up strong public opposition around the world, particularly in Europe.

Patent law plays a decisive role in stimulating the development of new medical products by offering an exclusive right as incentive for investing in expensive and long-term research. Without patents, existing medical products would not have been invented, and innovative and better medical products needed to overcome the diseases would not be developed. However, the tendency of patent protection expansion and the inadequate enforcement of patent rights in the biomedical fields seem to impede the access to essential biomedical inventions and adversely affect the implementation of public health. This article reviews patent protection for medical methods and patent practices, using the BRCA 1 genetic testing invention as an example. To solve the potential conflict between patentees and patients, the author asserts that patent law should be changed in a way that enhances both innovation and public health in the biomedical arena.

II. BRCA1 GENE AND RELATED PRODUCT PATENTS

The patentability of medical methods, namely diagnostic, therapeutic and surgical methods for the treatment of humans, is a controversial issue. Members of international conventions in the intellectual property field[6] cannot reach an agreement on this issue. Even the Agreement on Trade Related Aspects of Intellectual Property Rights [hereinafter TRIPS] fails to resolve this issue and leaves Members to decide whether such inventions shall be excluded from patent protection or not.[7] In Europe, Taiwan and

[5] The tumor suppressor gene BRCA I on chromosome 17q21 has been characterized. It is a 220-kilodalton nuclear phosphoprotein in normal cells. People carrying a mutation (abnormality) in this BRCA1 gene are at an increased risk of breast or ovarian cancer. The normal gene plays a role in repairing breaks in DNA. However, when the gene is mutated, it is thought that this repair function may become disabled and thus lead to more DNA replication errors and cancerous growth. *See* Description of Large Deletions in Human BRCA1 Gene & Use Thereof, U.S. Patent No. 7,250,497 (filed June 9, 2003); Palo Alto Medical Foundation, Genetic Screening for Breast and Ovarian Cancer, http://www.pamf.org/health/guidelines/geneticscreening.html (last visited Mar. 16, 2010). It shall be noted that this prediction has a higher frequency in the Ashkenazi Jewish population than in the general population.

[6] For example, the Paris Convention for the Protection of Industrial Property, which is the first major international treaty designed to harmonize the legal system of intellectual property protection across the countries and entered into force in 1884, does not deal with the issue of patentability of medical methods for the treatment of humans.

[7] *See* Agreement on Trade Related Aspects of Intellectual Property Rights art. 27.3, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, Legal Instruments – Results of the Uruguay Round, 33 I.L.M. 1125 [hereinafter TRIPS Agreement]: "Members may

most countries, methods of medical treatment are not patentable, regardless of traditional or biomedical related inventions. By contrast, the U.S. and the Commonwealth of Australia adopt a different approach, under which medical methods are patentable subject matters.

It is noteworthy that not all inventions relating to medical treatments are excluded from patentability in most countries; while patent law does not protect inventions narrowly defined as methods of medical treatment, inventions that do not fall within such a definition are still eligible for patent. To explain further, the patent system is not intended to ignore the economic value of patent rights and chill innovation in medical products. Thus, the concern over patentability of medical methods will not arise if the subject matter of a patent is a product, such as a gene or gene sequence.[8] Kits[9] and medicinal substances[10] are not considered as medical methods either.[11] Further, medical devices,[12] such as surgical, therapeutic or diagnostic instruments or apparatuses for use in medical methods, are eligible for patents.[13] Even if the subject matter of an invention is a process, it is not necessarily included in the unpatentable category, such as a method of controlling the operation of a medical device.[14] Only a medical process with its wordings of claims equivalent to "a method of medical treatment" will be excluded from patent protection.

With regard to the inventions relating to the implementation of BRCA1 genetic testing, the BRCA1 gene itself is undoubtedly patentable in every

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also exclude from patentability: (a) diagnostic, therapeutic and surgical methods for the treatment of humans or animals; . . . ."

[8] *See* U.S. Patent No. 7,374,884, *supra* note 1 and U.S. Patent No. 7,052,853, *supra* note 2.

[9] *See* Modified HIV Peptides, Antigens, Compositions, Immunoassay Kit & a Method of Detecting Antibodies Induced by HIV, U.S. Patent No. 7,612,168 (filed Aug. 26, 2005) and Test Kit for the Rapid Detection & Localization of Digestive Tract Bleeding in Equines, U. S. Patent No. 7,629,180 (filed Nov. 28, 2006).

[10] *See* Peptide Substance Restoring Respiratory Organs Function, U.S. Patent No. 7,625,870 (filed Dec. 7, 2004) and Substance Having Antitumor/Anti-inflammatory Activity, U.S. Patent No. 7,528,169 (filed Dec. 16, 2002).

[11] *See* Convention on the Grant of European Patents art. 54(4), 13 I.L.M. 268 (Nov. 29, 2000) [hereinafter EPC 2000]: ("Paragraphs 2 and 3 shall not exclude the patentability of any substance or composition, comprised in the state of the art, for use in a method referred to in Article 53(c), provided that its use for any such method is not comprised in the state of the art.").

[12] *See* DNA Biosensor & Methods for Making & Using the Same, U.S. Patent No. 7,615,780 (filed June 29, 2006) and Biosensor Cartridge & Biosensor Dispensing Device, U.S. Patent No. 7,585,464 (filed Apr. 16, 2003).

[13] European Patent Off., Guidelines for Examination in the EPO, ¶ 4.8, *available at* http://www.epo.org/patents/law/legal-texts/guidelines.html (last visited Mar. 16, 2010).

[14] JAPAN PATENT OFFICE, EXAMINATION GUIDELINES FOR PATENT AND UTILITY MODEL IN JAPAN ¶ 2.1 (2005), English version *available at* http://www.jpo.go.jp/tetuzuki_e/t_tokkyo_e/1312-002_e.htm (last visited Mar. 16, 2010). Taking an example, the following method of controlling the operation of a medical device is patentable: "a method for controlling the operation of a nuclear magnetic resonance (NMR) imaging device, comprising the steps of: (a) receiving an NMR signal from a patient's tissues by an RF coil; (b) comparing arithmetically the NMR signal received by predetermined means of a cancer cell and that of a regular cell; and (c) indicating a territory where cancer is suspected." *Id.* at 39-40.

industrial country.[15] For example, the European Patent Office (hereinafter EPO), which is an intergovernmental organization established in 1977 on the basis of the European Patent Convention (hereinafter EPC), granted two patents on the BRCA1 gene in 2001.[16] Claim 1 of EP0705902 (nucleic acid probes comprising a fragment of the 17q-linked breast and ovarian cancer susceptibility gene)[17] states the following: "An isolated nucleic acid coding for the BRCA1 polypeptide having the amino acid sequence set forth in SEQ.I D. NO:2, or modified form of said polypeptide which is functionally equivalent or associated with a predisposition to breast or ovarian cancer." Also, claim 1 of EP0705903 (mutations in the 17q-linked breast and ovarian cancer susceptibility gene)[18] states: "An isolated nucleic acid coding for a mutant or polymorphic BRCA1 polypeptide, said nucleic acid containing in comparison to the BRCA1 polypeptide encoding sequence set forth in SEQ. ID NO: 1 one or more mutations or polymorphisms selected from the mutations set forth in Tables 12, 12A and 14 and the polymorphisms set forth in Tables 18 and 19." The above-mentioned subject matters of patents relate to germiline mutations in the BRCA1 gene in human breast and ovarian cancer.

