Biotechnology in Switzerland: high on the public agenda, but only moderate support

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In Switzerland, there have been intensive public debates about biotechnology because of the specific Swiss political system of direct democracy that led, in 1992 and 1998, to two national referenda on biotechnology regulation. As a result, the Swiss population is well informed but skeptical about this technology. These findings contrast with the deficit model of public understanding of science, which predicts a positive correlation between knowledge of, and support for, a specific technology. What role did the media play in the development of public opinion? This question is discussed because of a content analysis (time series) of national newspapers. In addition, representative surveys and focus groups yield insights into the public perception of biotechnology and the influence of mass communication for opinion formation.

1. Introduction

Biotechnology has been a key economic and political issue for Switzerland. Economically, Switzerland hosts a number of large multi-national companies in the pharmaceutical and agricultural industries (e.g., Novartis, Roche, and Syngenta), and many small-scale start-up biotechnology companies. Politically, biotechnology has been high on the Swiss agenda, due to the special Swiss system of direct democracy. Switzerland is an interesting case study for investigation by communication researchers, and other social scientists, because of the conflicting points of view and intensive public debates.1

The second section of this paper gives background information on the Swiss political system in general, and specific information about the recent policy debate on biotechnology. In the third section, we describe the media coverage of the debate and discuss whether the media were able to meet certain quality standards. The fourth section investigates possible media effects, based on findings from surveys. Three well-known media effects have been selected for this purpose: agenda setting, knowledge gap, and consonance theory. The fifth section shows results from focus groups, providing an in-depth view on attitudes with regard to biotechnology, and the type of arguments used to justify these attitudes.

2. Swiss policy on biotechnology

The extent and form of public debates on biotechnology in Switzerland have been greatly influenced by the Swiss system of direct democracy, which allows citizens to launch a campaign
to collect signatures for a so-called “initiative” at the federal level. If the necessary number of signatures (150,000) can be obtained within a specified time, any group of citizens may submit an initiative. It then has to be debated by both the national parliament and the government, who can support or reject the initiative, or write a counterproposal with similar, but typically less radical, aims. A national referendum on the initiative has to take place within five years of its being submitted. If there is a counterproposal, both submissions have to be voted on.


There was almost no political or public debate on biotechnology during the 1970s and 1980s in Switzerland. During this first phase, the federal government did not intend to create a specific, blanket law on biotechnology. This ended in 1987 with the submission of the so-called “Beobachter Initiative” for restricting the abuse of reproductive medicine and gene technology in humans (accepted in 1992 as revised version of Art. 24 of the national constitution, with 74 percent voting in favor). This first piece of legislation in this field was motivated by a growing awareness of the lack of regulation in biotechnology, particularly as applied to humans.


The second phase, triggered by the submission of the “Beobachter Initiative,” continued until 7 June 1998, when the Swiss electorate rejected the second so-called “Gene-Protection Initiative” (German “Genschutz-Initiative”). Originally submitted in 1992, the initiative, which was rejected by 66 percent of those who voted, was intended to protect living organisms and the environment from genetic manipulation. By 25 October 1993, the committee for the initiative had gathered the necessary number of signatures. The text of the initiative called for the prohibition of the following three things:

1. The production and sale of genetically modified (GM) animals,
2. the release of GM plants and animals, and
3. the issue of patents on GM plants and animals.

This phase was accompanied by an increasingly controversial public debate that forced the government to change its original laissez-faire approach and to accept at least a certain amount of regulation.

The main biotechnology policy event in this period was the referendum on the Gene-Protection Initiative, which took place on 7 June 1998. Most other events in this area were more or less closely related to this referendum.

Nineteen ninety-seven was characterized by the Swiss parliament’s attempt to develop an indirect counterproposal to the “Gene-Protection Initiative.” Rather than formulating a direct counterproposal to it, Swiss industrialists and the government decided to adopt the strategy of planning and running a propaganda campaign for the “Gene Lex Package.” On 4 March 1997, the parliament issued a first draft of the “gene law,” with the additional legislation known as the “Gene Lex Package.” Public opinion polls showed that the Gene-Protection Initiative had a realistic chance of being supported by a majority of the population. The pro-gene lobbyists in parliament got together to draft a “gene law” to address the problem of regulating those areas of gene technology not already covered by existing Swiss legislation. Since the gene law was not developed as a direct counterproposal to the “Gene-Protection Initiative,” the Swiss will not be able to vote on it.

