

## Research and Development Steps for an Effective Vaccine, during the COVID-19 Pandemic Situation

Erjon Troja<sup>1\*</sup>, Klaudia Lekli<sup>1</sup>, Ranela Ceci<sup>2</sup>, Eralda Lekli<sup>3</sup>, Suela Këlliçi<sup>1</sup>

<sup>1</sup> Department of Pharmacy, Faculty of Medicine, University of Medicine, Tirana, Albania

<sup>2</sup> National Agency for Medicine and Medical Devices, Tirana, Albania

<sup>3</sup> Faculty of Medicine, University of Medicine, Tirana, Albania

---

### Abstract

**Introduction:** The COVID-19 vaccine, considered by many as a "game-changer" and therefore the most effective & prophylactic strategy tool for pandemic control and prevention, is being developed by many research, pharmaceutical and scientific institutions. Vaccine development has always been a really long and expensive process, but modern innovative technologies, along with incredible and specific economic and scientific efforts, immensely helped to narrow the development time and progress, in order to have in less than 12 months from official start of the pandemic, more than one approved vaccines and actually make possible the beginning of a massive vaccine

worldwide distribution and administration campaign, in record time.

**Methodology and objectives:** Through the scientific literature review, this article aims to supply for interested healthcare professionals and public, a summarized and detailed picture of the vaccines under development or approved ones, implemented platforms, clinical study trials phases, institutions, developing countries and funders, to explain vaccine options and candidates, against SARS-CoV -2.

**Results:** There are currently 261 vaccines in development, 78% of which are in the preclinical phase. 56 candidates (22%) from different developers have been admitted to clinical trials,

of which 44% are in Phase I trials; 30% are in Phase I/II; 7% in Phase II; 21% in Phase II/III and 21% in clinical trials of Phase III. Also, based on the platform used for development, actual data shows that there are around: RNA-based technology 13% of vaccines, DNA 8%, non-replicating viral vector 14%, viral replicating vector 8%, virus like particles 6%, inactivated virus 6%, live virus attenuated 1%, protein fraction 31%, unknown platform 13%. 45% of studies are conducted by the pharmaceutical industry, 28% by public and academic institutions. Among candidates, 11% of them received funding support from public and private grants. The U.S.A. includes around 26.8% of global research, followed by Asia 29% (China, leader with 19.5% globally and 43% of clinical trials). Europe also 29% of developing vaccines with 15 countries involved.

**Conclusions:** At the end of 2020, first vaccine candidates received important regulatory approvals and began their global use. This is a fantastic news but we are just in the middle of our campaign to fight back against the pandemic. Ongoing & future studies, together with global real-time data, will focus on the determination of SARS COV-2 antibodies and T lymphocyte-mediated immunity, optimizing pharmaceutical product development and vaccine efficacy protection against COVID-19.

**Keywords:** COVID-19, vaccine, research and development, pandemic