According to patent law, a patentee is entitled to prevent third parties from the acts of making, using, offering for sale, selling or importing for these purposes any patented invention without its consent.[19] Regarding a product patent like the BRCA1 gene patent, the exclusive right may extend to all subsequently invented new uses, even if they were not anticipated or mentioned in the patent application. Therefore, all possible uses of the BRCA1 gene, including recombination of a vector containing a BRCA1 gene and the use of the BRCA1 gene in the diagnosis of predisposition to breast and ovarian cancer, may fall within the scope of the patent. Thus, entities, such as biomedical companies, clinical laboratories or hospitals, who make unauthorized use of the BRCA1 gene in countries where Myriad holds a patent right will be liable as an infringers.[20]

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[15] The issues, whether a gene or gene sequence is an invention or discovery and whether the patent law shall include such research results into protection, are still arguable in some developing countries.

[16] Apart from the patents granted by the EPO, Myriad has also obtained a number of patents in the USA, Canada, Australia, New Zealand and Japan. MATTHEW RIMMER, INTELLECTUAL PROPERTY AND BIOTECHNOLOGY: BIOLOGICAL INVENTIONS 188 (2008).

[17] In the U.S., the similar invention belonging to the same patent family is protected by 17q-linked Breast & Ovarian Cancer Susceptibility Gene, U.S. Patent No. 6,162,897 (filed May 2, 1997).

[18] A similar invention in the U.S. is protected by 170-linked Breast & Ovarian Cancer Susceptibility Gene, U.S. Patent No. 5,753,441 (filed Jan. 5, 1996).

[19] *See* TRIPS Agreement, *supra* note 7, art. 28.1(a); Chuan Li Fa [Patent Act] art. 56(1) (R.O.C.) (2003) [hereinafter Taiwanese Patent Act].

[20] Based on the principle of territorialism, the patentee's right to exclude others is extinguished at the geographic borders of the granting country, and the patent right is generally not enforced extraterritorially. The author conducted a patent search with the keywords "BRCA" and "Myriad" at Chung Hua Min Kuo Chuan Li Tzu Tsun Chien So Hsi Tung [Taiwan Patent Information

With respect to the method of detection of the BRCA1 gene, Myriad worded its claims differently in Europe since the European countries do not allow patents on methods of medical treatment as the U.S. does. That is to say, Myriad adopted a "worded design-around" strategy to obtain patents at the EPO, so that in a sufficient degree, Myriad is still entitled to enforce exclusive rights and could prohibit third parties from using the diagnostic procedures in Europe. These will be discussed in Part III and Part IV of this paper.

III. BRCA1 GENETIC TESTING PATENT GRANTED BY THE USPTO

A. Legal Statute

In the U.S., the statutory subject matters of patents are set forth in 35 U.S.C. § 101: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title." Accordingly, any invention falling within one of the four classes, namely processes, machines, manufactures or composition of matter, is patentable. Methods of medical treatment, diagnostic, therapeutic or surgical steps of process, are same as inventions in other technical fields and are eligible for subject matters of patents.

Even though medical methods fall within the statutory category of patent protection, due to their nature, patenting on such inventions was still controversial in the earlier years in the U.S.[21] Until the *Ex parte Scherer* case[22] in 1954, methods of medical treatment were explicitly treated the same as other technical inventions, and the USPTO granted the first patent named "method of injecting medicaments by pressure jet." After the *Ex parte Scherer* case, there has been a long practice of giving patent protection for medical methods in the U.S., and a number of patents have been granted by the USPTO,[23] which cover divergent medical areas,[24]

Search], http://twpat2.tipo.gov.tw/twcgi/twpat2?30:960706019:0:::@@160286 (last visited Mar. 16, 2010). According to the information provided on the website, Myriad has not obtained any patent relating to the BRCA1 gene, even though Myriad owns several patents other than BRCA1 in Taiwan.

[21] JOHN R. THOMAS, PHARMACEUTICAL PATENT LAW 46 (2005).

[22] Ex parte Scherer, 103 U.S.P.Q. 107 (PTO Bd. 1954).

[23] It is noteworthy that physicians are rarely sued by patentees of medical methods. This changed, however, in 1993, after a surgeon holding a patent on a new type of incision for eye operations, Method of MakingSelf-sealing Episcleral Incision, U.S. Patent No. 5,080,111 (filed June 28, 1990), demanded royalty payments from hospitals carrying out this technique and sued a clinic for patent infringement. This is the famous *Pallin v. Singer* case. For more details, please *see* Pallin v. Singer, 36 U.S.P.Q.2d (BNA) 1050 (D. Vt. 1995) [hereinafter *Pallin v. Singer* case]. This lawsuit was controversial in the U.S., and patentees who enforced their proprietary rights on medical methods

including administering insulin, methods of diagnostic diseases, methods of treating cancers and surgical methods.[25]

B. Rationale of Patentability of Medical Methods

The legal rationale to provide medical methods patent protection is based on the prospect of a necessary spur for research into better and more innovative medical procedures.[26] Like other technical professionals, inventors in medical fields also need the proprietary right granted by patent law, which prevents immediate copying by others who have not invested in the research and therefore motivates R&D spending by protecting inventors' investment. It is also remarkable that the crucial factor, pharmaceutical companies' research and development resource allocations, rests mainly on whether research results can be commercialized and patentable, rather than whether the R&D might achieve advancement in medical technology.[27] As a result, it is difficult for medical researchers to receive financial support from industries or venture funding for their development in innovative medical methods,[28] if such inventions are *per*

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were considered unethical. Congress subsequently adopted an Amendment of Patent Act in 1996. An exclusion of remedies laid down in 35 U.S.C. § 287(c) was introduced, under which medical practitioners can be exempted from liability of patent infringement. Remarkably, the application of the remedy exemption is narrowly defined by the statue. In practice, only physicians performing surgical procedures are protected from infringement suits by this provision. For this reason, it seems that this legislation merely has had a symbolic impact. PHILIP W. GRUBB, PATENTS FOR CHEMICALS, PHARMACEUTICALS AND BIOTECHNOLOGY 240-41 (4th ed. 2004); JANICE M. MUELLER, AN INTRODUCTION TO PATENT LAW 236 (2d ed. 2006).

[24] JOHN R. THOMAS, *supra* note 21, at 47.

[25] The author conducted a patent search at the USPTO website (Patent Full-Text and Image Database, http://patft.uspto.gov/netahtml/PTO/srchnum.htm), which revealed that a number of patents on medical treatments have been granted, in particular surgical procedures, like Eye Surgery Methods, U.S. Patent No. 5,167,620 (filed Jan. 22, 1992), Breast Surgery Method & Apparatus, U.S. Patent No.6,280,450 (filed July 23, 1998), Method & Apparatus for Performing Stereotactic Surgery, U.S. Patent No.4,955,891 (filed Oct. 22, 1987), Laser Surgery Method, U.S. Patent No.5,403,306 (filed June 22, 1993), Laser Beam Ophthalmological Surgery Method & Apparatus, U.S. Patent No.5,480,396 (filed Dec. 9, 1994) and Ophthalmic Surgery Method Using Non-contract Scanning Laser, U.S. Patent No.5,520,679 (filed Mar. 25,1994).

[26] Joseph M. Reisman, *Physicians and Surgeons as Inventors: Reconciling Medical Process Patents and Medical Ethic*s, 10 HIGH TECH L.J. 355, 364-65 (1995); Chris J. Katopis, *Patients v. Patents?: Policy Implications of Recent Patent Legislation*, 71 ST. JOHN'S L. REV. 329, 339-46 (1997).

[27] Nahoko Ono, *Better than Nothing: Japan's Next Move on Patentability of Medical Methods*, 37(2) INT'L REV. INTELL. PROP. & COMP. L. 196, 206 (2006), *available at* http://www.ip.mpg.de/ww/en/pub/organization/services/editorialoffices/info/content7211.cfm (last visited Mar. 16, 2010).

