

Global Is Not Enough: Universal Biosafety. Can It Be the Next New Culture?

Jean-Michel Garcia*

HKU-Pasteur Research Centre, Hong Kong Special Administrative Region, People's Republic of China

Let's start with the basics. What is biosafety? In page 6 of a document published in June 2003 by the Secretariat of the Convention on Biological Diversity and the United Nations Environment Programme, we can find the following definition: "The concept of biosafety encompasses a range of measures, policies and procedures for minimizing potential risks that biotechnology may pose to the environment and human health" [1]. It is clear from this definition that, biosafety should consider three elements. It starts by (1) the identification of potential biological risks (that have to be minimized) to (2) not only the human health but also the environment (which include also the animal health) and (3) the set of measures put in place to act on those risks. In the case of laboratory setting, the point (2) has to be understood again in a three-fold consideration: the experiment, the experimenter and the environment. What is the goal of biosafety? To eliminate or reduce to minimum the risks identified. When this is achieved, biosecurity is obtained. All the difficulties arise then when one consider how to reach that goal.

Indeed, as mentioned upper, all start with the identification of risks. That means having staff properly trained. That training should cover the practices of handling infectious materials (To limit the scope of our discussion regarding what we put under the term "biotechnology" found in the upper definition we will use the terms "infectious materials" as any sample that could contain an "infectious agent") and the biology of the infectious elements under considerations (either the one handled or the one the experiment/experimenter has to be protected from that are in the surrounding environment). This is obvious and easy in the case of laboratory research; where we usually have a control on the infectious material used; but it could be more difficult in the case for example of clinical or epidemiological microbiology when the potential infectious agent is not clearly known. The latter case could be either because the potential agent is known but its presence in the sample not yet assessed; or because it is an unknown emerging pathogen. The second case, highlight a problem when facing biosafety that could be summarized by the following questions: what are the infectious agents circulating in the setting under investigation? One can only protect himself against what is known. The surveillance is therefore of paramount importance to have an efficient biosecurity not only to be sure we are aware of the species present but also that to be sure that there isn't a shift in the pathogens virulence or genetics that will render the protective measures or the diagnostics inappropriate for the current strains. Furthermore, knowing that most of emerging and reemerging infections are vector borne or zoonotic [2,3], it is crucial to include veterinary in any serious surveillance program. But that is not enough. The multidisciplinary should extend also to other fields to give a more comprehensive view of the ecology of the infectious agent. For example environmental and agricultural sciences will help understand better the ecosystem of the agent bringing to light factors affecting inter-species transmission (that may be blocked) and persistence or evolution in their reservoirs (that may be cured by vaccination or/and controlled) and therefore impact the biosafety measures that it will be possible to implement; but it can help also to take into consideration climatic data that have proven to be important in some vector born diseases (see for example references [4,5]). Still that is not enough, we

need to open wider the scope of the global management of biosafety, outside the life sciences, we should consider as well disciplines such as civil engineering for the design of biosafety buildings (farm, markets, laboratories, transportation) as well as in the development of human constructions to blend more in the environment and reduce its impact such as destroying the habitat of species that then go closer to human settling. For example, it is now accepted that the emergence of Nipah and Hendra viruses is due to such ecological changes associated with land use and with animal husbandry practices [6]. More innovation is required in the technological management of biosafety. Cross-disciplinary (civil engineering, mechanical engineering, microbiologist, epidemiologist, veterinary, sociology, economics, agronomy, etc) projects should aim at improving and rationalizing current practices for example by developing novel biosafety building or protection but also objectively validate their efficacy. It is amazing for example; that the real effectiveness of a simple protection such as masks, that is recommended by almost every guideline, to prevent transmission of influenza is still subject to debate despite the economical cost of such measure but also the waste management associated with that simple measure. A recent systematic review of the scientific evidence on the subject showed that data from 6/8 randomized controlled trials found no significant differences between control and intervention [7].

Due to its natural evolution (with all its mechanisms including mutation, recombination), the pathogens biodiversity generate every day the emergence of new strains of infectious agents in their natural reservoirs waiting for any opportunistic window to spill over to new hosts. In the past decade, SARS, H1N1 (2009), etc, proved that such "successful" occurrences can and will continue to happened. During these events, international collaborations were instrumental in the control of these epidemics but also showed a number of limitations and the need for a better coordination [8]. For example, there are still difficulties to exchange information (sometime the urgency of the response have hard time to balance the competitiveness between teams) but also reagents with strict regulation associated to the international logistic aspect. Of course, we still have to keep in mind the potential risks of deliberated emerging infections (bioterrorism and bio warfare) and related issues (often encompass under the Biosecurity label), but perhaps some legal framework could be workout at international level (or at least with international harmonization), including carriers and transportation association such as IATA, to establish a certification

***Corresponding author:** Jean-Michel Garcia, HKU-Pasteur Research Centre, Hong Kong Special Administrative Region, People's Republic of China, Email: jmgarcia@hku.hk

