

Biotechnology and its effects on the pharmaceutical industry

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Abstract---Biotechnology is widely regarded as a central pillar of agricultural production, industrial development, and modern medicine. It is expected to provide a fundamental scientific basis for addressing some of the most pressing challenges facing humanity in the contemporary era. Although its origins can be traced back several centuries, biotechnology has acquired particular significance in the modern period, which may rightly be described as a distinctly biological age. At its core, biotechnology is primarily concerned with two fundamental domains: food production and medical treatment. Its medical applications began in the mid-twentieth century with the production of antibiotics and pharmaceutical drugs, before expanding to include genetic engineering, recombinant DNA technology, the manipulation and transfer of genetic codes in animals, and gene therapy. Biotechnology is one of the most promising scientific fields for the development of more effective treatments and vaccines against complex and life-threatening diseases, including cancer and immunodeficiency disorders. Nevertheless, despite its considerable benefits for human health and well-being, biotechnology also raises significant legal, ethical, and socio-economic concerns. These include the potential imbalance between inherited biological characteristics and acquired technological interventions, as well as the unequal distribution of benefits between developed and developing countries. This study therefore examines the prospects of biotechnology in the pharmaceutical industry and analyzes its implications for developing countries.

Keywords---pharmaceutical industry, biotechnology, food, medicine, monopoly.

Introduction

The pharmaceutical industry initially emerged from the practices of pharmacists, who prepared medicinal compounds on a limited scale, before gradually evolving into large-scale industrial

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production, particularly after the Second World War. This transformation was driven by the growing global demand for medicines, especially in response to the emergence of new diseases and changing patterns of illness. Human societies have faced increasingly complex health challenges as a result of environmental pollution, disasters, and the spread of epidemics, all of which have intensified the need for innovative therapeutic solutions. These developments encouraged pharmaceutical companies to expand research and production in order to respond to urgent medical needs. Nevertheless, because pharmaceutical products are directly linked to public health, concerns over monopoly, excessive pricing, and the exploitation of patients' need for treatment long remained major obstacles to strengthening legal protection for such products.

The economic importance of the pharmaceutical industry has increased significantly due to rising global demand and the expansion of investment by pharmaceutical companies, particularly in developed countries. These companies have increasingly sought legal protection for pharmaceutical products in a manner comparable to other inventions resulting from human intellectual effort. Such protection is commonly justified as a reward for inventors and innovators, in recognition of their scientific creativity and their contribution to addressing major health problems, especially fatal and incurable diseases.

Within this context, and with the support of developed countries, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) emerged as a key international legal instrument governing intellectual property protection. The inclusion of pharmaceutical products within the scope of this Agreement had significant legal and economic consequences, as its provisions are binding on all member states of the World Trade Organization. These provisions include mechanisms for enforcement, as well as sanctions and financial penalties against infringers. Among the most important rules introduced by the TRIPS Agreement is the protection of product patents, including pharmaceutical products, for a minimum period of twenty years.

In light of the foregoing, the pharmaceutical industry may be regarded as both a vital and strategic sector, given its direct relationship with human health. At the same time, it is a field that requires long-term research, advanced scientific expertise, intellectual effort, and substantial financial investment. This raises several important questions: What are the most significant applications of biotechnology in pharmaceutical manufacturing? To what extent has biotechnology contributed to combating incurable and life-threatening diseases that have affected humanity throughout history? What are the future prospects of the pharmaceutical industry under the influence of biotechnology, particularly in view of the technological gap between developed and developing countries and the unequal access of vulnerable populations to advanced medical techniques?

On this basis, the present study examines whether biotechnological techniques have contributed to the development of effective methods of treatment and prevention against fatal diseases, thereby representing a benefit for humanity as a whole, or whether their monopolization and unequal distribution may transform them into instruments of biological, economic, and technological domination over the poorest populations of the world.

To address this problematic issue, the study is divided into two main sections:

Applications of biotechnology in the field of medicine (Section One).

Future prospects of the pharmaceutical industry under biotechnology (Section Two).