In December of the same year, and in record time, the federal government produced the second draft of a “gene law.” The speed with which the government worked was interpreted
as an expression of its willingness to seriously take into account the concerns of the Swiss population, and to develop strict regulations for gene technology.

The long-awaited vote on the Gene-Protection Initiative took place on 7 June 1998, after a very intensive press and advertising campaign. The two opposing camps split according to the well-known polarization line between the political left and right: The anti-gene-technology position was supported by the political left, i.e., the Green Party and the Social Democrats (although several Social Democrats were active in the pro-gene-technology camp). In addition, several influential environmental NGOs (Non governmental organizations such as the World Wildlife Federation, Greenpeace, Pro Natura, and Medical Doctors for Environmental Protection, etc.) were among the main opponents of gene-technology, and actively supported the Gene-Protection Initiative with considerable organizational and financial means. The main arguments against gene-technology were the risks for human health and the environment, and an ethical rejection of the patenting of animals and plants, since these are products of nature.

The political right—all the conservative parties—supported the pro-gene-technology position. The main actors in this camp were university researchers and the pharmaceutical industry, both believing their very existence to be threatened by the “Gene-Protection Initiative.” The main arguments raised in the public debate in favor of gene-technology, and therefore against the initiative, were that a great deal of medical research would be stopped and that a considerable number of scientific jobs would be lost. This fear of job losses was also expressed in a unique event: On 28 April 1998, several hundred genetic researchers and sympathizers gathered to march in a demonstration against the “Gene-Protection Initiative.” The event, labeled as the “demonstration of the professors,” received high media attention, but it was also criticized as being a public relations exercise.

The voting campaign on the Gene-Protection Initiative was one of the most intense the country had ever seen. The pro-gene-technology alliance managed to run a “well orchestrated campaign, using very different channels to convey the message.” Though there is no precise information available about the budgets of either camp, a prominent member of the pro-gene-technology alliance confirms that they had “considerable financial backing.”

Last, but certainly not least, the federal government made it quite clear that it was against the “Gene-Protection Initiative.”

For all these reasons, the pro-gene-technology alliance managed to change the attitude of public opinion on gene-technology from negative to positive. This happened quite dramatically in the last two months before the vote. This shift came as a surprise to most political observers but, as a result, the initiative was rejected by a large majority of Swiss voters (66.6 percent), although, as usual, the turnout was low: Only 40.6 percent of those entitled to vote actually did.

2.3. Third phase—the “Gene Lex Package” (since 1998)

In the third policy phase after the rejection of the “Gene-Protection Initiative,” the policy process has focused on the development of the so-called “Gene Lex Package,” dealing with non-human biotechnology.

After the vote, the Swiss government took its time getting on with the work on the “Gene Lex Package.” On 19 January 2000, it published a new draft of a “gene law” to be debated in parliament in Fall 2000. The “gene law” is not a single, independent law. Instead, it is a package of additions to other mainly environmental laws, but also to other laws concerning agriculture, animal protection, etc. Issues addressed in the draft are the protection of humans and the environment, ethical responsibilities, and informing the public. The draft does not ban the release of GM crops, either completely or for a restricted period of time (moratorium).
However, it insists on strict monitoring and restrictions. Furthermore, farmers cannot be held liable for any damages arising from GM crops within 30 years; instead, the producer of GM seed material can be deemed liable.

The law is in many points comparable to European Union (EU) regulations, but more restrictive on two points:

1. The notion of the “inherent dignity of living being” has to be respected.
2. Releases and trade of genetically modified organisms (GMO) can be prohibited where it is considered in the “dominant public interest.”

The draft of the “Gene Lex Package” has been supported by most organizations, including the pharmaceutical industry and farmers, but criticized by some branches of the agricultural industry and by environmental organizations.

