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Foreword

Diagnostic and therapeutic implements based on advanced Biotechnology should be available in low-income countries

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In 2015 the United Nations identified a set of 17 sustainable development goals (SDGs) as targets to be realized by the end of 2030. One of these goals is "to promote physical and mental health and well-being, and to extend life expectancy for all and to achieve universal health coverage and access to quality health care" (1). However, at just 11 years before that deadline, according to the Global Observatory on Health R&D, wide gaps and inequalities still persist. These are noticeable when comparing developed *versus* developing countries; and also when analyzing individual health issues. Such inequalities make it difficult for developing countries to achieve the WHO objectives of efficient, cost-effective and robust means of preventing, diagnosing and treating major diseases. Improving this situation requires adoption of appropriate public health policies (2). We wish to promote the notion that biotechnology-based diagnostics and therapeutic interventions should become available in low-income countries.

About 10-30% of infant mortality in developing countries is due to genetic diseases; however, due to currently prohibitive costs (3), genetic screening programs are in practice only feasible in middle- and high-income countries. For example, immunochemical tests (*e.g.* ELISA kits) for diagnostic purposes can be of immense value in low-income countries, because they can target antigens specific for endemic pathogenic viruses or bacteria. In the case of yellow fever, an ELISA kit has been developed, whereby a test with an accuracy of >90% can be carried out in 3.5h (4). During the outbreak of Ebola in 2014-2016, trials of a recombinant vaccine conducted in Guinea resulted in robust immunity within ten days of a single injection (5), raising the potential for disease prevention. Similar viral-based vector vaccine strategies could be utilized and adapted for different antigens derived from pathogens.

Another promising approach, is that of nucleic-acid-based compounds. This may be highly relevant to low-income countries as siRNA-based treatment is under investigation, and may provide a new category of small molecules therapeutics for Ebola or other viral infections (6). This treatment could target proteins responsible for viral RNA transcription and replication, and can be adapted in order to tackle viral variants (6).

The above are mere examples of reasons why biotechnological research targeting developing countries should be appropriately funded. Genetic and immunochemical tests, as well as recombinant vaccines and biological drugs should be made fully accessible to low-income countries with the concerted support of global UN programs (UNCTAD.WHO), non-for-profit organizations, charity foundations, and projects

of international cooperation. A complementary way to achieve an improvement of the health outcomes is to promote drug production in developing countries, as suggested by the director for investment and enterprise at the UN Conference on Trade and Development in Geneva (14–17 October 2014) (7). Another important tool to reduce the biotechnology divide between developed and developing countries is the education, postgraduate training, knowledge transfer and capacity building including innovation in low-income countries. One of the few examples worldwide in this respect is the program of International Centre for Genetic Engineering and Biotechnology (8), but such programs should be by far strengthened, possibly also by support of EC, G7 etc.

An overarching consideration, is that low-income countries take political decisions with priority given to matters concerning the health of their citizens, which includes health services. With demand originating from developing countries of need, international organizations can better respond to informed requests from individual or groups of countries, rather than taking their own decisions.

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