Section One: Applications of Biotechnology in the Field of Medicine

The applications of biotechnology represent one of the most significant scientific developments of the modern era¹, as they are directly related to living organisms and have contributed to finding solutions

¹ Maurice Cassier, *Pharmaceutical Patents and Public Health in France: Opposition and Specific Mechanisms for the Appropriation of Medicines between 1791 and 2004*, ESKA Editions / *Entreprises et Histoire*, 2004/2, No. 36, p. 39.

for diseases that once led human beings to death. The present age is, without dispute, the age of biology par excellence². On this basis, this section first examines general concepts related to biotechnology as an introduction to the subject, and then presents practical examples of inventions resulting from biotechnology in the field of medicine.

It should be noted that the medicine addressed in this study refers to medicines resulting from biotechnology-related inventions; that is, all pharmaceutical inventions connected to living organisms, such as plants, animals, or even organs of the human body, rather than chemical or industrial medicines. In general terms, the focus is on biological medicine. This will be explained through two points: general concepts related to biotechnology (First), and examples of inventions related to biotechnology in the field of medicine (Second).

First: General Concepts Related to Biotechnology

Biotechnology, biotechnics, or biological technology are several terms used to refer to a single concept³ associated with living organisms and the inventions derived from them through applications based on scientific principles, with the aim of obtaining a product or a manufacturing method intended to improve human life in the fields of food and health.

Biotechnology, biotechnics, or biological technology may also be understood as the methods applied to living organisms in order to obtain a product, whether for commercial or industrial use. It is, therefore, a technology grounded in biology and encompasses several fields, the most important of which, without exception, is health and pharmaceutical manufacturing.

It may also be defined as a set of techniques based on biological principles and applications. These techniques include the biological dimensions of human and economic development in the fields of medicine, pharmacy, and public health, such as the production of enzymes, serums, hormones, and other proteins and medicines generally produced through genetic engineering methods.⁴ These techniques and their applications have contributed to the development of research and discoveries related to genes, hereditary factors, immunology, biochemistry, cellular sciences, tissue sciences, and other related fields. This has led, and is expected to continue leading, to significant progress in the discovery and treatment of many diseases, as well as in improving the quality of many pharmaceutical products.⁵

² Dana Hama Baqi Abdul Qadir, *Intellectual Property Rights Related to New Plant Varieties and Pharmaceutical Products*, Dar Al-Kutub Al-Qanounia and Dar Shatat for Publishing and Software, Egypt, 2011, p. 203.

³ Biotechnology is “the use of microorganisms or biochemical reactions to manufacture products or develop useful processes.” See Bill Indge, *Biology from A to Z: 1100 Entries, Examples, and Advice for Revision*, new presentation 2007, Dunod, Paris, 2004, p. 39.

⁴ Engineering refers to design, planning, and implementation in order to reach a specific construction or structure that serves defined objectives. As for genetics and heredity, they concern the study of the causes of similarity and variation among different living organisms resulting from the action of genetic material. See, in this regard, Muhammad Lotfi Abdel Fattah, *Criminal Law and the Uses of Biotechnology: A Comparative Study*, 1st ed., Dar Al-Fikr wa Al-Qanoun, Mansoura, Egypt, 2012, pp. 26–27. In this regard, it has been stated that genetic engineering—which is the most commonly used term in the field of biotechnology—refers to the set of technical methods used in the field of biotechnology. The word “technology” is expressed using the term “technics,” whereas laboratory and technical methods, or “techniques,” are referred to using the term “technique.” Abdel Rahim Antar, *Patents and the Criteria for Their Protection*, Dar Al-Fikr Al-Jami‘i, Alexandria, Cairo, 2009, p. 111. Genetic engineering is “a field of biotechnology that carries out the modification of the genetic material of an organism. Genetic engineering is a rapidly expanding branch of biology and is now used for the manufacture of a wide range of useful substances.” See *Biology from A to Z: 1100 Entries, Examples, and Advice for Revision*, op. cit., p. 121.