2.4. Recent developments

The political debate on biotechnology took place in existing institutions (e.g., Parliament or regulatory offices), and in different and new arenas. The following descriptions show that even relatively small events can have a considerable impact on the public agenda.

- In 1999, a governmental body (Federal Council for Science) held a citizen consensus conference—called a Publiforum—on “Genetic Engineering and Food.” One of its aims was to try to overcome the gulf that had grown between the hardened fronts. However, in a close vote (a majority, but not unanimous, decision), the Publiforum recommended having a moratorium on GM crops. This radical recommendation has led some politicians and scientists to question the methodology of consensus conferences.
- On 1 July 1999, a federal directive on what can be labeled as GM-free food (containing less than one percent of GM organisms) came into force. The directive was well received, partly because it could be applied in practice.
- On 13 June 2000, the Ministry of Environment launched an “International Symposium on Gene Technology.” The plan was to hold four workshops per year. Jeremy Rifkin, an American opponent of gene technology, was invited to the first workshop. The pro-gene-technology lobby, including the Nobel Prize winner Rolf Zinkernagel, heavily criticized this invitation. The first workshop of the symposium was so controversial that the federal government withdrew as the main sponsor.

3. Biotechnology in Switzerland: high impact on the media agenda

The following elaborations give an overview of results from the content analysis of a quality Swiss newspaper from 1997 to 1999, and demonstrate the effective influence of an initiative on the media.

The “Gene-Protection Initiative,” which wanted to restrict gene technology in the extra-human domain, led to many articles being published between 1997 and 1999, with a clear peak in 1998, the year of the vote. The quantity and content of the articles related to the initiative; topics of the initiative, as well as key actors from politics, science and economy, strongly dominated media coverage during the voting debate.

This content analysis is the follow-up of a longitudinal content analysis of a Swiss opinion-leading newspaper within the scope of a European project. Altogether, we have data from 1973 to 1999.

The results presented here contain articles from a quality Swiss-German newspaper, with a focus on the past three years: The Neue Zürcher Zeitung, with a readership of 8.5 percent.
The sample includes 188 articles, grouped according to artificial weeks. The articles were merged by full-text research with the following keywords: biotech, gentech, cloning, Dolly (the first cloned sheep), transgenic.

3.1. Intensity: high impact on the media agenda

The general increase since the mid 1980s (Figure 1) expresses the mainstream trend of biotechnology, which is no longer just a scientific matter but now an economic and political issue. Looking at the recent past, the number of printed articles roughly doubled between 1996 and 1998. This is due to the initiative, which was heavily discussed in the media.

![Image of intensity graph: Articles in percent per year (1979–2000; N = 424).](image)

Not only can increasing production be seen as a result of the initiative, but the themes being discussed and the persons being talked about are also clearly linked to it.

A closer look at the articles shows a wide variety of themes, which ties in with a broader discussion among the public. The themes did not just concern the topic of the 1998 initiative, which mostly included non-human applications, but also other aspects of biotechnology. This appears to correlate with the increasing importance of biotechnology for society as a whole. New topics, like cloning and genetically modified food, were becoming more feasible and thus scored high in terms of the number of articles written about them.

Figures 2 and 3 give an overview of the themes and actors that were most frequently found in the sample. Topics concerning biotechnological issues related to food and agriculture such as GM-food, crops, transgenic plants, etc., appear in 21 percent of all articles. Regulatory issues score with 17 percent, topics comprising health issues with 13 percent, the same as for public opinion expressed in the articles. The latter corresponds to the high number of letters to the editor that were published during debate of the initiative (see 3.4).

Scientific actors can be found in 43 percent of all articles as the main actors, followed by politicians with 22 percent and actors from the business sector with 18 percent. This mirrors the key actors involved during the initiative debate.

3.2. Controversial arguments with respect to biotechnology

From a normative point of view, the public needs balanced media coverage on any issue in order to make up its political mind for voting. Balance can mean a diversity of actors with a diversity of arguments. It can also mean that a newspaper provides its readers with a range of topics on...
the issue to be voted, as well as a critical view on the matter. To examine how balanced (i.e., how equitably the pros and cons of biotechnology presented) the opinion-leading newspapers in Switzerland are, we looked closely at the benefits and risks (concerning biotechnology) mentioned, and the responsible actors respectively.