[28] The development of Surrogate Embryo Transfer (SET) is a good example. SET is a process by which an infertile recipient and a fertile donor's menstrual cycles are synchronized, the fertile donor's ovum is fertilized, an embryo formed, and the embryo subsequently washed out of the uterus of the donor and implanted into the infertile recipient in order to allow an otherwise sterile woman to carry, deliver, and give birth to a child. The procedure was funded and developed by a for-profit corporation with clear intent to patent the innovative technique and license it to clinics

se not subject matters of patents.[29]

The patentability of medical methods can also be supported by the argument of consistency and logic of patent law. Namely, if patents can be granted for medicines or medical devices that cure or alleviates diseases, methods for treating diseases, such as a method for administering drugs, ought to be patentable as well.[30] Similarly, it seems unjustified to refuse to patent a method of treatment of blood by dialysis, if an apparatus for purifying blood is patentable.[31]

Furthermore, supporters of patentability assert that patent systems can facilitate the dissemination of innovative medical methods, since the fundamental benefits conferred by patent law are disclosure of patented inventions and the publication of technical information. To explain in detail, an applicant for a patent must disclose the invention in a manner sufficiently clear and complete.[32] The disclosure must be enabling without undue experimentation, so that it will permit others to make and use the invention, once the patent expires. Moreover, patent applications are published, in most cases 18 months after the filing date.[33] As soon as the technical information of the invention is fully disclosed and published, the public's knowledge is enriched and interested parties can learn about the invention. These benefits of dissemination also apply to inventions regarding medical methods and enhance the public domain.[34] Without patent protection, inventors might treat new medical techniques as a trade secret, and the technical information might not be available for public scrutiny. In this event, patients' interests might not be safeguarded well, since the medical profession has no opportunity to review whether innovative medical techniques have fulfilled the requirements of safety and quality.

C. BRCA1 Diagnostic Method Patent

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across the nation. One of the physicians devoting in the development of the SET procedure, Dr. John Buster, is in favor of patenting medical methods. He believes he would not have been able to do this research that led to SET, if he would not have gotten the funding and if the investors stood no chance to profit from their investment via patenting and licensing the inventions resulting from his research. *See* Steven L. Nichols, *Hippocrates, the Patent-Holder: The Unenforceability of Medical Procedure Patents*, 5 GEO. MASON L. REV. 227, 258 (1997).

[29] In this event, the main financial support for medical research might depend on a research grant funded by the government. It is however arguable whether the amount of public funds is enough or available for promoting science and technology regarding methods of medical treatment.

[30] O. Mitnovetski & D. Nicol, *Are Patents for Methods of Medical Treatment Contrary to the Ordre Public and Morality or "Generally Inconvenient"?*, 30 J. MED. ETHICS 470, 474 (2004).

[31] *Id*. at 474.

[32] *See* TRIPS Agreement, *supra* note 7, art. 29.1; 35 U.S.C. § 112; Taiwanese Patent Act, art. 26(2).

[33] 35 U.S.C. § 122(b); Taiwanese Patent Act, art. 36(1).

[34] Katopis, *supra* note 26, at 340; Ono, *supra* note 27, at 207.

Since medical methods are patentable inventions in the U.S., Myriad has obtained a patent on the BRCA1 diagnostic method without difficulty. The USP5,709,999 (linked breast and ovarian cancer susceptibility gene) was granted by the USPTO in 1998.[35] The single and most important independent claim[36] prescribes the following:

> A method for detecting a germline alteration in a BRCA1 gene, said alteration selected from the group consisting of the alterations set forth in Tables 12A, 14, 18 or 19 in a human which comprises analyzing a sequence of a BRCA1 gene or BRCA1 RNA from a human sample or analyzing a sequence of BRCA1 cDNA made from mRNA from said human sample with the proviso that said germline alteration is not a deletion of 4 nucleotides corresponding to base numbers 4184-4187 of SEQ ID NO:1.

According to patent law, claims are the most important part of a patent. They define the legal boundary of the patentee's right and provide reasonably clear notice, in advance of litigation, of how far third parties can proceed in imitating the patented invention without infringing the proprietary right.[37] After scrutinizing the wordings of USP5,709,999, it is remarkable that the main content of this claim is a method for detecting a germline alteration in a BRCA1 gene. Following the literal claim interpretation, Myriad is allowed to broadly enforce its exclusive right in a sufficient degree. That is to say, any kind of diagnostic methods, which contain, but are not limited to, the procedure of "analyzing a sequence of a BRCA1 gene or BRCA1 RNA from a human sample" or "analyzing a sequence of BRCA1 cDNA made from mRNA from a human sample," fall within the scope of this patent, regardless of whether it is an *in vitro* or *in vivo* procedure. Third parties cannot avoid this patent by merely adding on additional procedures.

Thus, there might be no diagnostic method of BRCA1 genetic testing

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[35] Apart from U.S. Patent No. 5,709,999 (filed June 7, 1995), Myriad has obtained the following patents with regard to BRCA1 gene and genetic testing: Linked Breast & Ovarian Cancer Susceptibility Gene, U.S. Patent No. 5,693,473 (filed June 7, 1995) in 1997, 170-linked Breast & Ovarian Cancer Susceptibility Gene, U.S. Patent No. 5,753,441 (filed Jan. 5, 1996) and 17q-linked Breast & Ovarian Cancer Susceptibility Gene, U.S. Patent No. 5,710,001 (filed June 7, 1995) in 1998, 17q-linked Breast & Ovarian Cancer Susceptibility Gene, U.S. Patent No. 6,162,897 (filed May 2, 1997) and Carboxy-terminal BRCA1 Interacting Protein, U.S. Patent No. 6,030,832 (filed Nov. 21, 1997) in 2000 and Large Deletions in Human BRCA1 Gene & Use Thereof, U.S. Patent No. 7,250,497 (filed June 9, 2003) in 2007.

[36] Patent claims are divided into independent or dependent form. A dependent claim is one that refers to a previously presented claim, while an independent claim stands alone without referring to any other claim. MUELLER, *supra* note 23, at 69.

[37] MUELLER, *supra* note 23, at 271.

that can be deemed as not infringing Myriad's patent, since "analyzing" and "a sequence of a BRCA1 gene," "BRCA1 RNA" or "a sequence of BRCA1 cDNA" are the fundamental and indispensable elements of performance of the BRCA1 diagnostic procedure. Incorporated with the patents on the BRCA1 gene itself,[38] Myriad truly owns a monopoly in the medical treatment for breast cancer and ovarian cancer, which are safeguarded by products and process patents.

IV. BRCA1 GENETIC TESTING PATENT GRANTED BY THE EPO

A. Legal Statute

Methods of medical treatment are ineligible for patent protection in Europe and most countries; nevertheless, each country adopts different mechanisms in patent law to prevent such medical inventions from entitling an exclusive right. For example, methods of medical treatment are regarded as "industrially inapplicable inventions" in Germany and Japan.[39] Such inventions are not treated as subject matters of patent protection in Taiwan,[40] regardless of whether they fulfill the requirements of industrial application, novelty and inventive step. The former Article 52(4) of the EPC ruled that medical methods are considered as "industrially inapplicable inventions," and such inventions are regarded as ineligible as the subject matter of patents in Article 53(c) of the EPC 2000.

B. Rationale for the Unpatentability of Medical Methods

Even though the reasons to exclude the patentability of medical methods differ from country to country, the rationales for the exclusion correspond closely.

First, the patent policy derives from the idea that medical methods are in general practiced by physicians who must be free to treat their patients as they see fit, without having to worry about being sued for patent infringement.[41] To overcome diseases and to implement public policy, medical methods are as important as medicines and medical devices. It seems that patent law shall apply the same criteria to protect these inventions. Nonetheless, the significant differences in nature between

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[38] *See* U.S. Patent No. 6,162,897 (filed May 2, 1997) and U.S. Patent No. 5,753,441, *supra* note 18.

