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Climate Change and its impact on the Global Pharmaceutical Industry

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ABSTRACT:

Climate changes are affecting the pharmaceutical industry day by day. Climate change is a long-term alteration in weather patterns ranging from the tropics to the poles. It is an international hazard that has caused stress in various, diversified ways. This review article further sought to theorize on the climatic variability that might be compromising the sustainability of the pharmaceutical sectors worldwide. Ice cores from Greenland, Antarctica, and tropical mountain glaciers reveal how the Earth's climate varies in response to changing greenhouse gas levels. Ancient evidence can be derived from tree rings, ocean sediments, coral reefs, and sedimentary rock layers. The ancient, or paleoclimate, evidence-world can warm about ten times quicker than the rate of warming at the end of an ice age. Human activities are now emitting carbon dioxide at the rate of about 250 times quicker than when naturally emitted following the end of the last Ice Age

Keywords: Climate change, Pharmaceutical Industry, Medicine

1. INTRODUCTION:

The United Nations Framework Convention on Climate Change UNFCCC describes climate change as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.' 1 The pharmaceutical industry is a large organization of companies dealing with pharmaceuticals and medical products with interests in research and development, manufacture, and distribution. This cannot be ignored in its importance because it has shown that it has affected human health and quality of life globally. Pharmaceuticals position themselves very high in the important role in disease prevention, management, and treatment, with life-saving antibiotics, surgical dressings, cosmetics, and breakthrough cancer medicines.

2. THE IMPACT OF CLIMATE CHANGE:

Climate change is an alerting phenomenon with both quantifiable and unquantifiable faces to it; in its causes, conditions, and consequences, it presents visibly tangible, yet it is accountable for issues in the pharmaceutical industry.

1. Pharmaceutical supply chain: The traditional pharmaceutical supply chain is affected in a bad way by climate change through the disruption of transport networks. Such restrictions hinder the ability to manufacture and distribute pharmaceuticals. Even if the best solution seems to be infrastructural changes, the huge investment that such incompatibility demands is definitely not feasible for dealing with an apparently insurmountable issue like climate change.

2.Changing climate increases Burdon of the disease: Infectious diseases. The IPCC expects global warming to increase human health issues, especially within the tropics. Hence, temperature increases in countries such as Africa lead to an increase in mosquitoes; thus, the spread of malaria, dengue, and other insect-borne diseases increases. Other regions are also affected. Whereas the United States had malaria breakouts of varying levels, in 2006 an outbreak of legionnaires' disease was to strike the United Kingdom, while scientists attribute a bacterial lung ailment to be the cause of global warming. According to the World Health Organization, climate change will notably escalate the levels of insect-borne diseases across Europe. For instance, countries like Azerbaijan, Tajikistan, and Turkey are already at risk of mosquito-borne malaria transmission. Higher levels of temperature are increasing the quantity of ozone and other pollutants in the air. This is increasing the rate of cardiovascular and respiratory problems. Extreme heat waves are affecting more extensively, especially on children and the elderly people.

3.**Impact on manufacturing site and equipment's:** Climate change is a dynamic and emerging occurrence that calls for keen and proactive adapting mechanisms to ensure a step ahead of the risks and opportunities. Pharmaceutical companies need to build elaborate monitoring systems to assess factors related to climate, such as temperature changes. It will enable companies to modify their existing plans and processes to minimize the risks and exploit new opportunities in a rapidly changing climate.

4.**Water Pollution and scarcity:** Huge volumes of water are usually used in the cleaning and solvent extraction processes during pharmaceutical production; this might lead to the discharge of waste water containing active medicinal ingredients, solvents, and heavy metals. These respectively

remain in the environment, causing an imbalance in the ecosystem and possibly harming aquatic animals, which translate to bioaccumulation and biomagnification through the food chain. Water is critical in every step of the pharmaceutical manufacturing process, from drug development to equipment cleaning. Water scarcity due to climate change threatens the manufacturing capacity and operational costs of pharmaceutical businesses, more so in regions already water-stressed.

5.**Waste generation**: The pharmaceutical industry gives rise to huge volumes of wastes, such as manufacturing leftovers and packing materials and expired and unused abandoned items, which may be contaminated with antibiotic-resistant microorganisms and are potential areas of exposure to land and water, eventually increasing the risk to human health and wildlife.

