



4th Meeting of Bioenergy and Industrial Biotechnology research theme

Public perception and regulation of biotechnology and genetic engineering

Morning – student presentations

Like the previous meetings, students will work in pairs to produce a short ~10 minute presentation on one of four fields of biotechnology considered controversial. Each topic is centred on paper(s) provided.

Pairs:

Amy and Ben

Pierra and Matt

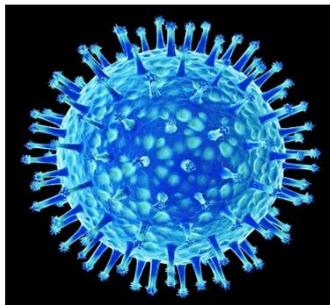
Holly C and Holly R

Presentation content is flexible but should briefly consider the background and methods used in the paper and the wider applications/justification for the research. I have included some links on additional points you may also wish to include.

Modification of viral genetic material

- Imai *et al.*, 2012. Experimental adaptation of an influenza H5 HA confers respiratory droplet transmission to a reassortant H5 HA/H1N1 virus in ferrets. *Nature*, 486, 420-428.

<http://www.nature.com/nature/journal/v486/n7403/full/nature10831.html>



- Points to consider:
 - Biosecurity and dual-use research
 - Safety vs. research
 - Censorship in scientific publishing

- Further reading:

<http://www.nature.com/nature/journal/v482/n7384/full/nature10884.html>

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3102706/>

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2519951/>

- Human-contagious strains already found in some countries

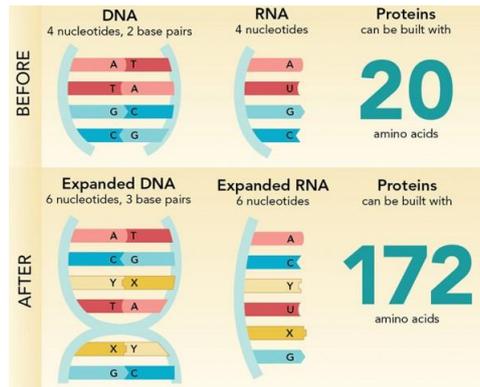
[http://www.livescience.com/18845-debate-h5n1-](http://www.livescience.com/18845-debate-h5n1-biosafety.html)

[biosafety.html](http://www.livescience.com/18845-debate-h5n1-biosafety.html) - counteractive high biosafety containment level hinders research

Artificial life

- Malyshev *et al.*, 2014. A semi-synthetic organism with an expanded genetic alphabet. *Nature*, 509, 385-388.

<http://www.nature.com/nature/journal/v509/n7500/full/nature13314.html>



- Further reading

<http://www.nature.com/news/first-life-with-alien-dna-1.15179>

<http://www.nature.com/nature/journal/v509/n7500/full/nature13335.html>

And/or

- Gibson *et al.*, 2010. Creation of a Bacterial Cell Controlled by a Chemically Synthesized Genome. *Science*, 329, 52-56.

<http://www.sciencemag.org/content/329/5987/52.full>

- Further reading

<http://www.dailymail.co.uk/sciencetech/article-1279988/Artificial-life-created-Craig-Venter--wipe-humanity.html> - media reaction

http://www.bbc.co.uk/blogs/newsnight/susanwatts/2010/05/assessing_the_impact_of_venter.html

<http://www.bbc.co.uk/news/10150685> - patents on genetic engineering

- Points to consider

- Speculative potential applications vs. potential risks of synthetic unknown life (also dual-use research)
- Patents in biotechnology, pros vs. cons

- Pro – limits release of information which could be used inappropriately

Human genetic modification and the use of gene editing technology

- Liang *et al.*, 2015. CRISPR/Cas9-mediated gene editing in human tripronuclear zygotes. *Protein & Cell*, 6(5), 363-372.

<http://link.springer.com/article/10.1007/s13238-015-0153-5/fulltext.html>

- Points to consider
 - Ethics of human embryo modification
 - Study turned down by Science and Nature
 - ‘Designer babies’
 - Technology progressing too fast for society?
 - CRISPR is relatively new technology
 - CRISPR was not universally effective and also created mutations



- Further reading
 - <http://www.dailymail.co.uk/sciencetech/article-3051365/Scientists-tweak-genes-human-embryos-time-Controversial-technique-lead-designer-babies.html> - media report

<http://www.nature.com/news/chinese-scientists-genetically-modify-human-embryos-1.17378> - Nature article

<http://www.wsj.com/articles/SB123439771603075099>

<http://www.nature.com/news/crispr-the-disruptor-1.17673>
- CRISPR

Genetically modified crops

- Paine *et al.*, 2005. Improving the nutritional value of Golden Rice through increased pro-vitamin A content. *Nature Biotechnology*, 23, 482-487.
<http://www.nature.com/nbt/journal/v23/n4/full/nbt1082.html>



- Further reading:
 - <http://ajcn.nutrition.org/content/89/6/1776.full.pdf> - Golden rice β -carotene pro-vitamin can be efficiently converted to vitamin A in humans
 - <http://bioscience.oxfordjournals.org/content/55/9/726.full> - the controversy and benefits
 - Kyndt *et al.*, 2015. The genome of cultivated sweet potato contains *Agrobacterium* T-DNAs with expressed genes: An example of a naturally transgenic food crop. *PNAS*, 112(18), 5844-5849.
<http://www.pnas.org/content/112/18/5844.full>
- Points to consider:
 - Could the sweet potato change public views of GMOs such as golden rice?
 - Is the “Precautionary principle” justified in light of the ability of golden rice to prevent death by malnutrition?