

Changing attitudes to biotechnology in Japan

Support for biotechnology in Japan is declining, although it remains higher than the US or Europe.

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A new survey of the Japanese population reveals waning support for biotechnology and genetic engineering in particular. Although a majority of people remain optimistic about biotechnology and its uses, a growing number of people feel that the risks associated with agricultural applications, and even environmental and health applications, are increasingly unacceptable.



Interest and optimism

Overall, the Japanese population has a high level of interest in science and technology^{4,5}. This has increased in recent years, as demonstrated by the growing number of respondents with a high level of interest in scientific innovation (30% in 1991, 39% in 1993, and 47% in 2000)^{1,2}. This level of interest also applies to biotechnology, with the 1991 and 1993 surveys demonstrating that 97% of respondents

had heard the term biotechnology—the highest level of reported awareness of biotechnology in the world (although we cannot be sure that people know what it means).

A small majority of respondents in the past three years have been favorably inclined toward genetic engineering as a means of improving the quality of life (54% in 1997 and 59% in 2000). However, on the whole, respondents view genetic engineering considerably less favorably than com-

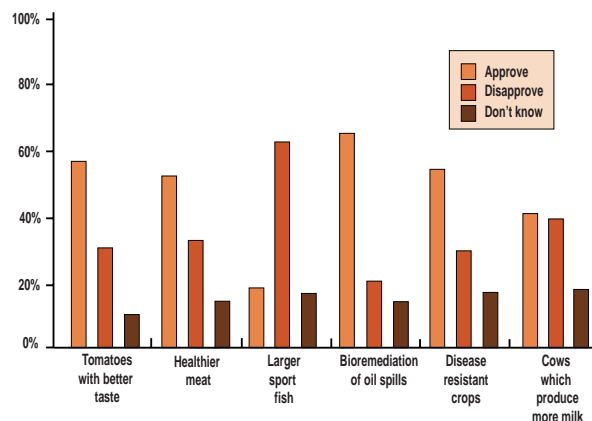


Figure 1. Public attitudes to six applications of biotechnology

puters and information technology (77% in 1997 and 82% in 2000) and telecommunications (76% in 1997 and 77% in 2000). During the past three years, more respondents have also become convinced that genetic engineering (12% in 1997 and 24% in 2000) could actually make life worse. A further distinction is that more people (62% in 1997 and 66% in 2000) perceive biotechnology in a positive light compared with genetic engineering, and also believe that the latter is more risky.

Surveys so far

Several nationwide random surveys of the Japanese public¹⁻³ have been conducted over the past decade to gain a better understanding of public attitudes to biotechnology. These surveys were carried out in 1991, 1993, and 1997, and on samples of 551, 352, and 297 people, respectively. In each case, all participants were randomly selected across the nation and responses were gathered by mail (except in the 1997 survey, which used random-digit telephone dialing).

From November 1999 to February 2000, we also conducted a new nationwide random mail response survey (receiving answers from 297 people) to assess the attitudes of the Japanese public to biotechnology in the context of increasing attention to the viewpoints of anti-GMO groups in the lay media.

At the same time, 370 Japanese scientists were questioned about their attitudes to biotechnology (complimenting a survey of 555 scientists carried out in 1991) to assess differences between the lay public and professionals (see "Ask a scientist").

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Ask a scientist

In addition to surveys of public attitudes to biotechnology, parallel surveys of scientists have also been carried out throughout Japan in 1991 (555 respondents) and in 2000 (370 respondents) using the same set of questions. Some interesting findings emerge when the scientist sample is compared with the public sample. For example, scientists consider biotechnology more similar to telecommunications than does the general public. In addition, more scientists (72%) than members of the general public (59%) believe that genetic engineering will improve the quality of life. However, in nearly every case of specific applications of biotechnology, there is no significant difference in opinion between the public and the scientist samples (see Table 2). And even though 59% of scientists said they approved of "tomatoes engineered for better taste," only 32% said they would buy fruits, compared with 52% who said they would not. Overall, scientists appear vague (sometimes deliberately so) about the definition of genetic engineering (perhaps intent on broadening the definition of genetic modification so that it is seen within the context of a long history of animal and plant breeding and is not singled out for special regulations). Scientists themselves appear to have a number of critical questions about biotechnology that need to be answered before they can be expected to widely support the adoption of biotechnology applications.