6. **Transmission of Microbial Resistance:** The growing temperatures due to climate change can fuel the rates of bacterial infections, and diseases may shift to higher altitudes and latitudes where they were not previously existent. Bacteria can grow rapidly, with their ability to duplicate themselves faster and even pass their genes from one to another by a process termed horizontal gene transfer. The faster it happens, the more likely bacteria will develop a type of resistance to drugs.7

7.**Biodiversity destruction:** Global warming and loss of biodiversity are becoming corresponding challenges for the pharmaceutical sector throughout the world. Global warming- induced loss of biodiversity raises a series of issues for the pharmaceutical companies:

Biodiversity loss hampers accessibility to natural resources which are the backbones for pharmaceutical companies for the development of new medicating drugs, most of the medicating drugs are derived from plants, fungus, and microbes. With the loss of habitats and species, it reduces the likelihood of discovering new, successful treatments. Ecosystem Disruption: Healthy ecosystems are the basis for a vast range of biological processes; the climatic changes could adversely affect those ecosystems with medicinal plants and species are associated, and it is a threat to the efficacy and availability of the plants and species; these may result in increased costs and less access to raw materials. Regulatory and ethical issues: With continuing biodiversity loss, more regulatory/bureaucratic needs and ethical problems in the exploitation of natural resources will come to the forefront. The pharmaceutical firms will also come across greater calls for regulation on sustainable corporative behavior, as well as greater scrutiny in the legal and ethical environments on the subjects of bioprospecting and biodiversity preservation. Sustainability and innovation: There is a requirement for pharmaceutical companies to incorporate sustainable practices into innovation with the objective of assisting in the reversal of these trends. Some of the ways of protecting or minimizing the impact on the environment, as well as reducing CO2 emissions by pharmaceutical research and development, include coming up with alternative procedures for drug formulation, contributing to conservation work, and incorporating sustainability in their core business activities, respectively.

8. **High cost:** In combating the increased health risks posed by the climatic change, pharmaceutical research and development can formulate more climate-resilient drugs and vaccines since much resources are spent by the pharmaceutical sector in the attempt to curb this.

9.**Impact on herbal drug production:** Rapid climate change, quick urban growth, sudden industrial boom, overpopulation pollution, declining forest cover, habitat loss, over-harvesting, destructive harvesting, and floods, among others—both natural and manmade disasters—lead to the reduction of species of wild medicinal plants. Examples such as these were common and indicated the impact of medicinal plant resources on:

a. The pollination large of more than 100 crops grown in the US. Warming temperatures and shifting precipitation patterns can influence the timing of blooms and the appearance of pollinators, such as bees and butterflies. Pollination may be adversely affected by mismatches between the time plants bloom and the time pollinators emerge.3

b. Climate change might eventually make the country more susceptible to wildfires. Wildfires are threating to both farms and the grassland and rangelands. Temperature and precipitation changes might also possibly increase the probability or severity of insects, weeds, and diseases. This will probably lead to increased weed and pest management.3

10. **Regulatory control:** The 'Schedule M' of the drugs and Cosmetics Rules 1945 have mentioned the GMP standards for acquiring a license to manufacture, market, or sell drugs. GMP rules for waste management should in line with the municipal and national laws,5 Climate change warrants stringent regulatory control while the proportion of batch rejections by the regulatory author also rises

3. Conclusion:

Evidently, climate change is bringing about significant shifts in the landscapes relating to the world, pharmaceutical business. Emerging temperatures, crucial weather occurrences, and changing ecologies are stressing the supply chains, disrupting operations, and rendering facilities much more vulnerable. Both the supply of drugs and their distribution, besides climate change, affect the economy in general, whatever rarity or pricing increase may be. Moreover, climate change is redefining the pattern of diseases and new and emerging health threats. It will now require realignment of research focus and development of new remedies and vaccines to fight new diseases and the evolving epidemiology of existing ones. The sector will also be faced with regulatory challenges as governments and bodies come to terms with despoliation of the prevailing clime.

Pharamceutcical companies are taking on greater cognizance of imperative need for sustainable business models

4. Citation:

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