Received January 19, 2012; **Accepted** January 20, 2012; **Published** January 24, 2012

Citation: Garcia JM (2012) Global Is Not Enough: Universal Biosafety. Can It Be the Next New Culture? Biosafety 1:e101. doi:[10.4172/2167-0331.1000e101](https://doi.org/10.4172/2167-0331.1000e101)

Copyright: © 2012 Garcia JM. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

structure (with associated control body and measures) to ease exchange of biological samples between accredited laboratories and reference centers and hence increase the reactivity when an pandemic occurs meeting the challenge of emerging infections, in the spirit of the fast-tracking system for drug/vaccines approval. These recent pandemics were also reminders that infectious agents make no discrimination on nationality, race, regional, national or continental borders and so on. Most part of the world is now at reach within 24h by modern interlinked transportation networks. Therefore, the treat by pathogens is of everyone concern. Even if one country put in place the best biosafety measures, its citizens will not be protected until their neighbors also has developed an efficient biosafety strategy, and their neighbor-neighbors. It is now admitted by everyone that more need to be done to reach global biosafety. The main issue remains on how. Apart from the training of people involved in the handling of such infectious material, the surveillance and the exchange of reagents and primary samples as we talked previously, despite increasing efforts by numerous organizations and governments, there is still large differences in the level of skills (and technologies) available to tackle biosafety issues in different countries or regions within a given country. In a Guest Editorial [9], Chua and co-authors proposed: "One solution is for the more established biosafety associations to encourage and assist in the formation of new biosafety working groups and new national or regional biosafety associations in neighboring countries. This approach of mentorship and leadership to newly forming associations will encourage the culture of collective responsibility and cooperation and promote biosafety and biosecurity around the globe." At present time seeing the blooming of social networking, such professional networking should not be a challenge to implement. No doubt that such initiative, if implemented, would also promote and seed collaborative work outside the scope of biosafety, in economical, cultural, and others aspects important for long-term international collaboration and mutual understanding. Indeed, despite the necessary knowledge, the will to work together as well as networking coverage and trust is crucial for efficient collaboration, especially in difficult time such as during an emerging pandemic. The solution proposed by Chua and al. would surely be a step forward in that direction.

To conclude, initiatives such as "One world, One Health" [10] and the 12 recommendations, they called the "Manhattan Principles", from their 2004 meeting already take in consideration the elements we mentioned in this paper (regarding the multidisciplinary, the training, the surveillance and so on). We think biosafety would strongly benefit

if such principles are integrated to it in the design of biosafety strategies to give a more comprehensive setting for the measures on the fields but also larger and more applied scope to applied and fundamental research projects. We invite and encourage all researcher or professional already involved in biosafety, but also who are developing innovative technology that could be useful to improve biosafety both in the control of infectious pathogen but also in their monitoring, to share their experience by submitting their work to *Biosafety Journal* which online structure will efficiently promote the sharing of information for the benefit of all. Finally, as Chua et al. [9] said: "In our quest to provide a safer world today and for the generations to come, we must shift our consciousness from national responsibility to one of a global responsibility...from a national community to a global community." Biosafety is not so much in the knowing as in the doing. Biosafety attitude and reflexes should become a second nature to people involved in handling, and those with a professional activity that put them in contact, with infectious agents. They, or rather We, should develop a dynamic biosafety culture...

References

1. The Secretariat of the Convention on Biological Diversity (2003) Biosafety and the environment: An introduction to the Cartagena Protocol on Biosafety. GE.03-01836/E. United Nations Environment Programme.
2. Morens DM, Folkers GK and Fauci AS (2004) The Challenge of Emerging and Re-emerging Infectious Diseases. *Nature* 430: 242-249.
3. Jones KE, Patel NG, Levy MA, Storeygard A, Balk D, et al. (2008) Global trends in emerging infectious diseases. *Nature* 451: 990-993.
4. Gage KL, Burkot TR, Eisen RJ, Hayes EB (2008) Climate and Vectorborne Diseases. *Am J Prev Med* 35: 436-450.
5. Githeko AK, Lindsay SW, Confalonieri UE, Patz JA (2000) Climate change and vector-borne diseases: a regional analysis. *Bull World Health Organ* 78: 1136-1147.
6. Field H, Young P, Yob JM, Mills J, Hall L, et al. (2001) The natural history of Hendra and Nipah viruses. *Microbes Infect* 3: 307-314.
7. Bin-Reza F, Chavarrias VL, Nicoll A, Chamberland ME (2011) The use of masks and respirators to prevent transmission of influenza: a systematic review of the scientific evidence. *Influenza Other Respi Viruses*.
8. Ridley RG (2004) Research on infectious diseases requires better coordination. *Nat Med* 10: S137-S140.
9. Chua T, Ellis M, Johnson B (2009) Global Biosafety: Now and Tomorrow. *Applied Biosafety* 14: 66-67.
10. <http://www.oneworldonehealth.org/>