⁵ Abdul Malik Abdullah Yahya Abu Dunya, *Biotechnology or Biological Biotechnology*, article published in the *Yemen Medical Journal*, dated August 21, 2017.

Second: Examples of Inventions Related to Biotechnology in the Field of Medicine

Biotechnology is regarded as offering a promising future for the treatment of diseases, as its applications involve biological materials derived from living organisms, such as animal serums, plants known for their therapeutic properties, or even cells from the human body. For example, biotechnology has contributed to the treatment of serious diseases such as AIDS, Alzheimer's disease, diabetes, cancer, arthritis, and other chronic diseases for which medicine remains unable to develop fully effective treatments.

In 1982, the first drug formulated according to the principles of biotechnology was introduced, namely insulin. At present, more than one hundred medicines have been developed in recent years on the basis of this technology. In addition, more than 350 clinical studies are still being conducted worldwide to develop and test medicines whose manufacture depends on the principles of biotechnology. Biotechnology-derived drugs and vaccines have helped more than 250 million people worldwide.⁶ Biological medicines may be defined as follows:⁷ "They are the product of living cells whose source is either human, animal, or microbial, and which are usually composed of large molecules, unlike conventional medicines, which consist of small molecules and are manufactured through chemical processes."

The applications of biotechnology, through the major transformation they have brought about and continue to generate in the pharmaceutical industry, medical treatment, and the understanding of human and animal genetic and hereditary structures, are likely to become, in the near future, a key criterion for assessing progress in any country⁸. Biotechnology has contributed to the expansion of the pharmaceutical trade and has opened broad opportunities for international investment in countries rich in biodiversity, thereby increasing its economic importance from a commercial perspective. For example, the use of venom in pharmaceutical manufacturing has made the snake belonging to the genus *VIPRA*, particularly the species *V. BERUS*, an economically valuable species, since the value of 10 grams of its venom has been estimated at approximately 100,000 dollars. This makes it a significant economic resource for the country in which it is found. According to recent statistics, the value of the global market for medicines extracted from genetic sources has reached 75.150 dollars annually.

Biotechnology has also opened the field of investment to major international companies. EXTRACTA, a company specializing in scientific research, concluded a partnership agreement with the British multinational company GLAXO SMITH KLINE, which owns 142 factories in 41 countries. Within this framework, 4 billion dollars were invested in research related to biodiversity in Brazil.⁹

Biotechnology has played a significant role in developing and activating the pharmaceutical market through the production of medicines for diseases that were previously difficult to treat, either by converting plant sources into medicines after chemical processing or by using bacteria, such as converting threonine from porcine insulin into alanine, an amino acid found in human insulin. Biotechnology therefore occupies an important position in the pharmaceutical industries¹⁰, to the extent

⁶ Abdul Malik Abdullah Yahya Abu Dunya, *Ibid*.

⁷ Examples of biological medicines include: human growth hormone and human insulin. For further details in this regard, see Abdul Malik Abdullah Yahya Abu Dunya, *Ibid*.

⁸ See Marcelo D. Varela, "The World Trade Organization, Patents, Medicines, and the North-South Relationship: A Southern Perspective," *De Boeck Université, International Review of Economic Law*, 2004/1, Vol. XVIII, No. 1, pp. 104 ff. Special situations concerning pharmaceutical products.

⁹ Al-Ayeb Jamal, *Biodiversity as a Dimension in International Law and International and Algerian Efforts to Protect It*, thesis submitted for the Magister degree in International Law and International Relations, Faculty of Law, Ben Aknoun, Algeria, 2005, pp. 27-28.

¹⁰ Hanan Mahmoud Kawtharani, *Legal Protection of Patents under the Provisions of the TRIPS Agreement: A Comparative Study*, 1st ed., Al-Halabi Legal Publications, Beirut, Lebanon, 2011, p. 33. See also, for further clarification, BERRI Nouredine, *The Legal Protection of Biotechnological*

that research in biotechnology is often responsible for developing the substances and preparations suitable for the manufacture of pharmaceutical products.