As can be seen from Figure 4, a little more than one quarter of all examined articles have no benefit or risk indicators. One quarter of all articles mention that biotechnology is a risky thing, and a little less than one quarter say that biotechnology is a beneficial technology. Particularly outstanding is the fact that a quarter of all articles mention both benefits and risks: Every fourth article treats biotechnology controversially in one-way or another, while pointing out its pros and cons. Consequently, the coverage of biotechnology has indeed been balanced, especially when taking into account that this sample includes 30 letters to the editor, each of them taking a clear position one way or the other, i.e., being very biased.

The way benefits and risks were presented has to be specified: In general, it is not the journalist who weighs up the pros and cons, or gives his or her opinion on the whole, or on a specific topic, but quoted experts who voice their opinions.
The variables that link the actors involved with particular benefits or risks are worth examining. Scientists seem to take the strongest stands on both fronts, and are accordingly viewed as either scapegoats or trustworthy experts who can solve problems, e.g., incurable diseases, famines in the Third World, environmental pollution, and social inequity. In 61 percent of all articles that mention benefits, these were assigned to scientists. On the other hand, in 46 percent of all articles that voice risks, scientists are held to account for them. Science “as a whole,” does not seem to occupy a clear position in the Swiss newspapers: Scientists can be found on both sides.

3.3. Framing the story: what the readers should “read”

We can confirm an increasing interest in the “frame concept” when it comes to analyzing media production, media products and media reception. A frame highlights a certain piece of information and adds salience to it by “making a piece of information more noticeable, meaningful, or memorable to audience.”7 A frame defines a problem within an article, announces a causal interpretation, evaluates morally, and/or proposes a solution. A frame’s function is therefore “to construct meaning, incorporating new events into its interpretative envelope.”8 Frames refer to the way journalists create reality within media texts, as well as to the scheme recipients reconstruct the meaning in an article.

Sharon Dunwoody and Hans-Peter Peters specified four frames within risk communication and identified them as strategies of coping.9 Journalists develop ways to ease their daily work by using available patterns of reporting.

In the case of the present analysis, frames were sought in the text and attributed to the given categories.10 Frames were classified as follows:

1. Progress: announcement of a new development, breakthrough, historical direction, conflict between progressives and reactionaries.
2. Economic prospects, R & D arguments.
3. Ethical: call for ethical principles, thresholds, and distinction between acceptable and unacceptable risks in discussions on known risks.
5. Runaway: fatalism following innovation, having adopted the new technology/product, a price may well have to be paid in the future.
7. Public accountability: call for public control, participation, public involvement, regulatory mechanism, private versus public interest.
8. Globalization: call for global perspective, national competitiveness within a global economy, or the opposite: splendid isolation:11

The findings (Figure 5) show a clearly favored frame, namely public accountability. In 35 percent of the articles, the call for public control, participation, public involvement, regulatory mechanism, and private and public interests are structures that bind the context of an article. The frames “progress” (21 percent) and “economics” (12 percent), which both have positive connotations, also appear, followed by the rather scary frame called “Pandora’s Box” with 10 percent, which represents a warning and a call for restraint in the face of unknown risks. Ethical concerns frame eight percent of the articles. These last two frames, Pandora’s Box and ethics, overemphasize negative valuations with respect to moral, environmental matters and health. They include cloning issues, security matters, transgenic plants and crops, GMO release, regulation and public opinion. In between these more or
less clearly positioned frames on the positive and negative sides, we find the heterogeneous frame “public accountability,” which represents a differentiated and quasi-reflexive reporting on biotechnology. It is worthwhile examining these articles more thoroughly, since they mirror the Swiss discussion of biotechnology with regard to the initiative. Politicians, members of NGOs, scientists and representatives from industry play an important role, and debate topics which are connected with the initiative e.g. regulation, transgenic plants, crops and animals, science policy, security matters, cloning and public opinion. They take different positions for or against biotechnology, and present different arguments as to why the public should accept or reject the initiative. On the one hand, scientists or representatives from industry put forward arguments concerning working or research possibilities in Switzerland, thus supporting the new technology. On the other hand, representatives from NGOs bring up moral arguments and point out the dangerous side of biotechnology, mentioning disadvantages for the environment, health, and consumers.