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Table 1. Images that come to mind when respondents think about biotechnology/genetic engineering^a

Image	1997 Public survey	2000 Public survey	2000 Scientist survey
GM food	5%	17%	9%
Medicine	11%	13%	17%
Cloning and IVF	7%	25%	10%
Genetic testing	1%	3%	2%
Gene therapy	3%	11%	12%
Improved crop variety	20%	11%	15%
Genes/genetic engineering	11%	16%	21%
GM animals	4%	3%	5%
GM crops	9%	16%	8%
Specific example	6%	5%	8%
Industry	2%	2%	7%
Tech/scientific progress	6%	9%	21%
Environment	3%	3%	2%
Ethics	2%	9%	4%
Benefits and risks	3%	9%	6%
Against nature	4%	7%	3%
Other	2%	6%	5%
Not stated	21%	9%	7%
Don't know	11%	1%	1%

^aRespondents were asked the question: "What comes to mind when you think about modern biotechnology in a broad sense, that is, including genetic engineering?"

The major concerns expressed about genetic engineering were "fear of the unknown," "going against nature," and "environmental destruction." Many expressed both optimism and pessimism, saying that more stringent controls of biotechnology research were needed. An 18% increase in the number of respondents (from 14% in 1997 to 32% in 2000) concerned with the deleterious effects of

biotechnology on the range of fruits and vegetables available may reflect increasing concerns about the industrialization of food production. Respondents also appear to be increasingly concerned about the risk of genetic discrimination and its effect on insurance premiums (39% in 1997 compared with 65% in 2000).

Increasing reticence over the usefulness of biotechnology is also reflected in a 9%

decrease in the proportion of people who thought that biotechnology could substantially reduce environmental pollution (45% in 1997 and 36% in 2000). However, there was a 7% increase in the number of respondents who considered that biotechnology could reduce world hunger (38% in 1997 compared with 45% in 2000).

Image, acceptability, and threat

When asked to describe the images evoked by biotechnology and genetic engineering, respondents gave the specific definitions and examples given in Table 1. The most common specific examples of biotechnology cited were cloning (7% in 1997 and 25% in 2000), GM crops (9% in 1997 and 16% in 2000), and GM food (5% in 1997 and 17% in 2000). Although the "pomato" (a somatic hybrid plant of potato and tomato regenerated from fused protoplasts that had originally received significant coverage in the Japanese media) was cited by 8% of the respondents in 1997, this example was cited by only 1% in 2000. Significantly, the number of respondents who associated biotechnology with the agricultural improvement of crop varieties dropped from 20% in 1997 to 11% in 2000.

Based on the questions from the 1996 Eurobarometer survey⁶, respondents were also asked whether they had heard about six applications of biotechnology, and then about the benefits, risks, and acceptability of these applications.

Pest-resistant GM crops were the most familiar biotech application, with a 22% increase in respondents (from 65% in 1997 to 87% in 2000). Overall, more people in the 2000 survey than in the 1997 sample had heard of every development, consistent with an increased interest in science and technology.

In all cases, the most acceptable application was "introducing human genes into bacteria to produce medicines and vaccines" (56% in 1997 and 45% in 2000); even for this application, however, a sizeable number of respondents disapproved of its use (25% in 1997 and 33% in 2000). Given that many diabetics depend upon insulin made in this way, this level of disagreement suggests that many people do not really understand the implications of their answers about biotechnological applications.

Overall, there has been a significant decrease in acceptance by the public regarding biotechnology applications across the board; for example, support for pest-resistant crops has dropped from 52% in

Table 2. Attitudes toward products originating from GMOs^a

Application/response	1991 Public survey	1993 Public survey	2000 Public survey	1991 Scientist survey	2000 Scientist survey
<i>Tomatoes with better taste</i>					
Approve	—	69%	58%	—	59%
Disapprove	—	20%	32%	—	33%
Don't know	—	11%	10%	—	8%
<i>Healthier meat</i>					
Approve	—	57%	52%	—	56%
Disapprove	—	26%	33%	—	34%
Don't know	—	17%	15%	—	10%
<i>Larger sport fish</i>					
Approve	19%	22%	19%	16%	19%
Disapprove	50%	54%	64%	57%	67%
Don't know	31%	24%	17%	27%	14%
<i>Bacteria to clean up oil spills</i>					
Approve	75%	71%	65%	83%	66%
Disapprove	7%	13%	21%	7%	24%
Don't know	18%	16%	14%	10%	10%
<i>Disease-resistant crops</i>					
Approve	75%	66%	55%	86%	61%
Disapprove	6%	7%	29%	5%	26%
Don't know	19%	17%	17%	9%	13%
<i>Cows that produce more milk</i>					
Approve	—	44%	42%	—	60%
Disapprove	—	32%	40%	—	29%
Don't know	—	24%	18%	—	11%

^aRespondents were asked the question: "If there were no direct risk to humans and only very remote risks to the environment, would you approve or disapprove of the environmental use of genetically engineered organisms designed to produce ...?"