This is also achieved through genetic engineering, by detecting changes occurring in genes associated with certain diseases and disabilities. Scientists have been able to develop a genetic map containing all data related to diseases such as cancer, diabetes, and congenital malformations. This makes it possible to identify appropriate medicines for these diseases, as well as enzymes and antibiotics derived from viruses and bacteria, such as interferon, which is used to treat viral infections, including “hepatitis.”¹¹

Charles Arntzen is considered the first to adopt the idea of genetically engineering plants to produce edible sera and vaccines by inserting them into vegetables and fruits using genetic engineering techniques. Successful practical experiments were conducted to generate immune improvements against *E. Poelo* bacteria in humans using a serum derived from genetically modified potatoes.

These results were published in 1998. It has been possible to produce no fewer than 250 medicines using genetic engineering techniques, whereas those responsible for their production were unable to produce them through conventional methods.¹²

Section Two: Future Prospects of the Pharmaceutical Industry under Biotechnology

Scientists have been able to use biotechnological techniques in various fields, including the pharmaceutical industry, whether through the introduction of natural genetic materials, disease-detection methods, gene therapy, forensic medicine, or the establishment of lineage. The medical applications of biotechnology have contributed to reducing human suffering, correcting genetic or hereditary defects in certain organs that do not perform their functions properly, and treating hereditary diseases.

However, a central question arises: in which direction are these techniques leading humanity? How far can their development extend, and what are their future prospects? Ultimately, these products are inventions that may obtain patents from the competent authority, and a patent is both a privilege granted to its holder and a form of monopoly. Conversely, most patents originate from genetic resources and traditional knowledge inherited by peoples over time, such as folk medicine. This therefore constitutes a depletion of the biological resources of developing countries.¹³

Moreover, the more technology advances and accelerates in developed countries, the wider the gap becomes between them and developing countries. This has resulted in two major effects. The first is reflected in the monopoly over the original pharmaceutical product, through the most important agreement in this regard, which embodies the clear monopoly and exploitation of developing countries, namely the Agreement on Trade-Related Aspects of Intellectual Property Rights, known briefly as “TRIPS,” and its consequences for their health situation. The second is reflected in the depletion of the biological resources and traditional knowledge of developing countries. This will be clarified through the following two points: the monopoly over the original pharmaceutical product (First), and the depletion of the biological resources of developing countries (Second).

Inventions, dissertation submitted for the Magister degree in law, business law, University of Tizi-Ouzou, Faculty of Law, 2004–2005.

¹¹Al-Ayeb Jamal, *Ibid*, p. 27; see also Al-Kawtharani, *Ibid*, p. 33 ff.

¹²Nasr Abu Al-Fotouh Farid Hassan, *Protection of Intellectual Property Rights in the Pharmaceutical Industries: A Comparative Study*, New University Publishing House, Alexandria, 2007, pp. 189–190.

¹³See, in this regard, Reem Saud Samawi, *Patents in the Pharmaceutical Industries*, Dar Al-Thaqafa, Amman, 2009, pp. 110–111.

First: Monopoly over the Original Pharmaceutical Product

The TRIPS Agreement is considered the most important agreement within the framework of the World Trade Organization¹⁴. Along with American law, it gave legitimacy to patents and, consequently, protection to products resulting from biotechnology¹⁵, particularly those related to pharmaceutical products.¹⁶ This agreement was followed by events and clashes between the interests of developed and developing countries. Among the issues it addressed, and which generated considerable controversy, particularly for developing countries, was the issue of patents, their conditions, and the manner in which they are protected. The TRIPS Agreement included several provisions relating to patents. In this regard, a patent is considered the certificate granted by the state to the inventor as a reward for embodied intellectual effort, provided that the invention is capable of industrial application, whether it takes the form of a final product or a manufacturing process.

