# UNDERSTANDING DRIVERS OF COMMUNITY CONCERNS ABOUT GENE TECHNOLOGIES

C Cormick and S Ding

Biotechnology Australia, GPO Box 9839, Canberra, ACT, 2601. Australia

**ABSTRACT**
To best engage in effective communication about emerging technologies that are often causes of social concern, the drivers of concern need to be best understood. Better understanding of social concerns enables for better two-way dialogue in providing information or education that also addresses concerns, and provides a mechanism for feedback to developers of new technologies as to what the community is willing to accept and why. Biotechnology Australia has undertaken extensive community research into social attitudes and drivers of these attitudes, to develop a model for analyzing social acceptance of new technologies. These findings underpin models for science-community dialogue.

**INDEX TERMS**
Community concerns, Gene technology, Biotechnology, Community dialogue, Emerging technologies

**INTRODUCTION**
Gene technology has been the focus of much public and political debate around the globe for the past 30 years, and has continually posed a communications challenge for both scientists and the community[1]. Yet many policy decisions based on public attitudes towards gene technology, being made by industry researchers and government agencies, are based not so much on what the public think, but on what key people think the public think[2].

Common faulted assumptions used in communicating about gene technology include:

- the public is ignorant of scientific facts,
- the public believe GMOs are unnatural, and
- the public is a victim of distorting media[3].

Communications strategies that have been based on these premises have generally proved ineffective, both through not engaging in dialogue with the community to better understand their concerns, and through not understanding that the community have specific interests that they wish to be communicated with on. This has been shown clearly in cases of risk communication, where the public are generally not interested in the facts of the science when they have high concerns about a technology, but wish to know who is ensuring their safety. Vincent Covello has described this as: The community don't care that you know, but want to know that you care[4].

While many surveys have been undertaken to find out what the public thinks about gene technology, or to map public concerns, there has been less work concentrating on the underlying causes of community concern, which need to be fully understood in order to minimise public rejection of new technologies with broad benefits. Also, many policy decisions by industry, researchers and government, referring to public attitudes towards gene technology use over-simplified or erroneous statements of public attitudes. A better understanding of community concerns and factors of acceptance enables for more effective education, consultation and community uptake of new technologies.

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[1] Cantley. M, How should public policy respond to the challenges of modern biotechnology? *Current opinion in Biotechnology*, No 15. 2004.

[2] A similar finding is reported by Public Perceptions of Agricultural Biotechnologies in Europe research project. European Communities, 2001.

[3] Public Perceptions of Agricultural Biotechnologies in Europe research project. European Communities, 2001.

[4] Covello.V. *RISK Newsletter*, Vol. 21, No. 4.

This article examines some key studies into drivers of attitudes towards gene technology, and looks at the five factors of influence that have been developed which can be applied to many other emerging technologies.

**THE SCIENCE COMMUNICATION PROCESS**

The problem with public concerns about biotechnology, from many biotechnologists' points of view, is that the public simply don't understand the science, and if they were only educated about it, the concerns would go away or diminish. This model, however, is an oversimplifications and fails to take into account the opposing point of view, which is that the developers of biotechnology applications simply don't understand the public, and if only they were educated about the causes of public concerns they would engage better with them and develop applications that better suited the public's needs.

Public debates on gene technology are too often characterized by scientists speaking a different language from the community, one factual-based and one emotive-based[5], so a process is clearly needed to bring the two closer together. Effective science communication and science education is part of this, but the other part is more effective understanding of the community.

Fostering a better two-way dialogue between developers of the technologies and society, and better understanding of drivers of social concerns needs to be undertaken, to minimise rejection of new gene technology applications.

This need has recently been highlighted by the British Association for the Advancement of Science's report *Connection Science: What we know and what we don't know about science in society*. It found three key areas requiring action:

- The need for a 'broker' to disseminate and discuss research developments, bringing together researchers from different fields and disciplines, and connecting researchers with stakeholders, policymakers and the public.

- Pragmatic research to fill factual gaps, for example, about where do people currently gain their knowledge about scientific matters, and about developments in education.

- Research which goes into greater depth about people's values, motivations and concerns. Survey results tell us much about what people believe; we need to understand more about why they hold these beliefs and how they manage their anxieties and concerns[6].