Table 3. Attitudes toward cross-species gene transfer

Type of genetic modification/ response	1993 Public survey	2000 Public survey	2000 Scientist survey
<i>Crops containing exogenous plant genes</i>			
Acceptable	39.2%	32.3%	48.9%
Unacceptable	25.5%	39.5%	35.2%
Don't know	35.3%	28.2%	15.8%
<i>Crops containing exogenous animal genes</i>			
Acceptable	10.6%	18.6%	37.5%
Unacceptable	40.3%	54.0%	43.2%
Don't know	49.1%	27.4%	19.3%

1997 to 33% in 2000, and support for GM food has dropped from 45% in 1997 to 31% in 2000. Fewer people in 2000 said they were willing to buy GM fruits that taste better (36% in 1997 compared with 20% in 2000). Unlike public attitudes in other parts of the world (e.g., see p. 935), however, medical applications of biotechnology, such as “preimplantation diagnosis” and “xeno-transplantation,” are less acceptable than GM crops and food.

In order to understand whether the people differentiate between the various applications of genetic engineering in terms of perceived benefits and risks, respondents were asked whether each application was useful to society, and how much risk they perceived. High levels of benefit and low risk were perceived for medical applications, such as introducing human genes into bacteria to produce medicines/vaccines and developing genetically modified animals for medical studies.

Both 1997 and 2000 data on the public sample show that the highest level of perceived benefit was for animals used in medical studies followed by modified bacteria used in producing medicine. The lowest level of perceived benefit and highest risk for all samples was for xenotransplantation. Another compelling finding was that the respondents in the 2000 survey considered GM food and drinks (cited as a high risk by the 1997 sample) to be less risky than pest-resistant crops and (to a lesser extent) xenotransplantation.

A glance at Table 2 reveals that respondents gave the highest levels of support for

“the use of bacteria to clean oil spills,” followed by “disease-resistant crops” and “tomatoes with better taste.” The high disapproval of applications such as transgenic fish engineered for sport fishing demonstrated the degree to which people are willing to support genetic engineering for “fun” rather than “need.” Both 1997 and 2000 samples showed majority support for the release of GM plants, namely tomatoes and disease-resistant crops.

When asked to explain their level of support, respondents in the 2000 survey indicated that they believed a particular application had “unknown effects” or was “unnatural,” “unethical,” or “unnecessary” (the “four U’s”). In particular, cross-species (plant–animal) gene transfer (rather than plant–plant) was perceived to be particularly unacceptable (Table 3). Whereas the opponents (from 40.3% in 1997 to 54.0% in 2000) of such procedures increased, so did the proponents (from 10.6% in 1997 to 18.6% in 2000), indicating that viewpoints are becoming more polarized.

Conclusions

The majority of the Japanese public still has optimistic views about biotechnology. In both 1997 and 2000, Japanese respondents were more favorably disposed to biotechnology and genetic engineering than their counterparts in Europe^{6,7} or New Zealand³.

The population is well informed about scientific developments and even discriminates between biotechnology and genetic engineering, which is viewed less favorably. In this regard, the long history of fermenta-

tion technology in Japan may help explain people’s familiarity with the concept of biotechnology; after all, almost every household uses microorganisms to make pickles daily.

In the past three years, awareness of biotechnology has increased, and the number of proponents and opponents has also grown, suggesting that viewpoints are becoming increasingly polarized (as is the case in other parts of the world). Although the majority remains favorably disposed to biotechnology, acceptance for its applications has declined overall. Even environmental applications of GMOs have dropped in acceptance between 1991 and 2000 (Table 2), suggesting that bad publicity concerning GM crops has tainted perceptions of other applications. The results of the 1997/2000 surveys in Japan (and New Zealand survey in 1997) suggest that it is the debate on GM crops rather than cloning that has made people negative³. In general, people appear more skeptical about the potential of biotechnology, as demonstrated by the 9% drop (45% in 1997 and 36% in 2000) in the proportion believing that biotechnology would substantially reduce environmental pollution. The public clearly also feels that there is a great need for improved regulation of the area (see “Confidence in regulatory bodies”).

Areas of particular concern are the impact of genetic engineering on the variety of fruit and vegetables available and the possibility of compulsory genetic testing and discrimination by insurance companies. Whereas medical applications of biotechnology receive high approval ratings, applications such as “preimplantation diagnosis” and “xenotransplantation” are less acceptable than agricultural applications, such as GM crops and food.

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Confidence in regulatory bodies

One part of the 1997 and 2000 surveys asks the public to comment on their confidence and approval of regulatory structures. The results show respondents were overwhelmingly in favor of international regulatory bodies, such as the United Nations and the World Health Organization (62% in 1997 and 69% in 2000). Following in a distant second position were scientific organizations and ethics committees. There was a significant drop in confidence in scientific organizations among respondents in the 2000 survey compared with 1997. Very low confidence was shown for the Diet and other government agencies in Japan. Schools and universities were the most trusted sources of information, and will be expected to be influential in opinion making through the media.

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