The TRIPS Agreement granted protection to pharmaceutical patents and expanded the scope within which patents may be granted¹⁷. In other words, patents are granted in all fields of technology; by implication, patents may even be granted for living organisms, in accordance with Article 27 of the Agreement. The latter therefore expanded, to the greatest possible extent, the legal protection granted to innovations, as it allowed patents to be obtained for any inventions, whether products or industrial processes, in all fields of technology. This raises questions about the fate of developing countries that do not possess technology or industrial capacity, especially when the matter concerns vital fields such as health, medicine, and food. ¹⁸Accordingly, these inventions may turn from a blessing from which humanity benefits into a curse, a monopoly, and a means of exploiting peoples, particularly developing and poor countries that are unable to possess manufacturing capacity or innovate pharmaceutical products.

For example, in the case of medicines, the Agreement permitted the granting of a patent for the product itself, and not merely for its method of manufacture. This means that a medicine protected by a patent becomes subject to monopoly for a minimum period of 20 years. In addition, it is sold at very high prices, and the countries that need it are required to pay for its intellectual property rights. Most Arab legislations prohibit the granting of patents for the product itself, because investment in product patents leads to higher prices, which in turn harms public health and contributes to the spread of incurable diseases. Given the research-based nature of the pharmaceutical industry, it cannot withstand

¹⁴See Marcelo D. Varella, "The World Trade Organization, Patents, Medicines, and the North-South Relationship: A Southern Perspective," op. cit., p. 88. See also, in this regard, Sharifa Najem, *Protection of Pharmaceutical Materials in Comparative Law and International Agreements*, Dar Al-Khaldounia, Algeria, 2009, p. 132 ff.

¹⁵Ajja Al-Jilali, *Crises of Intellectual Property Rights: A Crisis of Right, a Crisis of Law, or a Crisis of Access to Knowledge?*, Dar Al-Khaldounia, Algeria, 2012, p. 134 ff.

¹⁶Jalal Wafaa Mohammadin, *Legal Protection of Industrial Property under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)*, New University Publishing House, Egypt, 2004, p. 25. See also Mahmoud Mohy El-Din Muhammad Al-Jundi, *Patents and the Pharmaceutical Industry under Egyptian Law and the TRIPS Agreement*, Dar Al-Nahda Al-Arabiya, Cairo, 2014, p. 95. See also Nasr Abu Al-Fotouh, Op. cit, p. 95.

¹⁷Muhammad Hassan Abdel Majid Al-Haddad, *International Mechanisms for the Protection of Industrial Property Rights and Their Economic Impact: A Comparative Study with Islamic Sharia*, Dar Al-Kutub Al-Qanounia, Dar Shatat for Publishing and Software, Egypt, 2011, p. 199.

¹⁸Intellectual property law has been diverted from a purpose that serves human progress and creativity. These rights have become a tool for exercising political pressure on developing countries, which have believed the illusion that patents contribute to the promotion of creativity and invention, and that their absence is the cause of the backwardness of developing countries. For further details in this regard, see Ajja Al-Jilali, Op. cit, pp. 137–138.

external competition without effective protection rights. This has led to the need to implement a protection system through the TRIPS Agreement.¹⁹

Patent rights resulting from pharmaceutical research and development activities require protection as inventions, whether products or industrial processes, in all fields of technology, provided that they are new, involve an inventive step, and are capable of industrial application. This results in a monopoly over the products derived from them²⁰. This is also what international organizations, under the sponsorship of multinational companies, seek to achieve, as these companies in turn monopolize the global pharmaceutical industry by registering patents to protect their intellectual property rights. The minimum term of protection is 20 years from the date of filing the patent application, during which others are prevented from infringing upon these rights until the expiry of the protection period.

In this regard, states that have acceded to the TRIPS Agreement must amend their domestic legislation in order to bring it into conformity with the provisions of the Agreement, since one of its most important principles is that it must either be accepted as a whole or rejected as a whole.²¹

It is worth noting that, when the TRIPS Agreement tightened the restrictions imposed on member states by obliging them to grant patents for any invention, in any field, without restrictions or controls, it nevertheless introduced certain exceptions in paragraphs 2 and 3 of Article 27. These exceptions appear to reflect legitimate purposes, as they are limited to preserving morality and protecting the health and safety of humans, animals, and plants. However, they also open another field of legal disagreement because they rely on broad and imprecise terms, such as public order and the protection of human, animal, or plant life or health. The legal meaning of these concepts differs from one state to another; what the legal system of one state considers to fall within public order or morality may not be regarded as such by the legal system of another state.

