Transgenics-GMO Facts and Fiction

We originally considered the Transgenics ("GMO") problem from the standpoint of complexity and complex interactions: simply put, in spite of claims of "safety," Transgenics have unknown risks of extreme adverse events (tail events, black swans). No rigorous risk analysis has been done. However, in the process of our engagement with the scientific aspects of the discussion, we discovered that there are many other problems with transgenicss, including a well organized manipulation of the public perception claiming a nonexistent "scientific" basis for safety of the product. The scale and energy of this campaign and associated political lobbying revealed the intentional deception in the name of science that is undermining public safety.

FICTION	FACT
There is a consensus that Transgenics (GMO) are safe	There is no such *scientific* consensus in statistical meta-analyses of actual studies. The only consensus is that of vocal advocates among science journalists, skewing public perception, and perhaps some non-expert scientists. Moreover, risk analysis should be derived from meta-analysis which weigh negative observations more than confirmatory ones (due to the probabilistic properties of tail events) and these "exceptions" are often not included in current meta-analyses as there is pressure from the industry to repress them.
We need transgenics GMO agriculture to feed the world	In spite of trumpeted claims, no clear difference in actual yields of food crops has been established, particularly after taking into account weed resistance. There is no economic necessity for transgenics GMO agriculture. Hunger today is largely caused by non-economic diversion to other uses and limitations in distribution, not limitations in production. The largest supply and demand problem is the diversion of 45% of US corn to ethanol due to government mandate, enough food value to feed over 500 million people, or most of the world's hungry people. Other agricultural research can and should be done that generate less risk and bring us closer to sustainable solutions (e.g. agroecology).
We can solve nutrient deficiencies in vulnerable populations, as in the use of 'golden rice' for vitamin A deficiency.	Charlatans may claim to "save the world" with pictures of children that appeal to emotions and proposals of a "solution" that is lucrative to themselves when simpler ones are in existence. 'Golden rice' in particular has been paraded as a miracle cure, but doesn't have utility in practice. There are simpler solutions that don't pose novel risk and unintended consequences such as supplements or cultivation of alternate crops.
If you are skeptical about transgenics-GMO you are anti-science	The exact opposite: it is pseudoscience that requires gullibility. Science is founded on rigorous analysis and experiments that arise from skepticism about untested assumptions. Our critique of the use of GMOs hinges on rigorous risk-analysis—a topic that is not considered by most scientists, but is part of scientific analysis.
If you are skeptical about GMO agriculture you necessarily reject all uses of GE e.g. insulin production	The use of GMOs within confined growth contexts to generate purified products, especially for medical uses, is not precluded by our analysis. We might compare this application to doing pathogen laboratory research with reasonable and necessary precautions against their spread, as compared to doing it without.
Humans have always produced GMO	In the popular debate, GMO typically refers to transgenic organisms, which are novel in their means of creation of the genetic material, and the reason for the use of this method, is that it creates organisms that would not arise by conventional methods.
Transgenic techniques are a 'more precise' extension of other breeding techniques	Transgenic synthesis is qualitatively distinct from mutation and breeding processes. The organisms produced map to completely different risk profiles due to the nature of the space of possible genomes they are able to achieve.
We know enough about genetics to know that GMOs are safe	This claim is based upon limited understanding of specific molecular mechanisms. Rule 101 of complex systems: One cannot understand a macroscopic system by appeal to its components in isolation. Without careful study at the cellular, organismal, farming industry, food supply and ecological scales, it is incorrect to claim the GMOs have in general been shown to be safe.
Herbicides are not GMOs! Stop conflating them	Herbicides and GMO agriculture are linked. One of the primary purposes of GMO development is either the incorporation of herbicide resistance, or the inclusion of herbicide/pesticides within the food plant itself. This leads to changes in agricultural practices of putting herbicides more directly on food plants, and their increased presence in food products. These changes in crop biology and agricultural practice also have ecological impacts.
GMOs are just as natural as other plants and are therefore safe	Food plants for human consumption are selected by long experience for lack of toxicity among the many plants that have toxins that are harmful, or fatal. Randomly eating plants rapidly leads to health problems or death. One of the major reasons plants are not safe to eat is that they have pesticides in them to prevent animals from consuming them. By putting pesticides in GMOs we may be reversing the process of selection of safe plants, introducing toxins that make the plant less susceptible to pests, but are then also harmful to humans.
GMO require fewer pesticides	This claim is both misleading and has not been borne out even as claimed. Indeed, there is evidence to the contrary. Pesticides that are produced within the food plants themselves are not being included in the calculation of the reduction in pesticide use, and their presence at large scales in food crops may pose significant problems for health or the environment. In the case of herbicide resistant plants, the widespread use of the same herbicide (roundup) due to use of a single GMO strain has led to herbicide resistance in weeds and thus increasing herbicide use that is counter to the original (first few years) reduction.
GMO Crops have been around almost 20 years, that's a long time, enough to be sure that it doesn't have adverse impacts.	Moving from 0% to nearly 100% GE in major cultivars such as corn in 15 - 20 years' time is much too rapid an adoption rate to rigorously assess the impact of its adoption given the possible long term effects, and adverse effects may already be present in recognized adverse health trends but are not yet associated with those crops. Without controlled studies differentiating who is eating GMOs this cannot be adequately evaluated. For example, the herbicide "roundup" has been used much longer, since the 1970s, and its status was recently changed to "probably carcinogenic to humans" in 2015 with implications for GMO use due to the linkage between GMOs and roundup. Moreover, each new GMO that is introduced caries its own risks. Considering one GMO to provide tests of the new GMOs does not make scientific sense.

For additional reading, see *The Precautionary Principle* http://arxiv.org/abs/1410.5787