[39] *See* Patentgesetz [PatG][Patent Act] art. 5(2), Dec. 16, 1980, BGBl. 1981 I at 3 (F.R.G.), English version *available at* http://www.ip-firm.de/patentact.pdf (last visited Mar. 16, 2010); JAPAN PATENT OFFICE, *supra* note 14.

[40] *See* Taiwanese Patent Act, art. 24(3).

[41] GEORG BENKARD ET AL., PATENTGESETZ, GEBRAUCHSMUSTERGESETZ [PATENT ACT, UTILITY LAW] § 5 Rdnr. 19 (10th ed., 2006); GRUBB, *supra* note 23, at 240; Ono, *supra* note 27, at 201.

medicines or medical devices and medical methods should not be ignored. Medical activities are more directly influenced by medical methods. Patents on such inventions may prevent physicians from utilizing their best skills and means available at the every time of conducting the medical activities.[42] Thus, patent law should not place physicians in potential inherent danger of infringement of proprietary rights.[43]

Secondly, the patentability of medical methods is excluded on the basis of the essence of occupation of physicians. Medical practitioners are concerned with maintaining or restoring human health. Different from other occupations in other fields, physicians bear special ethical duties and the purpose of clinic practice is intended to overcome diseases, secure public safety and promote common welfare regarding public health matters. The nature of public health does not correspond to the purpose of patent system,[44] which is enacted for encouraging, protecting and utilizing inventions and creations so as to promote the development of industries.[45] Thus, methods of medical treatment adopted by physicians that directly influence clinic practices should not be subject matters of patents. Further, patent protection for methods of medical treatment can lead to conflicts between the physician-inventors and their own patients, since physicians, who are under fiduciary and ethical obligations to the patients, usually invent the medical methods.[46]

From the viewpoint of health care, the patentability of medical methods can lead to the commercialization of medical care. The negotiation for licensing patents is a difficult and time-consuming process. Due to the royalties required by patentees, the costs of health care might unavoidably increase, and innovative methods of medical treatment might become more unaffordable.[47] Access to life-saving techniques should not be restricted by patentees.

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[42] Ono, *supra* note 27, at 200-01.

[43] It shall be noted that with the exception of the U.S., patent law in most countries provides an exemption of medicine prescriptions and acts to prepare medicines, such as Article 11(3) of the German Patent Act and Article 58 of the Taiwanese Patent Act. Accordingly, the scope of patent protection shall not extend to an act to prescribe a medicine and an act to prepare a medicine in accordance with a prescription by physician, when the patent relating to an invention of a medicine which shall be manufactured by mixing two or more medicines or to an inventions of a process to manufacture a medicine by missing two or more medicines.

[44] RUDOLF KRAßER, PATENTRECHT: EIN LEHR – UND HANDBUCH ZUM DEUTSCHEN PATENT – UND GEBRAUCHSMUSTERRECHT, EUROPÄ ISCHEN UND INTERNATIONALEN PATENTRECHT [Patent law: a teaching - and manual of German patent - and utility model rights, European and International Patent Law] S. 209 f. (5th ed., 2004); Joseph Straus & Karolina Herrlinger, *Zur Patentierbarkeit von Verfahren zur Herstellung Individuumspezifischer Arzneimittel* [*The patentability of methods for producing individual-specific drug*], GRUR Int. 2005, 869, 870 (2005).

[45] *See* U.S. CONST. art. I, § 8; Taiwanese Patent Act, art. 1.

[46] Reisman, *supra* note 26, at 364.

[47] Reisman, *supra* note 26, at 364. Taking the famous *Pallin v. Singer* case in the U.S as an example, *supra* note 23, the patentee claimed that physicians performed its patented surgical procedure have to pay $3 to $4 per surgery in around 1993.

In addition, the non-patent mechanisms can maintain the existing medical tradition, under which physicians are willing to share their clinical experiences and public dissemination of new technologies can be implemented through medical literature and academic publications.[48] By contrast, patent protection for medical methods harms this tradition, since inventors are in general careful in making the patentable technologies available to third parties and maintain secrecy so that the respective inventions can fulfill the requirements of novelty and inventive step[49] under patent law.[50] The culture of disclosure and peer review within the medical community would be overridden if medical methods were subject matters of patents.[51]

From the perspective of patients, the fact that certain medical methods are protected by patents may give patients the wrong or misleading impression. Patients do not always realize the importance of peer review by the medical profession, which in a sufficient degree secures the safety and effectiveness of new medical techniques. They also might misunderstand that a certain innovative medical technique is necessarily safe and effective, simply because such invention is "guaranteed" by patent granted by governmental authority. Furthermore, patent protection for medical methods might lead to invasion of patients' privacy. During the process of finding and analyzing patent infringement, assessing the compensatory damages or determining the amount of royalties, patients' privacy might be disclosed,[52] since how medical treatments proceed and whether the patented medical methods are applied to patients are critical factors of negotiation for licensing and patent litigations.[53] Thus, the enforcement of patent rights conflicts essentially with clinic practice.

C. Meaning of an Unpatentable Diagnostic Method

Even though medical methods are unpatentable in most countries, it is worth noting that the meaning of an unpatentable medical method is

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[48] People believe that physicians are under an ethical obligation to share "their knowledge and skills for the benefit of humanity." Reisman, *supra* note 26, at 364.

[49] The requirement of inventive step in the EPC 2000 and the Taiwanese Patent Act is similar to that of non-obviousness in the U.S. Patent Act.

[50] PATENTGESETZ MIT EUROPÅ ISCHEM PATENTÜ BEREINKOMMEN [Patent Law with the European Patent Convention: Commentary on the basis of German and European law] § 5 Rdnr. 16 (Rainer Schulte & Rainer Moufang eds., 7th ed., 2005); Bradley J. Meier, *The New Patent Infringement Liability Exception for Medical Procedures*, 23 J. Legis. 265, 266-68 (1997); Straus, *supra* note 44, at 871; G 01/04, EPO Opinion of 16 December 2005, at 17.

[51] THOMAS, *supra* note 21, at 46.

[52] An inadequate revelation about patients' personal data might occur, in particular when the litigation proceeds before a court in the U.S. U.S. litigation, like patent litigation, features very broad discovery of documents. Any essential information may be discovered by virtue of a discovery procedure.

[53] THOMAS, *supra* note 21, at 46.

narrowly defined. Inventors can easily "design around" the prohibited regulation and submit patent applications that are not read as methods of medical treatment. In the following, only the meaning of an unpatentable diagnostic method will be discussed, since the BRCA1 genetic testing patent relates to inventions relating to diagnosis.

In most countries, only such a diagnostic method is excluded from patent protection, which is practiced on the human body and its process involves a number of steps leading towards the identification of a condition and thereby makes it possible to decide on a particular course of treatment.[54] As the EPO Enlarged Board of Appeal in G 01/04 explained further, these steps of a diagnostic method (hereinafter Four-Diagnosis-Steps) are characterized as being: (i) the examination and collection of data; (ii) comparison of the data with normal values; (iii) recording any deviation from the norm; and finally (iv) attributing the deviation to a particular clinical picture.[55] It is noteworthy that the term "method of diagnosis" is interpreted narrowly, according to the case law decided by the EPO. Only a method, which comprises all of the Four-Diagnosis-Steps listed above and therefore allows the identification of a pathological condition, falls within this definition.[56] Thus, the procedure of taking a sample from the human body or determining internal temperature or pH does not in itself identify a condition, and it is not deemed to be a method of diagnosis.[57] Also, a method performed on the human body that does not enable a disease to be identified but may be of value in diagnosis is not excluded from patent protection. For example, a method of measuring blood glucose and a method of assessing tissue viability by measuring total hemoglobin, oxygen saturation and hydration are all considered to provide only intermediate results and do not fall within the scope of methods of diagnosis.[58]