Figure 5. Frames in percent (1997–1999; \(N = 188\) articles).

3.4. Letters to the editor: clear positions and punchy votes

These findings are based on an extended sample, which includes two quality newspapers. In addition to the *Neue Zürcher Zeitung*, the *Tages-Anzeiger* has been analyzed for the period from 1997 to 1999.

Letters to the editor can be seen as textual sources full of rich argumentation. They reflect how the public understands and views a particular issue, and provide access to opinions outside the domain of professional journalists and experts.

However, the letters are neither representative nor unfiltered pieces of information. Each letter to the editor has to fulfill criteria established by the editorial department, and will not be printed if it does not appeal to the editor or if its content does not “fit in.” Still, letters to the editor are informative, especially when it comes to moral or ethical arguments.

During the three years examined, 72 letters referring to biotechnology were uncovered; most of the letters were written before the vote on the “Gene-Protection Initiative.” The analysis shows a wide range of views on both the technology and the initiative, most with a clear position for or against biotechnology. Forty-seven percent of the letter writers evaluated biotechnology negatively, 31 percent evaluated it positively, 15 percent mentioned neither benefits nor risks, and a mere seven percent presented both sides of the issue. However, these findings need to be interpreted with precaution. They suggest that people who write letters to the editor have a clear position for or against the technology. On the other hand, the result could also mean that letters with non-ambiguous content have a greater chance of being published.

A closer look at the letters indicates that writers have no reservations about declaring their disapproval clearly. In particular, scientists and representatives of research institutes and
universities are often targets of criticism. Representatives from NGOs and industry, as well as politicians, were also evaluated negatively, albeit slightly less so. On the other side, we can conform positive evaluations relating to scientists and NGOs.

3.5. Conclusion

Media analysis of the three years shows that biotechnology was high on the agenda. The discussion was greatly influenced by the initiative that was put to vote in 1998. Arguments from supporters and opponents are one of the most important features of letters to the editor. The numbers of letters to the editor indicate how much the issue has been discussed in public.

The findings suggest that the public had the possibility to make up its mind. Different positions, for or against the technology, could be found, and media coverage extended to all areas of biotechnology.

4. Agenda setting, knowledge gaps, and consonance media effects

The following section explores how public perceptions of biotechnology can be linked to media coverage of this highly controversial topic. The basic issue is to better understand the role of the mass media in the process of forming and shaping public agenda, knowledge, and opinions towards biotechnology in Switzerland, since the survey data available clearly demonstrates a shifting climate of public opinion towards biotechnology between 1997 and 2000.

4.1. Theoretical background

In the following, four topics concerning questions of media influence will be discussed. This will be done on the basis of different media effects paradigms: (1) processes of agenda setting, (2) knowledge gaps, (3) public perceptions of media influence, and (4) shifts in the climate of public opinion. Agenda setting theory is certainly one of the most influential new theoretical perspectives. It was developed in the early seventies by Maxwell E. McCombs and Donald L. Shaw and relies on the assumption that media do not tell people what to think, but what to think about. Media focus the public agenda on a certain number of topics and issues by processes of gatekeeping. Thus, the agenda-setting theory claims that the media agenda, the intensity of media coverage on a topic—measured by content analysis—correlates with the public agenda as perceived salience of this topic—measured by survey research. Thus, media are able to influence the perceived public agenda by the varying amount of issue coverage. The public agenda can be measured differently; on the one hand by asking the perceived relevance of a topic—intra-personal agenda—and on the other hand, by measuring the interpersonal agenda, by asking people how often they discuss the topic with other people. Over time, the agenda-setting theory claims that issue salience will increase as a function of intensifying media coverage and will decrease if media coverage goes down. The agenda-setting function of the media is mediated by a third factor, namely the visibility or obtrusiveness of a topic, or the occurrence of interpersonal communication.