What may be observed, however, is that biotechnology has contributed significantly to the pharmaceutical industries, yet it has also transformed medicine into a commodity like other products derived from this technology. In this case, however, the matter has serious consequences, because it makes treatment subject to monopoly and prevents others from using it except with authorization from the inventor; otherwise, they may face sanctions on the basis of intellectual property rights. Thus, intellectual property rights have become more of a burden than a form of protection for creativity. Another serious consequence is the widening of the gap between developed countries, which are most often the owners of this technology, and other countries.

Second: Depletion of the Biological Resources of Developing Countries

No one denies the role played by biotechnology in several fields. However, the natural resources underlying biotechnological patents originate in developing countries, from animals and plants that are used and exploited by developed countries within the framework of contracts known as bioprospecting contracts. These contracts often result in the piracy of biological resources, or what is known as biopiracy. This causes significant harm to developing countries, which are known for their richness and abundance in biological resources and biodiversity.²² On the one hand, developing countries sell these resources without receiving fair compensation; on the other hand, these same countries later purchase the resulting products at the highest prices. Biopiracy occurs through the use of intellectual property

¹⁹Samia Lahoul, "The Impact of the Expiry of Patents for Original Medicines on the Trends of the Global Pharmaceutical Market," article published in the *Algerian Journal of Economic Development*, Issue 03, December 2015, p. 02.

²⁰See Maurice Cassier, *Pharmaceutical Patents and Public Health in France: Opposition and Specific Mechanisms for the Appropriation of Medicines between 1791 and 2004*, op. cit., p. 30.

²¹See, in this regard, Reem Saud Samawi, *Patents in the Pharmaceutical Industries*, Op. cit, p. 105 ff.

²²Martin Khor, *Intellectual Property: Biodiversity and Sustainable Development—Resolving Difficult Issues*, translated into Arabic by Prof. Dr. Al-Sayyid Ahmed Abdel Khaleq and Prof. Dr. Ahmed Badi' Balih, Dar Al-Mareekh Publishing, Riyadh, Saudi Arabia, 2004, p. 35.

systems to legitimize exclusive ownership and control over biological resources, biological products, and their methods of production.

The attempt to obtain patents over biodiversity and knowledge derived from the innovations, creativity, and inherited practices of Third World peoples constitutes a form of biopiracy. Piracy-based patents involve a denial of the innovation embedded in indigenous knowledge. The rush by the governments and companies of industrialized countries to grant patents and reward inventors has led to the neglect of the collective and cumulative innovations developed by rural communities over several centuries²³. It is the companies of developed countries that practice biological or biotechnological piracy through their efforts to appropriate the biodiversity and indigenous knowledge of developing countries.²⁴

This form of piracy continues to increase in the absence of effective protection systems for such diversity and knowledge, particularly due to the low level of expenditure on scientific research²⁵. According to estimates, this level of expenditure reaches only 4%.

The TRIPS²⁶ Agreement is considered the instrument that gave legitimacy to this type of patent over living organisms.²⁷ It imposed the globalization of the American model of intellectual property rights, resulting in the expansion of patents into the realm of nature, including living organisms such as plants, animals, and cells from the human body, as well as the knowledge possessed by peoples concerning medicinal herbs.

Intellectual property law has thus been diverted from a purpose intended to serve human progress and creativity toward a purpose aimed at appropriating the natural and genetic resources of human beings. These rights have become a tool for exercising political pressure on developing and poor countries, and a means of reinforcing the advantages enjoyed by the industries of major powers.