Further, an invention deemed as an unpatentable diagnostic method must be practiced on the human body. Therefore, *in vitro* diagnostic testing,[59] namely methods for treating samples that have been extracted from the human body, like blood, urine, skin, hair, cells or tissues, and methods for gathering data by analyzing such samples are not considered to be diagnostic methods.[60] To decide whether a particular step of a method is practiced on the human body, the crucial factor is whether the step requires the presence of a patient to perform it. It is however irrelevant whether the

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[54] U.K. Intell. Prop. Off., Examination Guidelines for Patent Applications Relating to Medical Inventions, ¶52 (Aug. 2008) [hereinafter U.K. IPO].
[55] G 01/04 Diagnostic Methods, ¶ 6.4.1; SCHULTE, *supra* note 50, § 5 Rdnr. 40.
[56] G 01/04 Diagnostic Methods, ¶ 4.2.2.
[57] U.K. IPO, *supra* note 54, ¶ 54.
[58] KRAßER, *supra* note 44, S. 207; U.K. IPO, *supra* note 54, ¶ 55.
[59] U.K. IPO, *supra* note 54, ¶ 58.
[60] *See* EP2126563 (method for determining health status by analyzing analytes).

procedure is invasive or capable of causing harm to patients.[61] Moreover, an unpatentable diagnostic method must be carried out on the living human body. A method performed on a dead body to determine the cause of death may be the subject matter of patent protection.[62]

In summary, an invention of medical procedures cannot be granted a patent if all the technical steps are practiced on the human body. However, it is patentable if any of the above-mentioned Four-Diagnosis-Steps is carried out away from the body. Thus, the criterion, whether a diagnosis related invention can be patented or not (given that itit fulfills the requirements of industrial application, novelty and inventive step), lies in the wording of the claims.[63] If the claims are equivalent to "a method of diagnosis," they will not be patented in most countries. By contrast, inventions, which are essentially medical methods, can still be included in patent protection if inventors successfully use "adequate" wordings in claims. The BRCA1 genetic testing patent granted by the EPO is a good example.

D. BRCA1 Genetic Testing Patent

Following the definition of a diagnostic method, the procedure for determining whether a patient has a BRCA1 gene is not necessarily unpatentable, even in countries that prohibit patenting medical methods. The wordings of the claims play a decisive role, as explained above. Thus, the controversial issue over the patentability of the BRCA1 genetic testing invention, which had been discussed from 2001 until November 2008 in Europe, rested on the factors of whether the claims submitted by Myriad constituted an unpatentable method of diagnosis and whether the wordings modified by Myriad was accepted by the EPO.

Soon after submitting a patent application regarding the BRCA1 genetic testing in 1995 in the U.S. and Canada, Myriad filed a patent in Europe. In 2001, the EPO granted EP0,699,754 (method for diagnosing a predisposition for breast and ovarian cancer). However, as soon as this patent was published, objections were raised. A number of institutes, including French Institut Curie, the Institut Gustave Roussy, the Belgian Society for Human Genetics and the Associazione Angela Serra per la Ricerca sul Cancro, asserted that this invention was not novel under the EPC and the claimed subject matter was deemed to be a method of diagnosis. Further arguments against this patent included concerns that it would jeopardize the development of research and the identification of new

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[61] U.K. IPO, *supra* note 54, ¶ 62.

[62] SCHULTE, *supra* note 50, § 5 Rdnr. 26; U.K. IPO, *supra* note 54, ¶ 58; TAIWAN INTELLECTUAL PROPERTY OFFICE, EXAMINATION GUIDELINES FOR PATENT APPLICATION ¶ 2-2-14 (2004).

[63] GRUBB, *supra* note 23, at 240.

tests and diagnostic methods in breast cancer research.[64] The opponents then, according to Article 99 (1) EPC 2000, gave notices to the EPO of opposition and argued that this patent should be revoked. After a more than seven year proceeding of public hearings and opposition before the Opposition Division and the Technical Board of Appeal (TB), the EPO accepted on November 17, 2008 the modified wordings of the claims submitted by Myriad and maintained the validity of the BRCA1 genetic testing patent in the amended form.

The original patent granted by the EPO consisted of twenty-five independent claims. However, only seven independent claims survived after the opposition procedure.[65] Comparing the amended claims with the original ones, the claims, which comprised the above-mentioned Four-Diagnosis-Steps and therefore fit the definition of a diagnostic method, were deleted. Using the original claims 4, 5, 7, 8, 11, 12 and 13 as examples, the controversial procedural steps were as follows:

> 4. A method as claimed in any one of claims 1 to 3 wherein the sequence of the BRCA1 gene in said sample is compared with the sequence of one or more wild-type BRCA1 gene from the sequence set forth in SEQ.ID. No. 1 and wild-type allelic variants thereof.
>
> 5. A method as claimed in any one of claims 1 to 3 wherein the level and/or sequence of an expression product of the BRCA1 gene in said sample is investigated.
>
> 7. A method as claimed in claim 6 wherein mRNA of said sample is contacted with a BRCA1 gene probe under conditions suitable for hybridization of said probe to an RNA corresponding

[64] However, it shall be noted that the sole responsibility of the EPO is to consider oppositions under the law laid down in the EPC. The factor, whether this patent would deter research institutes or biomedical industries from devoting to research and develop, shall not be taken under consideration.

[65] Among them, the most important four independent claims are as the following:

1. A method for diagnosing a predisposition for breast and ovarian cancer in a human subject which comprises determining in a tissue sample of said subject whether there is a germline alteration that is a frameshift mutation in the sequence of the BRCA1 gene coding for a BRCA1 polypeptide altering the open reading frame of SEQ ID NO 2, said alteration being indicative of a predisposition to said cancer.

2. A method for diagnosing a lesion of a human subject for neoplasia associated with the BRCA1 gene locus which comprises determining in a sample from said lesion whether there is an alteration that is a frameshift mutation in the sequence of the BRCA1 gene coding for a BRCA1 polypeptide altering the open reading frame of SEQ ID NO: 2, said alteration being indicative of neoplasia.

6. A method for diagnosing a predisposition for breast and ovarian cancer in a human subject which comprises determining whether there is gremline alteration 5385insC in the BRCA1 gene in a tissue sample of said subject, said alteration indicating a predisposition to said cancer.

7. A method for diagnosing a breast or ovarian lesion of a human subject for neoplasia associated with the BRCA1 gene locus which comprises determining whether there is mutation 5385insC in the BRCA1 gene in a sample from said lesion.

> to said BRCA1 gene and hybridization of said probe is determined.
>
> 8. A method as claimed in any one of claims 1 to 4 wherein a BRCA1 gene probe is contacted with genomic DNA isolated from said sample under conditions suitable for hybridization of said probe to said gene and hybridization of said probe is determined.
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> 11. A method as claimed in claim 10 wherein said polypeptide is detected by immunoblotting or immunocytochemistry.
>
> 12. A method as claimed in claim 10 wherein binding interaction is assayed between the BRCA1 gene protein isolated from said sample and a binding partner capable of specifically binding the polypeptide expression product of a mutant BRCA1 allele and/or a binding partner for the BRCA1 polypeptide having the amino acid sequence set forth in SEQ.ID No:2.
>
> 13. A method as claimed in claim 12 wherein inhibition of biochemical activity of said binding partner is determined.

The BRCA1 genetic testing patent granted by the EPO makes one fact very clear: apart from in the U.S. and Australia, an invention of a diagnostic method can still be protected by patent rights in most countries, regardless of whether the patentability of medical methods is explicitly prohibited by the patent law or not.