Whereas agenda setting is concerned with the function of media to focus people on specific issues, thus homogenizing the sphere of public opinion, the knowledge-gap hypothesis—first formulated by Philipe Tichenor, George Donohue, and Clarice Olien in 1970—proposes a more dysfunctional aspect of mass communication by assuming that the information flow generated by media publicity on an issue like biotechnology will be not homogeneous across different social strata. This is because people with a higher education (a) are more motivated
to acquire public affairs knowledge, (b) depend more on the information-rich printed-media, (c) have better information processing skills, and (d) process media information at a faster rate than those with a lower educational background. As a consequence of the underlying existing social structure, the gap in public affairs or science knowledge between the segments with higher socio-economic status or high education and the lower status segments tends to increase rather than decrease. The development of knowledge gaps if influenced by mediating third factors like complexity of the topic, intensity of conflict or perceived relevance of a topic. These factors motivate information seeking and information processing; they are able to compensate educational disadvantages, at least to a certain extent.

There is a rich tradition in communication-effects research demonstrating effects of selective exposure and attention to mass communication. In particular, the various theories of cognitive consistency, like the Dissonance Theory formulated by Leon Festinger in the 1950s, assume that people tend to expose themselves to media content that conforms to their predispositions, and interpret media messages based on their cognitive schemata and affective evaluations. As a result, media publicity tends to confirm and reinforce preexisting attitudes, and attitude change does not seem to be a major outcome of media influence. Nevertheless, people are influenced by mass-media publicity, especially concerning new complex and controversial topics like biotechnology, since there are no predispositions at all. Furthermore, people’s capacity to process persuasive messages is limited. Not all people were motivated enough and/or have the mental ability to process media information on complex and rather abstract topics like biotechnology. Thus, the Elaboration Likelihood Model postulates that persuasive media effects are still possible by the so called peripheral route, but these are based on peripheral cues, such as attractiveness of expert sources, positive or negative effects associated with topics or visual images. Priming effects in this context means that mass media publicity or campaign messages—e.g., highlighting future health related possibilities of genetic engineering—encountered in the past, primarily activate or trigger positive rather than negative ideas in the minds of audiences processing information supplied by the mass media.

4.2. Methods and data

The data of the Swiss part of the European project is based on two large representative Eurobarometer Surveys. Although similar to the ones realized in the other European countries, the data was gathered in Switzerland with a time lag of about six months. The data of each survey is based on personal interviews of a representative sample of about a thousand Swiss citizens, aged 18 and above in the three language regions.

The first Eurobarometer Survey in Switzerland was carried out in 1997 between the end of May and the beginning of June, almost one year before the very controversial so called Gene-Protection Initiative had to be voted on, and about three months after the big media event “Dolly” happened. The second Eurobarometer Survey took place in Summer 2000 about two years after the Swiss population rejected the controversial and heavily debated Gene-Protection Initiative with a 66.6 percent margin.

Consequently, the first survey documented a situation where public discussion of biotechnology was becoming increasingly intense and controversial, whereas the second survey took place during a fundamentally different phase. In 2000, there was no longer much public debate concerning biotechnology, and there were no referenda on the agenda. Thus, as mentioned earlier, there was much less media coverage and decreased involvement by the Swiss public.
4.3. Results

There are several indicators (Table 1) demonstrating clear evidence of agenda-setting processes by the mass media in Switzerland concerning awareness of biotechnology on an aggregate basis.

First, content analysis demonstrates a decrease in printed media coverage of about 60 percent between spring 1997 and Summer 2000. Media reporting dropped from 66 articles per paper in the four-month period before the survey began in 1997 to only 16 articles in the period after the Gene-Protection Initiative was rejected by the Swiss citizens on 6 June 1998. Second, survey data shows a parallel, but weaker, decrease in message discrimination by the public. While almost 80 percent of Swiss citizens surveyed in the first Eurobarometer Survey in 1997 had read or heard something in the media about biotechnology—compared to only 53 percent in the other European countries—less than 60 percent affirmatively answered the same question three years later. This is equal to a decrease of about 25 percent. In addition, a quite similar pattern was found in the percentage of people often, or sometimes always, actively seeking information and following media reports concerning biotechnology. This measure dropped from 27 percent to 18 percent.

