



## Medical Biotechnology in the Service of Coronavirus Vaccine Discovery and Production

### *Coronavirus pandemic*

Coronavirus 2019 (COVID-19) is a highly contagious infectious disease with a broad spectrum of symptoms caused by a novel virus, now named SARS-CoV-2, from the coronavirus family<sup>1</sup>. Its outbreak, above all, has cast a shadow over the health and economic spheres of communities<sup>1,2</sup>. From the earliest days of disease reporting, hypotheses emerged for prevention, legislation, vaccine, and treatment as solutions. In the case of vaccines, in particular, decision-makers and researchers in all fields, including medical biotechnology, began studying and trying to develop vaccines from the very beginning of the outbreak, even before the epidemic was reported in their country. Although the outbreak was reported about a year and a half ago, and since then prevention methods have been taught to the people, legislation has been more or less enacted in countries, and relatively effective treatments have been proposed, people in some countries are experiencing the deadliest days due to COVID-19<sup>3</sup>. Therefore, the highest hopes were for the production of vaccines as the most effective solution, which falls within the field of medical biotechnology<sup>4,5</sup>.

### *Medical biotechnology*

Modern biotechnology provides breakthrough products and technologies by utilizing biological systems and living organisms or parts of them. In medical biotechnology, pharmaceutical and medical products are produced using biotechnological tools to prevent, diagnose, and treat diseases. Antibiotics, genetic testing, genome mapping, and artificial tissue growth are among the most well-known products in this field<sup>6</sup>. However, among medical biotechnology products, vaccines have been the focus of attention during the pandemic<sup>4,7</sup>. The genome-based approach achieved theoretically acceptable candidates for the vaccine by genomic analysis and investigating virulence factors<sup>8</sup>.

### *Vaccines*

Vaccines are biological preparations that are produced using the science and tools of the medical biotechnology field. Both organisms-living or dead-and parts of them are used to produce vaccines in medical biotechnology<sup>5,6</sup>. Although they have long been an effective and safe way to prevent infectious diseases (prevention), they are now being investigated for anti-cancer therapeutic purposes (treatment)<sup>9</sup>. There is a long-established scientific process to validate the use of biotechnology-produced products<sup>10</sup>, but following a routine process would continue the coronavirus invasion in the current emergency.

### *Vaccines licensure during the pandemic*

Licensure of a vaccine routinely occurs after obtaining the result of long-term efficacy at an effective dose in the target population from phase I to III trials. After the licensure and the introduction of the vaccine on the market, investigations continue like other medical and pharmaceutical products (post-licensure vaccine safety surveillance)<sup>11</sup>. In addition, there is a mechanism called Emergency Use Authorization (EUA) that facilitates the availability and use of vaccines-as well as other medical products and procedures-in this pandemic-as well as in other emergencies - but this does not mean that vaccines are not rigorously and carefully tested. In fact, in this mechanism, all three phases of clinical trials that are conducted in the routine process of evaluating medical biotechnology products are performed, but for example, to receive it from The United States Food and Drug Administration (FDA), at least 3,000 people must participate in phase III and be followed for a median two months completion of an investigational Covid-19 vaccine regimen<sup>12</sup>.

### *Concluding remark*

As previously noted, medical biotechnology has so far achieved many promising avenues; one of the highlights is vaccine production for overcoming the pandemic. However, it is still early to judge whether vaccines are the foremost solution to overcoming the pandemic, and there is even a notable report of a new outbreak in a vaccinated country<sup>13</sup>. Of course, the effectiveness and safety of coronavirus vaccines must be measured over time. In addition, the importance of basic sciences has been received attention in this pandemic<sup>14,15</sup>.

Keywords: Biotechnology, Coronavirus, COVID-19, SARS-CoV-2, Vaccines

### **Conflict of Interest**

The authors have no conflict of interest.

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