V. IMPACTS ON IMPLEMENTATION OF PUBLIC HEALTH

A. Impeded Access to the Patented BRCA1 Related Inventions

Once a link between a disease and precise genetic defect has been established, the respective diagnostic testing products and procedures can be developed relatively easily, such as kits, home-brew detection methods or high-throughput scanning platforms.[66] After Myriad successfully isolated the location of the BRCA1 gene, the genetic linkage to familial breast cancers was identified. As the finding explained by Myriad states, "inherited mutations in the BRCA1 and BRCA2 genes account for approximately 7-10% of all breast and ovarian cancers. Women with BRCA mutations have a lifetime risk of breast cancer between 56-87%, and a lifetime risk of ovarian cancer between 27-44%. In addition, mutations in BRCA1 gene have also been linked to various other tumors, e.g., proliferative breast disease (PBD), papillary serous carcinoma of the

[66] S Ayme´ & G Matthijs & S Soini, *supra* note 3.

peritoneum (PSCP), and prostate cancer."[67] This finding explains the importance of the BRCA1 genetic test inventions, which can help predict breast and ovarian cancers.

Given the widespread application of the BRCA1 inventions in medical practice, Myriad has obtained patents covering the BRCA1 gene and its use in the development of gene therapeutic and predictive medicine products, including "composition-of-matter" patents on the gene itself and "method-of-use" patents for the application of the BRCA1 in the therapeutic and diagnostic arenas.[68] Based on these patents, Myriad essentially has a monopoly over all ways of genetic testing for breast cancer and ovarian cancer. In addition, Myriad enforces its exclusive rights aggressively and seeks licensing agreements on unreasonable terms and conditions. For example, Myriad is principally unwilling to grant a license and requires the genetic testing be performed in its own laboratories in the U.S.[69] Even if few laboratories are allowed to perform tests, they are obligated to send the DNA samples obtained from high-risk individuals to Myriad.[70] Such a licensing condition, providing patient's samples, gives rise to concerns over improper violations of patients' privacy. Furthermore, Myriad demands unreasonable royalty and licensing fees. It is estimated that the initial family mutation searches performed by Myriad cost 2,400 U.S. dollars,[71] which is two to three times more than that charged by laboratories in Canada.[72] Also tests at French laboratories cost only 762 Euro and the bill charged by Myriad is three and a half times more expensive. Unreasonable royalties and fees mean additional expenditure on social and medical systems;[73] public health systems might therefore be undermined.

Nowadays, medically relevant genetic testing is regarded as an integral part of health service. It can significantly improve an individual's life quality due to knowledge of diseases and treatment options.[74] However, clinical laboratories and medical institutions are not free to make use of the patented genetic testing products and methods of diagnosis. Many biomedical laboratories have reportedly stopped using certain genetic tests

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[67] *See* Description of Large Deletions in Human BRCA1 Gene & Use Thereof, U.S. Patent No. 7,250,497 (filed June 9, 2003).
[68] RIMMER, *supra* note 16, at 188.
[69] Brian Goldman, *HER_2 Testing: The Patent "Genee" Is Out of the Bottle*, 176(10) CANADIAN MED. ASSOC. J. 1443, (2007).
[70] RIMMER, *supra* note 16, at 189. With the help of these samples, Myriad may build up its genetic data bank, which is an important resource for the follow-up research, like development in gene therapeutic methods or genomic medicine.
[71] RIMMER, *supra* note 16, at 189.
[72] Goldman, *supra* note 69.
[73] RIMMER, *supra* note 16, at 189.
[74] Soini et al., *supra* note 3.

because of high license costs.[75] Interests of patients might be harmed because they cannot afford the overcharged price of the BRCA1 genetic testing. It is noteworthy that the way Myriad enforces its BRCA1 related patents has stirred up strong public opposition, not only in Europe, but also in the U.S. Recently, the American Civil Liberties Union and a group of physicians, researchers and patients filed a lawsuit[76] in New York against Myriad's patents claiming it is denying genetic lifesaving tests. Plaintiffs challenge the unlawful monopoly owned by Myriad. They also contended that the U.S. patent policy of allowing the patenting of products of nature violates the First Amendment and Article 1, Section 8, Clause 8 of the U.S. Constitution.[77]

B. Negative Impacts Resulting from Patented Biomedical Inventions

Innovative biomedical inventions open up new fields of clinical practice, such as genetic testing and gene therapy. Affordable access to essential biomedical inventions is then indispensable, since it is of major importance for further development and implementation of public health. Nevertheless, genes and gene sequences are eligible subject matters of product patents in most industrial countries; and influences resulting from gene patents are extremely broad and powerful. Methods of medical treatment are not patentable in most countries, apart from that they are treated the same as other technical inventions in the U.S. and Australia. However, the example of the BRCA1 genetic testing patent points out the extremely manipulative strategy adopted by inventors, who can easily design around the explicit prohibition, by means of using the "appropriate and adequate" wordings in claims.[78] Not only Myriad but also other biomedical companies have obtained proprietary rights regarding medical methods related inventions. The patent on the HGF gene therapeutic method is another example.[79] In 2001, the USPTO granted the USP6,248,722 (medicament comprising HGF gene), and the procedural steps of the therapeutic treatment are subject matters of this patent. The two independent claims provide that:

> 1. A method for treating a disease in a subject for which

[75] Soini et al., *supra* note 3.

[76] Association for Molecular Pathology v. U.S. Patent & Trademark Office, 2009 WL 3614434 (S.D.N.Y.) (2009).

[77] J. Brett Busby et al., *United States: Chilling Assault on Personalized Medicine*, http://www.allbusiness.com/legal/trial-procedure-summary-judgment/12950260-1.html (last visited Mar. 15, 2010); Paula Reed Ward, *Patent Suit Challenges Limits over Cancer Test*, http://www.post-gazette.com/pg/09134/970055-84.stm (last visited Mar. 16, 2010).

[78] It is worth noting that the scope of the patent right, such as the BRCA1 genetic testing patents, differs from the U.S. to the EPO because of the wordings of claims.

[79] Ono, *supra* note 27, at 205.

HGF is effective, comprising administering intramuscularly to the subject an expression vector containing a HGF gene in a therapeutically effective amount.

5. A method for accelerating the growth of vascular endothelial cells in a desired target tissue in a subject without accelerating the growth of vascular smooth muscle cells, comprising administering intramuscularly to the subject an expression vector containing a HGF gene in a therapeutically effective amount.

In order to design around the prohibition from patenting therapeutic methods in Europe, the inventor then filed a patent application for a medical use invention. The claims of the EP0,847,757 (medicine comprising HGF gene) are as follows:

1. An HGF gene for use in a method of treatment of the human or animal body by therapy.

2. An HGF gene as claimed in claim 1 for use in the treatment of arterial disease or cartilage injury.

3. A liposome which contains an HGF gene, and which is a membrane fusion liposome fused to Sendai virus.

4. A liposome as defined in claim 3 for use in a method of treatment of the human or animal body by therapy.

5. A liposome which contains an HGF gene for use in a method of treatment of the human or animal body by therapy.

6. A liposome as claimed in claim 5 for use in the treatment of arterial disease or cartilage injury.

7. A pharmaceutical composition comprising a carrier or diluent and, as an active ingredient, a liposome as defined in claim 3 or an HGF gene.

8. Use of an HGF gene in the manufacture of a medicament for the treatment of arterial disease or cartilage injury.

9. Use of a liposome which contains an HGF gene in the manufacture of a medicament for the treatment of arterial disease or cartilage injury.

10. Use of a liposome as defined in claim 3 in the manufacture of a medicament for the treatment of arterial disease or cartilage injury.

Comparing the above-mentioned two patents on the HGF gene therapeutic method, the scope of the U.S. patent is obviously broader than the patent granted by the EPO. The U.S. patents covers any kind of procedural step consisting of the essential elements of the HGF gene and

therapeutic effects, regardless of the disease to which it is applied. However, the scope of the European patent extends solely to the process of treatment for arterial disease or cartilage injury. Nevertheless, the inventor is free to submit another patent application to the EPO if a new therapeutic effect is identified subsequently, namely a new medical use for treatment of a disease other than arterial disease and cartilage injury, such as diabetes or brain infarction. Eventually, the patentee of the HGF gene therapeutic method is entitled to exclude third parties from making use of this invention in the medical field, both in the U.S. and Europe.