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<tr>
<th>Table 1. Processes and dimensions of agenda-setting.</th>
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<td></td>
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<td>1997</td>
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<tr>
<td>Media agenda</td>
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<td>Message discrimination</td>
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<td>Active information seeking</td>
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<td>Interpersonal agenda-setting</td>
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<td>Issue salience</td>
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<td></td>
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<td>Mean</td>
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Nevertheless, contrary to these two media related indicators, there are positive trends if one looks at interpersonal agenda-setting or issue salience. The number of people talking sometimes, or even often, with others about biotechnology rose from 60 percent to 65 percent and the mean perceived personal relevance of biotechnology rose in the same way from 6.5 to 6.8 on a ten-point scale. To sum up, these opposing shifts could be interpreted with an echo-effects model: Although media attention shifted somewhat away from biotechnology in Switzerland after the heated debate of the Gene-Protection Initiative in 1997 and 1998, two years later, there is still a delayed agenda-setting impact in the form of more discussion and perceived relevance.

In the Eurobarometer Surveys, knowledge concerning biotechnology was measured in two ways. First, nine comparable school-book type questions were used to measure background
knowledge such as, "Ordinary tomatoes do not contain genes, while genetically modified tomatoes do; true or false?" Second, there was an open question at the beginning of the interview, asking people, "What comes to mind when you think about modern biotechnology, including genetic engineering?" This question was coded afterwards by content analysis, and one dimension consisted of eight thematic associations such as references to medical applications, GMO food, genetically modified crops, etc.

In 1997, only half of the population on average gave correct answers to the textbook type questions; but this ratio was still significantly higher than in most other European countries. The data show that this type of knowledge decreased slightly between 1997 and 2000 from a mean of 5.6 to 5.1 correct answers. However, if we look at the open question, 82 percent of people mentioned at least one thematic reference to the term biotechnology or genetic engineering, an increase of 57 percent. To sum up, because of the intensive media information flow in Switzerland, most people obviously acquired at least a minimal core meaning of this new phenomenon called biotechnology.

Table 2. Stable knowledge gaps over time.

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<tr>
<th>Knowledge measures</th>
<th>Total</th>
<th>Education</th>
<th>Knowledge gaps</th>
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<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Medium</td>
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<tr>
<td>Knowledge test:</td>
<td>1997</td>
<td>5.6</td>
<td>4.9</td>
</tr>
<tr>
<td>means (1–9 points)</td>
<td>2000</td>
<td>5.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Biotechnology—associations</td>
<td>1997</td>
<td>57</td>
<td>48</td>
</tr>
<tr>
<td>percent of “At least 1 of 8”</td>
<td>2000</td>
<td>82</td>
<td>69</td>
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Nevertheless, there are significant knowledge gaps if different educational segments are compared. There is a medium, but significant, correlation between the different knowledge scores and the educational status. However, contrary to the knowledge-gap hypothesis, the correlations were higher in 1997 than in 2000. According to the knowledge-gap hypothesis, knowledge gaps should be higher in situations with increased information flow. This contradictory result could be explained by the amount of conflict that was particularly high in the situation of Switzerland, since several other studies demonstrated conflict as a contingent condition leveling out existing knowledge gaps. Ceiling effects could be another possible explanation, especially for the associative knowledge in the year 2000, where more than 80 percent were familiar with the term “biotechnology.”

