Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Commentary

India's cost-effective COVID-19 vaccine development initiatives

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The creation of cost effective vaccine is fundamental for the effective mitigation of the deadly COVID-19 pandemic. India is moving to achieve this target to meet the high demand to produce the cheapest vaccine against COVID-19. India also harbors over 1.3 billion people and many cannot afford a costly vaccine. In addition, millions of people who live across over 30 world's poorest countries will also expect an affordable low-cost vaccine.

India has a long history of vaccine production and the Haffkine Institute [1] for example has been recognized by the World Health Organization (WHO) as a prequalified vaccine producer before the country got independence from Britain in 1947. Haffkine, by the way, was the world's first plague vaccine producer in 1897 [2]. India's first privately-funded vaccine company, Biological E Ltd., came into existence in 1953 [3] and since then, several companies have started promoting public-private partnership endeavors.

The Prime Minister of India has recently encouraged scientists to develop the vaccine for COVID-19 [4]. Major biotech firms namely, the Serum Institute of India, Bharat Biotech, Premas Biotech and Zydus Cadila have been engaged actively in the vaccine creation trails. The Serum Institute of India [5] has a long history of producing vaccines against tetanus, influenza, rabies, measles, and mumps. It's currently collaborating with Codagenix to develop a vaccine, including live-attenuated vaccine against COVID-19 [6]. Besides, it has a partnership with Codagenix, a New York based firm specialized on vaccines and the Oxford University to produce the COVID-19 vaccine. India also has a tie up with the Oxford University to produce the Oxford COVID-19 vaccine or ChAdOx1 nCoV-19. The Serum Institute has announced that it will produce the vaccine at low cost and it's registered for phases II and III clinical trials (NCT04400838, ClinicalTrials.gov).

The Bharat Biotech [7] likewise has experience in vaccines against rHCB, rotavirus and typhoid. With the partnership of Thomas Jefferson University, it has entered the animal trials and attempts to develop a novel one-drop nasal vaccine named "CoroFlu" against COVID-19 in collaboration with the University of Wisconsin and FluGen Inc. Furthermore, the Premas Biotech [8] uses recombinant proteins development platform to develop the new vaccine against COVID-19 jointly with Akers Biosciences. They combine three antigens from spike, membrane and envelope protein to produce a triple antigen vaccine as they have already developed rVLP, recombinant virus like particle. Likewise, Zydus Cadila [9], located in Gujarat state of India has developed a COVID-19 vaccine called ZyCoV-D, which is currently undergoing phase II clinical trials. It has prior experience in producing vaccines against Diphtheria-Tetanus-Pertussis (DTP) Influenza (type B), Measles-Mumps-Rubella (MMR), Typhoid, etc. It's also producing Remdesivir injection for COVID-19.

India has exported complex vaccines such as the penta-valent rotavirus vaccine in the past [10]. What's unique about India is that it has the expertise for low-cost per-unit vaccine production of vaccines. Due to the low budget vaccine making history, new products against COVID-19 will be of great use in many low-income countries worldwide benefiting millions of people who cannot afford expensive vaccines. India has manufactured the oral polio vaccine and distributed freely across the country as part of the polio eradication initiative by the WHO.

Recently, India has requested the World Trade Organization to waive some provisions in the international agreements that regulate intellectual property rights, to speed up efforts to contain the COVID-19 pandemic and to make sure developing countries such as India are not left behind. India is currently finalizing the electronic vaccine intelligence network or eVIN to provide real-time information on the stock and storage details on vaccines nationwide. The government has formed an expert committee to advice on the priorities of vaccine distribution throughout the country. Few months ago, the WHO has praised India's vaccine production capacity in a meeting of COVID-19. It's time for the developing world to collaborate with India to produce and distribute a cost-effective COVID-19 vaccine as soon as possible.

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