It is therefore misleading to believe that patents are a means of creating knowledge, because the essence of a patent is secrecy for a period of 20 years, during which others are prevented from exploiting it. Indeed, even access to it may be considered a crime, to the extent that the American legislator linked it to national security, as in the case of the crime of economic espionage under the 1996 law, where espionage was defined as “a violation of intellectual property rights,” and those who violate such rights may be punished by 14 years of imprisonment and a fine of 10 million US dollars.²⁸

Accordingly, developing countries have accepted the assumption that patents contribute to promoting creativity and invention²⁹, and that their absence is the reason for their underdevelopment. This has resulted, on the one hand, in the widening of the technological gap between them and developed

²³Vandana Shiva, *Intellectual Property Rights: Protection or Plunder?*, translated into Arabic by Prof. Dr. Al-Sayyid Ahmed Abdel Khaleq, revised by Prof. Dr. Ahmed Badi' Balih, Dar Al-Mareekh Publishing, Riyadh, Saudi Arabia, 2005, p. 79.

²⁴See, for further clarification, Frédéric Thomas, “Biodiversity, Biotechnology, and Traditional Knowledge: From the Common Heritage of Humanity to ABS (Access to Genetic Resources and Benefit-Sharing),” Armand Colin, *Revue Tiers Monde*, 2006/4, No. 188, pp. 825–842.

²⁵Al-Sayyid Ahmed Abdel Khaleq, *Protection of Intellectual Property Rights under the TRIPS Agreement and Economic Legislation*, Dar Al-Fikr wa Al-Qanoun, Ru'ya Foundation Press, Cairo, 2011, p. 132 ff.

²⁶Marcelo D. Varella, “The World Trade Organization, Patents, Medicines, and the North-South Relationship: A Southern Perspective,” op. cit., p. 02.

²⁷Ajja Al-Jilali, Op. cit, pp. 134–135.

²⁸Ajja Al-Jilali, Ibid, p. 138.

²⁹From the invasion of lands through colonialism to the invasion of minds through the myth of technology transfer: in the past, lands were subject to privileges, until this shifted toward intellectual rights, which outwardly became a privilege granted to the owner of the idea, while in practice constituting a monopoly for the beneficiary. In most cases, developing and poor countries are the ones subjected to monopoly under the pretext of technology transfer and the protection of intellectual rights against infringement, in exchange for encouraging creativity and the development of science. No one denies that technology has improved human living conditions; however, at the same time, it has become a burden for other peoples who have not even been able to secure basic needs such as food and medicine.

countries, and, on the other hand, in the loss of their biological diversity, traditional knowledge, and folk medicine known for generations.

Conclusion:

It is widely acknowledged that inventions generate substantial benefits for society, particularly in the biological sciences, where they contribute to the development of solutions and treatments for previously intractable diseases. They also play a significant role in the food sector by improving both the quality and productivity of agricultural products. Moreover, investment in inventions and pharmaceutical industries is a high-risk undertaking that requires sustained effort, long-term research, and considerable financial resources. For this reason, such inventions warrant protection under intellectual property law, as they represent, first and foremost, the product of intellectual creativity and scientific effort.

However, the interests of developing countries must also be duly considered, since these countries often constitute the primary source of the biological resources and raw materials from which many such inventions are derived. Their prior authorization should therefore be obtained, and they should receive fair and equitable compensation. Excessive exploitation of the resources of developing countries may pose serious risks to biodiversity and to the environment more broadly. It may also render agricultural societies dependent on biotechnology, rather than enabling them to benefit meaningfully from discovery, research, and technology-transfer agreements.

Accordingly, it is necessary to establish a legal framework capable of reconciling the requirements of the TRIPS Agreement with the legitimate interests of developing countries that lack advanced technological capacities. This requires legislative intervention in many jurisdictions, including Algeria, through the reform of patent regulations so that they address all relevant dimensions, including life forms and biological materials. Such regulation must be precise, context-sensitive, and adapted to the specific characteristics of each society, particularly in view of the technological gap between developed and developing countries. This balance is essential to safeguard both the rights of patent holders and the broader interests of society, especially in the field of pharmaceutical manufacturing, where legal imbalances may have serious implications for public health.

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