Biotechnology Australia has been conducting qualitative and quantitative attitudinal studies since 1999, looking at issues as diverse as genetically modified food and crops, cloning, and human health issues, including stem cells, and using this to position itself as a credibly source of factual and balanced information that meets the community's information needs. Key findings from the research includes the strong influence of ethics in decision making and the five key factors of influence.

**Beyond Risk/Benefit Analysis**

General studies into differing applications of gene technology often look at comparing the risks and the benefits of different applications, and show a general increase in acceptance when there are more perceived benefits. For example, from 1999 to 2003 concerns about genetically modified foods rose from 66% to 74%, but during the same period, attitudes towards GM crops that had been modified to be pest-resistant remained fairly constant with a 'useful' rating of 74% to 73%.[7]

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[5] Berube.D. Scientists and the Public: Barriers to Cross-Species Risk Communication, *Connexions*, March 31, 2005

[6] British Association for the Advancement of Science, *Connection Science: What we know and what we don't know about science in society*, April 2005.

[7] Yann Campbell Hoare Wheeler: *Public Attitudes Towards Biotechnology*, 1999; Millward Brown: *Biotechnology Public Awareness Survey*, 2001; and Millward Brown: *Biotechnology Public Awareness Survey*, 2003.

What has emerged about the drivers of attitudes, through several studies undertaken for Biotechnology Australia, is that most people make attitudinal decisions about gene technology based on more than a simple risk/benefit analysis, as ethical considerations also inform attitudes. So an attitudinal survey of pest-resistant GM crops in 2003 rated them as being beneficial by 73%, was rated as being risky by 64% and as being morally acceptable by 69%.[8] However, using human genes in animals for growing organs rated as 74% risk, 67% benefit but a very low moral acceptability of only 52%. It is apparent that any decision solely looking at the risk/benefit analysis of this application, without understanding the very low moral acceptability rating, would miss this key driver of community rejection.

Ethical considerations were also based more on both the processes by which a technology was developed and who benefited from the technology, than simply the outcomes of it. So a gene technology application that was considered generally beneficial, could be rejected based on the development being perceived to be harmful to people or the environment, and the largest beneficiary being a multinational company over the public[9].

Again, this demonstrates that purely addressing the scientific issues in science communication does not adequately meet public's information needs, which tend to be not based on the science itself, but how it is being introduced and who will control its introduction.

**Factors of Influence**

Focus group studies, used to compliment quantitative studies, have been very useful in delving deeper into the way people form their attitudes and the influence these attitudes might have on behaviours. The three major studies undertaken for Biotechnology Australia by Yann Campbell Hoare Wheeler and Millward Brown included 40 focus groups.

A key finding from the focus groups studies was the emergence of five key factors of influence in governing acceptance of gene technologies – which also apply to many other emerging technologies. These are:

1. **Information** - a level of understanding of the technology and what it can and cannot do, which has to be provided from a credible source. Misinformation campaigns, either demonizing the technology or over-promising its benefits tend to increase confusion and diminish trust in many people, leading to a lessening of the influence of information on attitude formation. And it is worth noting that pro- and anti-gene technology information does not have equal weighting. A recent study of information mixes in the USA showed that negative information on GM foods had a larger impact on people than positive, and when people were shown both positive and negative, the net effect was still a slightly lower rating of GM foods[10].

2. **Regulation** - a level of confidence that effective regulation exists to protect humanity and the environment. In relation to gene technology regulation in Australia government regulation is much more highly preferred over industry regulation, and while knowledge of government regulators is low, confidence in them is relatively high (70%).[11]

3. **Consultation** - a feeling that the public has had some input to the development of the technology. If the public believe that a technology has been foisted upon them they are more likely to reject it. Consultation must also address root concerns in the language of those concerned, and must be seen to be having some effect. Hence scientific information is often not well received by members of the public who are seeking information that addresses their more emotive concerns. Consultation is

[8] Millward Brown: *Biotechnology Public Awareness Survey*, 2001.

[9] Millward Brown: *Biotechnology Public Awareness Survey*, 2003.

[10] Tegene, Huffman, Rousu and Shogren: *The Effects of Information on Consumer Demands for Biotech Foods: Evidence from Experimental Auctions*, United States Department of Agriculture Economic Research Service, 2003.