In light of the manipulative patent practice in reality, it is then interesting to note that various biomedical inventions, not only genes, gene sequence, kits, medicines and medical devices but also methods of treatment for diseases, may be protected by patent right. Without any difficulty, inventors can obtain patents on biomedical inventions. Patent thicket and royalty stacking may limit the public's access to essential biomedical products and health care services. Negative impacts on implementation of public health might still be hampered by these patents, regardless of how hard most countries try to exclude medical methods from patent protection and provide physicians freedom to treat their patients.

C. Finding a Proper Balance Among Patentees and Patients

Biomedical industries' competitiveness would hardly be assured or be improved unless research results are protected by intellectual property rights. Biomedical inventions, which are derived from billions of dollars invested by biomedical industries, must be protected by authoritative patent rights to ensure a return on the investment in the R&D and the competitiveness of commercial end products. The patent system rewards innovation by allowing a patent holder to exclude others from using the patented process or technology. A patent holder can license or directly employ its patent and realize substantial economic gains. Following the reward system, an inventor is entitled to enlarge the scope of a patent right and to obtain a valuable patent in accordance with the patent law. Developing a proper patent strategy is also advisable in patent practice. However, after more and more biomedical inventions have been patented, including genes and methods of medical treatment, patent protection in turn becomes a new barrier to clinical practice. That is to say, when clinical laboratories and medical institutions make use of patented biomedical inventions, they have to seek authorization or licensing from patentees. This might lead to uncertainty or higher prices for the medical products. Moreover, the over-protection of patents and improper enforcement of patent rights might have negative impacts on the development of new products, the clinical diffusion and the use of innovative medical products.

Given this potential conflict between patent law and public health, rethinking and reconstructing the current patent protection for biomedical inventions have been under discussion in recent years. More and more people assert the necessity of introducing new policy measures, which might reasonably restrict patent rights regarding essential biomedical inventions. In fact, some European countries have tried to find solutions within the framework of the patent system. For example, in 2005, the Belgian Patent Act introduced a new compulsory license mechanism[80] for public health reason, in order to remedy possible access problems in the field of health care.[81] Also, a compulsory licensing for patents on diagnostic methods and products might be authorized, according to the draft amendment of Swiss Patent Act.[82] New approaches such as the establishment of clinical use exception,[83] or necessity doctrine[84] in patent law may be considered as well.

VI. CONCLUSION

Biotechnology has become the mainstream in this century and its research results have been applied to medical fields after the Human Genome Project was completed. Undoubtedly, patent law plays an indispensible role in stimulating the development of innovative biomedical products by offering an exclusive right as incentive for investing in

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[80] Compulsory licensing is a mechanism to force the patentee to grant a license to third parties. The authorization of compulsory licensing is only allowed under certain circumstances, as set out in Article 31 of the TRIPS Agreement and Article 76 of Taiwanese Patent Act.

[81] The new provision, Article 31bis of the Belgian Patent Act, provides that in the interest of public health, the King can grant a license for the exploitation and application of an invention protected by a patent for: a) a medicine, a medical appliance, a medical appliance or product for diagnosis, a derived or combinable therapeutic product; b) the process or product necessary for the manufacture of one or more products indicated under a); and c) a diagnostic method applied outside of the human or animal body. *See* Geetrui Van Overwalle, *The Implementation of the Biotechnology Directive in Belgium and Its After-Effects. The Introduction of a New Research Exemption and a Compulsory Licence for Public Health*, 37(8) INT'L REV. INTELL. PROP. & COMP. L. 889, 908-19 (2006).

[82] The draft amendment of Swiss Patent Act rules in Article 40(c) that the government may grant a compulsory licensing for patents on diagnostic methods and products to remedy a practice determined after judicial or administrative process to be anti-competitive. *See* Botschaft zur Änderung des Patentgesetzes und zum Bundesbeschluss über die Genehmigung des Patentrechtsvertrags und der Ausführungsordnung, Bundesblatt [Embassy of amending the Patent Act and the federal decision on the approval of the Patent Law Treaty and the Regulations, Federal Gazette], Nr. 1, (Jan. 10, 2006).

[83] The author asserts that a new mechanism of clinical use exception may deal with the negative effects resulting from the patented genetic testing products. *See also* Michele Westhoff, *Gene Patents: Ethical Dilemmas and Possible Solutions*, 20(4) HEALTH LAW 1, 9-10 (2008); Leisa Talbert Peschel, *Revisiting the Compromise of 35 U.S.C. § 287(c)*, 16(2) TEX. INTELL. PROP. L. J. 299, 311-19 (2008).

[84] Todd Martin, *Patentability of Methods of Medical Treatment: A Comparative Study*, 82(6) J. PAT. & TRADEMARK OFF. SOC'Y 381 (2000); Nichols, *supra* note 28, at 260-261.

expensive and long-term research. A patent enables the creation of economic wealth and competitiveness. It can be used not only in making and selling products but also as a marketing tool for the next financing round, and then ensure a return on dollars invested in R&D.[85] For instance, a patent holder can receive royalties by virtue of licensing or obtain an investment by venture capital. Therefore, it is advisable that undertakings pursue patent protection once an invention is created,[86] as well as develop an actively systematic patent strategy.[87] However, the widespread pursuit of patents for biomedical innovations, especially patents on biomedical methods, has aroused strong public opinion in recent years.

Indeed, patent thicket and royalty stacking necessitate striking a proper balance among the interests of patentees and patients. As demonstrated by the BRCA1 patents, the biomedical industries often adopt manipulative patent strategies that harm patients and the health care system at large. Based on the foregoing and the growing number of biomedical inventions, there is a need for a comprehensive review the patent law, to reconsider whether and how patent law shall be changed in a way that enhances both innovation and public health in the biomedical arena.

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[85] PETER HUCH, DIE INDUSTRIEPATENTABTEILUNG [INDUSTRY PATENT DEPARTMENT], S. 3, 58 (2d ed., 2001).

[86] Alexander J. Wurzer, Patentmanagement [Patent Management], S. 17 (2004); H. Jackson Knight, Patent Strategy 86 (2d ed. 2001).

[87] HUCH, *supra* note 8585, at S. 38 f.

REFERENCES

Books

BENKARD, GEORG (2006), PATENTGESETZ, GEBRAUCHSMUSTERGESETZ [PATENT ACT, UTILITY LAW], 10th ed.

GRUBB, PHILIP W. (2005), PATENTS FOR CHEMICALS, PHARMACEUTICALS AND BIOTECHNOLOGY: FUNDAMENTALS OF GLOBAL LAW, 4th ed.

HUCH, PETER (2001), DIE INDUSTRIEPATENTABTEILUNG [INDUSTRY PATENT DEPARTMENT], 2d ed.

JAPAN PATENT OFFICE (2005), EXAMINATION GUIDELINES FOR PATENT AND UTILITY MODEL IN JAPAN.

KNIGHT, H. JACKSON (2001), PATENT STRATEGY, 2d ed.

KRAßER, RUDOLF (2004), PATENTRECHT: EIN LEHR – UND HANDBUCH ZUM DEUTSCHEN PATENT – UND GEBRAUCHSMUSTERRECHT, EUROPÄ ISCHEN UND INTERNATIONALEN PATENTRECHT [PATENT LAW: A TEACHING - AND MANUAL OF GERMAN PATENT - AND UTILITY MODEL RIGHTS, EUROPEAN AND INTERNATIONAL PATENT LAW], 5th ed.

MUELLER, JANICE M. (2006), AN INTRODUCTION TO PATENT LAW, 2d ed.

