Synthetic Biology in Global Health: Lessons from History and Anthropology

Jennifer A. Liu, Assistant Professor, University of Waterloo

The term global health "implies consideration of the health needs of the people of the whole planet above the concerns of particular nations," and is associated with the emergence of important nongovernmental actors.[1] Synthetic biology as a field of research and practice, and those working with SynBio, may constitute such actors. Last year, Douglas and Stemerding convened a special issue of *Systems and Synthetic Biology* to address select SynBio applications, processes, and governance as they relate to global health. They suggest that "SynBio is positioned to address major global health issues through advanced vaccine development, diagnostics, drug synthesis, and the detection and remediation of environmental toxins."

SynBio holds potential value for the remediation of various health problems, including designing out cold chain requirements, simplifying certain (e.g. vaccine) administration procedures thus facilitating local capacity and uptake, rapid production of preventive and therapeutic agents, and environmental monitoring, etc. The authors in the special issue address a number of important considerations including IPR and patent regimes. In this short piece, I suggest that we would do well to take some lessons from history and anthropology as we consider the application of SynBio in global health contexts.

By global health contexts I mean both the local peoples and sites that are most often the targets or recipients of global health interventions (typically in the global 'South' and marked by relative underdevelopment and poor health metrics) and the global health partnerships that most often occur between institutions in the global 'North' and 'South.' I use global health *contexts* to remind us that global health is not a singular thing. "You cannot dwell in the global."[2]

Thus, if SynBio is to be meaningful in global health contexts, I suggest that we pay serious attention to various social issues, three of which I foreground here. Histories of global and international health are riddled with stories of failure. Often institutional goals, priorities, and logics do not align with those of targeted groups. Against a backdrop of attending seriously to local contexts, I suggest that we also give serious attention to the following three related areas:

1) Public inclusion: including local and multiple publics in design of research, technologies, and programs at every step.
2) Placing the technological potential of SynBio in social contexts: locating the broader social, political, economic, etc. aspects of the health problems to be addressed by SynBio.
3) Studying SynBio institutions: assess and analyse the underlying priorities, assumptions, and logics of those practicing and applying SynBio.

1. Public Inclusion: Most international health programs have been designed in a top-down manner. The subsequent move to global health initially seemed to include a recognition of the failure of the vertical approach, however many recent programs appear to have resuscitated it. Jenny Reardon's account of the failure of the Human Genome Diversity Project (HGDP) shows that considerations of varied public values cannot simply be tacked on to existing project design, but rather must be built-in every step of the way.

Especially in projects of controversial science, Science and Technology (STS) scholars have shown that the early inclusion of multiple publics not only produces better public

[1] TM. Brown, M. Cueto, and E. Fee, *AJPH* 2006: 62.
[2] B.Latour quoted in W. Anderson, *SocHistMed* 2014: 378

acceptance of downstream programs and products, but also better science. Far from the earlier ideal of value-free science, science is shot through with social values and human interests. Thus, Heather Douglas advocates for value-laden sciences; good science requires the acknowledgement of values. Charis Thompson shows how good stem cell science comes out of an ongoing and iterative relationship between science and ethics. This is a relationship in which scientists become one of a set of multiple publics. These scholars, and others, show that good science is expressive of social values and that the inclusion of broad publics is necessary for the production of good science as well as the uptake of its outputs.

2. Placing technology in context: A 'magic-bullet' approach has long been favored in biomedicine with its high-tech focus and cultural logic of eradication. If we take seriously the substantial research that suggests that health problems reflect social problems, and that poverty strongly shapes health vulnerability, then technological approaches that ignore the specific social contexts are unlikely to provide much relief and, in fact, risk to make things worse.

Many scholars attribute the failure of the 1950s WHO Malaria Eradication Programme (MEP) to an overreliance on technological fixes.[3] One unfortunate consequence was the development of DDT and artemisin resistance. Even the successful smallpox eradication campaign has been criticized for its violence and social rupture which has left, in some areas, resistance to subsequent vaccination efforts. SynBio technologies applied in global health contexts should not be stand-alone solutions but components of broader socio-political projects.

3. Studying SynBio institutions: Barriers to technological and medical interventions in developing countries have most often been framed as located in the recipient cultural groups. That is, cultural, social or psychological attributes in local communities act as barriers to appropriate uptake. As early as 1976, George Foster recognized the importance of attending to the cultures of bureaucracies as well; global health institutions and personnel have cultures, too, which may serve as barriers to implementation.

Even as the designers of the failed HGDP, for instance, saw the project as an anti-racist corrective to the limited scope of the HGP, those targeted by the project had their own epistemic approaches and political concerns that proved irreconcilable. The failed MEP was reshaped in response to institutional, as much as malarial, pressures along the way.[4] We must, therefore, critically analyze our own SynBio-related institutions and projects in order to understand the internal underlying logics, assumptions, and interests that underpin SynBio work.

In sum, while some working in SynBio and global health explain public resistance to their projects by recourse to a deficit model of public understanding, this is neither an accurate nor productive framing. Often the deficit is located in our own understandings of other public values. By taking seriously local contexts, including diverse publics, using SynBio innovations in tandem with broader social projects, and scrutinizing our own practices and assumptions, we enhance the possibilities for meaningful engagements of SynBio in global health. Finally, by now, most working definitions of global health include a statement about equity. Equity is not only about the distribution of benefits, but also risks. We should exercise extra caution to ensure those already most vulnerable -- for this is precisely what constitutes them as populations in need of intervention -- do not bear an undue burden of risk related to SynBio.

[3] e.g. Marcus Cueto 2013, Randall Packard 2007, Jeremy Greene et al. 2013

[4] M. Cueto 2013 (full references available upon request)