[11] Millward Brown: *Biotechnology Public Awareness Survey*, 2001.

also more effective if done before the development of an application, rather than after its development (as has occurred with GM foods).

4. **Consumer choice** - the ability for an individual to accept or reject each application of the technology. In relation to human health applications of gene technology there is high perceived choice, but in relation to GM foods most people want to see more labeling of GM foods.

5. **Consumer benefit** - a clear individual and societal benefit from each application. The current generation of GM foods, for instance, do not have many perceived consumer benefits, while most health applications do.[12]

It should also be pointed out that perceptions are more important than realities in relation to these five factors of influence – so if there is a perception that there is no good regulation, than in mind of the public(s) there is no good regulation. Perception, in effect, becomes reality. Very few applications of biotechnology currently fulfill all five criteria well and contentious applications, like genetically modified foods and crops, fulfill none of them well.

Pro-gene technology advocates work very hard to push these factors towards higher acceptance, through key messages such as 'this technology will feed the world', while anti-gene technology advocates work hard to push them towards higher rejection, through such key messages as: 'we don't know enough about the technology' or 'regulation is not thorough enough'.

The high rejection of GM foods can be mapped out as having confusing information due to the high amount of conflicting information, or misinformation; a feeling that no public consultation was undertaken; a lack of consumer choice in countries without GM food labeling; and no direct consumer benefits as the technology was produced to benefit farmers and large agro-chemical companies. GM medicines, by comparison, rate high against all five criteria and have high acceptance.

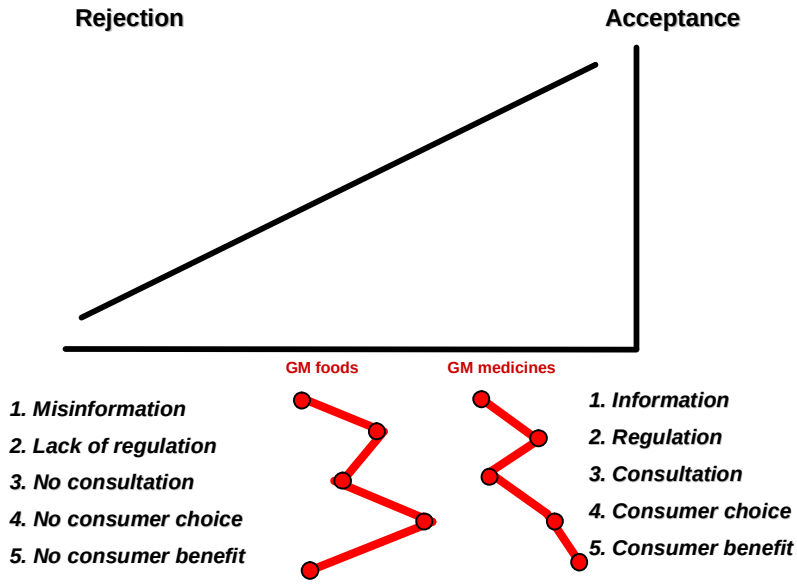


Figure 1

Using this model, the next generation of GM foods in Australia are being developed with clear consumer benefits, choice, transparency of regulation, and with two-way dialogue with the community in their development. Such a strategy should both increase consumer adoption of the technology and lead researchers to develop products that consumers desire.

**EVALUATION**

[12] Cormick.C: *Australian Attitudes to GM Foods and Crops*, Pesticide Outlook, Royal Society of Chemistry, December, 2002.

So what does it all mean? To seek optimal adoption of a new technology it is necessary to best understand both the drivers of concerns and the factors of influence that govern adoption, so that it is possible to match technological development with community acceptance.

**DISCUSSION**

We are already witnessing nanotechnology being highlighted as a technology of global concern, not primarily because of the technology itself, but because of the lack of perceived regulation and community consultation undertaken in its development. Science communication needs to best understand drivers of community concerns to most effectively meet them or many emerging technologies will meet strong community resistance that will hamper their introduction.

**CONCLUSION**

How a technology is introduced into society can be more important than the benefits of the technology. We live in a rapidly changing world and need to best understand the nature of social change to optimize the development of new technologies that are both beneficial economically and are acceptable to society.

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