

Exercises in responsible research and innovation: Experiences from a workshop for early career researchers in synthetic biology

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In December 2019, researchers from the Responsible Research and Innovation (RRI) Group at the University of Manchester hosted a workshop with 20 early career researchers from the Future Biomanufacturing Research Hub (FBRH) and the Manchester Synthetic Biology Research Centre (SYNBIOCHEM). Workshop participants included research fellows, experimental officers and laboratory technicians.

Held as part of an FBRH/SYNBIOCHEM away-day, the two-hour workshop engaged participants in discussion and exercises on RRI. Participants were first asked to reflect on notions of responsibility, then presented

with a brief overview of RRI from the RRI group. This was followed by two hands-on exercises (1) a group speculative fiction exercise and (2) an exercise asking participants to apply RRI to their own work. This brief highlights experiences and insights from these two exercises.

RRI exercise 1: Speculative fiction – Pacifyzer™: A new drug to pacify the “warrior gene.” In this exercise, participants assumed the role of a research group partnering with a company targeting a so-called “warrior gene” identified in an indigenous population. The warrior gene is linked to increased risk-taking behaviours and is prevalent in certain indigenous

Figure 1. Pacifying the “warrior gene”

Drawbacks and challenges	<ul style="list-style-type: none"> Reinforcing racial and social stereotypes; targeting specific ethnic groups Concerns about who will own or have access to data and who will eventually have access to the product Could undermine other efforts to help indigenous groups
Benefits	<ul style="list-style-type: none"> If successful, target populations could benefit Advancing science, with spillovers into related efforts
Recommendations	<ul style="list-style-type: none"> Must involve input and participation of targeted populations Strict regulation and independent oversight Perhaps begin such research by targeting a less controversial gene?

populations that have histories of drug and alcohol addiction.

Group members were asked to assume individual stakeholder roles, e.g. lab PI, pharma company rep, research scientist, indigenous community outreach worker, in order to bring forward different perspectives. Groups then presented their commentaries (drawbacks, benefits and challenges) and recommendations.

Overall, the consensus of all groups was that developing this application was problematic from a societal and ethical standpoint and could only proceed with certain provisions (See Fig 1).

RRI exercise 2: How might RRI apply to your own work? In this exercise, we asked participants to ask themselves the following questions in the context of RRI, to write their answers on post-it-notes, placing them under appropriate heading on the

white boards and flipcharts. (See Fig 2 for questions and a sample of answers to each)

Summary and reflections. Overall, the session was productive and beneficial, allowing researchers who have engaged in a range of RRI-related activities to reflect on their experiences and for those newer to the concept to explore what it's about.

These RRI activities are experimental and we hope that this session will open up opportunities for further engagement. In particular, future activities could explore how to connect lab work and targets with addressing societal needs and equipping both centres with the capacity to implement and sustain their own RRI activities into the future. We plan to organise further activities to explore ways that front-line early-career researchers can further embed RRI thinking into their work.

Figure 2. Applying RRI to my own work

What are my motivations?	<ul style="list-style-type: none"> • Provide greener more sustainable solutions • Production of new knowledge • Training the next generation of researchers
How can RRI add value to my project?	<ul style="list-style-type: none"> • Reflect on what we do in a structured way • Consider wider implications of our work • Help take project down a more desirable path
What are the actions I need to take?	<ul style="list-style-type: none"> • Anticipation of risk and engage more widely • Strengthen relations with industrial partners • Better articulate what we do and why
What actions would I take?	<ul style="list-style-type: none"> • Run anticipatory studies on actual projects • Promoting research/industry collaboration toward a greener economy • More public engagement on the benefits of synthetic biology

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The Responsible Research and Innovation (RRI) Group at the Manchester Synthetic Biology Research Centre (UKRI Biotechnology and Biological Sciences Research Council Award BB/M017702/1) undertakes research and analysis and facilitates collaboration and deliberation anticipate, prepare for, or mediate impacts of synthetic biology technologies in society, economy, and the environment. The Future Biomanufacturing Research Hub (FBRH) at the University of Manchester (UKRI Engineering and Physical Sciences Research Council, Award EP/S01778X/1) is developing innovative technologies for high-value manufacturing to sustainably produce pharmaceuticals, chemicals and materials.

The session on Responsible Research and Innovation was held at the FBRH/Symbiochem Away Day on 16 December 2019 at the Alliance Manchester Business School, University of Manchester. For further details, contact: andrew.watkins@manchester.ac.uk