RIMMER, MATTHEW (2008), INTELLECTUAL PROPERTY AND BIOTECHNOLOGY: BIOLOGICAL INVENTIONS.

SCHULTE, RAINER & RAINER MOUFANG (eds.) (2005), PATENTGESETZ MIT EUROPÄ ISCHEM PATENTÜ BEREINKOMMEN: KOMMENTAR AUF DER GRUNDLAGE DER DEUTSCHEN UND EUROPÄ ISCHEN RECHTSPRECHUNG [PATENT LAW WITH THE EUROPEAN PATENT CONVENTION: COMMENTARY ON THE BASIS OF GERMAN AND EUROPEAN LAW], 7th ed.

THOMAS, JOHN R. (2005), PHARMACEUTICAL PATENT LAW.

WURZER, ALEXANDER J. (2004), PATENTMANAGEMENT.

Articles/Shorter Works in Collection

Goldman, Brian (2007), *HER_2 Testing: The Patent "Genee" Is Out of the Bottle*, 176 (10) CANADIAN MEDICAL ASSOCIATION JOURNAL 1443.

Katopis, Chris J. (1997), *Patients v. Patents?: Policy Implications of Recent Patent Legislation*, 71 SAINT JOHN'S LAW REVIEW 329.

Meier, Bradley J. (1997), *The New Patent Infringement Liability Exception for Medical Procedures*, 23 JOURNAL OF LEGISLATION 265.

Mitnovetski, O. & D. Nicol (2004), *Are Patents for Methods of medical Treatment Contrary to the* Ordre Public *and Morality or "Generally Inconvenient"?*, 30 JOURNAL OF MEDICAL ETHICS 470.

Martin, Todd (2000), *Patentability of Methods of Medical Treatment: A Comparative Study*, 82(6) JOURNAL OF THE PATENT AND TRADEMARK OFFICE SOCIETY 381.

Nichols, Steven L. (1997), *Hippocrates, the Patent-Holder: The Unenforceability of Medical Procedure Patents*, 5 GEORGE MASON

LAW REVIEW 227.
Ono, Nahoko (2006), *Better than Nothing: Japan's Next Move on Patentability of Medical Methods*, 37(2) INTERNATIONAL REVIEW OF INTELLECTUAL PROPERTY AND COMPETITION LAW 196, *available at* http://www.ip.mpg.de/ww/en/pub/organization/services/editorialoffices/info/content7211.cfm.
Overwalle, Geetrui Van (2006), *The Implementation of the Biotechnology Directive in Belgium and Its After-Effects. The Introduction of a New Research Exemption and a Compulsory Licence for Public Health*, 37(8) INTERNATIONAL REVIEW OF INTELLECTUAL PROPERTY AND COMPETITION LAW 889.
Peschel, Leisa Talbert (2008), *Revisiting the Compromise of 35 U.S.C. § 287 (c)*, 16(2) TEXAS INTELLECTUAL PROPERTY LAW JOURNAL 299.
Reisman, Joseph M. (1995), *Physicians and Surgeons as Inventors: Reconciling Medical Process Patents and Medical Ethics*, 10 HIGH TECH LAW JOURNAL 355.
Soini, Sirpa et al. (2008), *Patenting and Licensing in Genetic Testing: Ethical, Legal and Social Issues*, 16 EUROPEAN JOURNAL OF HUMAN GENETICS S10, *available at* http://www.nature.com/ejhg/journal/v16/n1s/index.html.
Straus, Joseph & Karolina Herrlinger (2005), *Zur Patentierbarkeit von Verfahren zur Herstellung individuumspezifischer Arzneimittel* [*The patentability of methods for producing individual-specific drug*], GEWERBLICHER RECHTSSCHUTZ UND URHEBERRECHT INTERNATIONALER TEIL 2005.
Tzen, Chin-yuan (2008), *Fen Tzu Chi Yin Chien Tse Pi Hsu Mien Tui Te Wen Ti* [*The Challenge of Molecular Genetic Tests*], 1(2) BIOMEDICINE 109.
Westhoff, Michele (2008), *Gene Patents: Ethical Dilemmas and Possible Solutions*, 20(4) HEALTH LAWYER 1.

Cases

Association for Molecular Pathology v. U.S. Patent & Trademark Office, 2009 WL 3614434 (S.D.N.Y.) (2009).
Ex parte Scherer, 103 U.S.P.Q. 107 (PTO Bd. 1954).
Pallin v. Singer, 36 U.S.P.Q.2d (BNA) 1050 (D. Vt. 1995).

Treaty

Convention on the Grant of European Patents, 13 I.L.M. 268 (November 29, 2000).
Agreement on Trade Related Aspects of Intellectual Property Rights, April 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 3, Legal Instruments – Results of the Uruguay

Round, 33 I.L.M. 1125 (1994).

Constitution and Statutes

Chuan Li Fa [Patent Act] (2003) (R.O.C.).
Patentgesetz [PatG][Patent Act], December 16, 1980, BGBl. 1981 I at 1-25 (F.R.G.).
UNITED STATES CONSTITUTION.

Internet and Other Sources

All business, http://www.allbusiness.com/legal/trial-procedure-summary-judgment/12950260-1.html.
Breast and Ovarian Cancer Genetic Screening, http://www.pamf.org/health/guidelines/geneticscreening.html.
Busby, J. Brett et al. (September 10, 2009), *Chilling Assault on Personalized Medicine*, http://www.mondaq.com/article.asp?articleid=85778&email_access=on.
Chung Hua Min Kuo Chuan Li Tzu Tsun Chien So Hsi Tung [Taiwan Patent Information Search], http://twpat2.tipo.gov.tw/twcgi/twpat2?30:960706019:0:::@@160286.
European Patent Office, Guidelines for Examination in the EPO, *available at* http://www.epo.org/patents/law/legal-texts/guidelines.html.
U.K. Intellectual Property Office, Examination Guidelines for Patent Applications relating to Medical Inventions (August 2008).
USPTO Patent Full-Text and Image Database, http://patft.uspto.gov/netahtml/PTO/srchnum.htm.
Ward, Paula Reed, *Patent Suit Challenges Limits over Cancer Test*, http://www.post-gazette.com/pg/09134/970055-84.stm.

U.S. Patents

U.S. Patent No. 4,955,891 (filed October 22, 1987).
U.S. Patent No. 5,080,111 (filed June 28, 1990).
U.S. Patent No. 5,167,620 (filed January 22, 1992).
U.S. Patent No. 5,403,306 (filed June 22, 1993).
U.S. Patent No. 5,480,396 (filed December 9, 1994).
U.S. Patent No. 5,520,679 (filed March 25, 1994).
U.S. Patent No. 5,693,473 (filed June 7, 1995).
U.S. Patent No. 5,709,999 (filed June 7, 1995).
U.S. Patent No. 5,710,001 (filed June 7, 1995).
U.S. Patent No. 5,753,441 (filed January 5, 1996).
U.S. Patent No. 6,030,832 (filed November 21, 1997).
U.S. Patent No. 6,162,897 (filed May 2, 1997).

U.S. Patent No. 6,280,450 (filed July 23, 1998).
U.S. Patent No. 7,052,853 (filed August 21, 2003).
U.S. Patent No. 7,250,497 (filed June 9, 2003).
U.S. Patent No. 7,374,884 (filed May 13, 2004).
U.S. Patent No. 7,528,169 (filed June 26, 2003).
U.S. Patent No. 7,585,464 (filed October 30, 2003).
U.S. Patent No. 7,612,168 (filed August 26, 2005).
U.S. Patent No. 7,615,780 (filed June 29, 2006).
U.S. Patent No. 7,625,870 (filed January 05, 2006).
U.S. Patent No. 7,629,180 (filed November 28, 2006).