Now let us have a look at media influences on attitudes. Forty-three percent of the Swiss respondents in the second Eurobarometer Survey in 2000 believe they had been influenced by the media coverage of biotechnology (Table 3). Of those, 26 percent thought they had become more critical of biotechnology, while 17 percent believed they had developed a more positive attitude towards it. The media impact seems to be strongly influenced by each individual’s own original attitude towards biotechnology: Forty percent of those in favor of biotechnology report that the media had influenced them to view biotechnology even more favorably, whereas 44 percent of those originally opposed to biotechnology shifted towards viewing it even more negatively. Thus, both groups seemed to use the media to reinforce their attitudes. These findings tie in one conclusion from research on consonance models, postulating that different people use the same media content very selectively to support the existing attitudes, in this case towards biotechnology. Such predispositions function as frames that guide how people process new media content and the arguments presented for or against biotechnology.
Table 3. Selective and attitude-consonant perception of influence in 2000.

<table>
<thead>
<tr>
<th>Percentages</th>
<th>Did media coverage influence attitude to biotechnology?</th>
<th>If yes, in what direction?</th>
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<tbody>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>All respondents (N = 1010)</td>
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<td>Segments with different personal attitudes towards biotech</td>
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<tr>
<td>positive</td>
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<td>41</td>
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<tr>
<td>ambivalent</td>
<td>41</td>
<td>53</td>
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<td>negative</td>
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<td>44</td>
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</tbody>
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Now, let us have a last look at shifts in attitudes between 1997 and 2000. In Switzerland, expectations of what biotechnology could offer society were quite low in 1997, comparable to those of some other European countries such as Germany or Austria (Table 4). This is possibly a result of the delayed first Eurobarometer Survey in Switzerland, and that it was only a few months after the big media event “Dolly.”

In 1997, only 37 percent thought that biotechnology would improve their way of life in the next 20 years. In comparison, almost a third of the respondents expected biotechnology to have negative effects. In the following three years, the Swiss increased their expectations of the benefits of biotechnology by about 20 percent, to 59 percent. In 2000, there were few countries where people have such positive expectations, but findings were similar in Sweden, Holland, and the United Kingdom. For Switzerland, this clear shift in attitudes towards biotechnology seems to be largely a result of the long-term and well-funded campaign against the so called Gene-Protection Initiative by the pharmaceutical industry, which strongly emphasized the positive potential of modern biotechnology for medical applications in the future, and its crucial value for science and industry in Switzerland.

Table 4. Increased expectations of biotechnology, but still only moderate support.

Expectations: Will biotechnology/genetic engineering improve our way of life in the next 20 years?

<table>
<thead>
<tr>
<th>Percentages</th>
<th>1997</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>improve</td>
<td>no effect</td>
<td>worse</td>
</tr>
<tr>
<td>Switzerland</td>
<td>37</td>
<td>11</td>
</tr>
<tr>
<td>Europe weight</td>
<td>46</td>
<td>9</td>
</tr>
</tbody>
</table>

Acceptance: What is your personal attitude towards biotechnology? (10-point scale for or against)

<table>
<thead>
<tr>
<th>Percentages</th>
<th>1997</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>positive</td>
<td>ambivalent</td>
<td>negative</td>
</tr>
<tr>
<td>Switzerland</td>
<td>19</td>
<td>34</td>
</tr>
</tbody>
</table>

Attitude scale: 1–10 points; negative: 1–4; ambivalent: 5–6, positive: 7–10.
The two Eurobarometer Surveys also detected a shift in the acceptance of biotechnology at the level of attitudes during the last three years, but the effect is smaller, only 10 percent. The segment of the population holding positive attitudes towards biotechnology rose from only 19 percent in 1997 to 27 percent in 2000, but even today, those against biotechnology (38 percent) outnumber those for it (27 percent).

This shift in attitude can partly be attributed to media influence since biotechnology acceptance remained almost stable in the group reporting no media discrimination, whereas
Acceptance of biotechnology rose significantly from 1997 to 2000 in the groups having heard about biotechnology from the mass media (Table 5).

Acceptance of biotechnology in Switzerland is significantly higher among younger people (Part. Corr.: −0.16). In comparison, gender and level of education have not been linked significantly to the level of acceptance. Nevertheless, there was a trend up until 1997 for biotechnology to be accepted more by men and better-educated respondents, than by women and people with lower educational backgrounds. Furthermore, biotechnology tends to be strongly supported by people holding positive attitudes towards technology in general (Part. Corr.: +0.40), but to be rejected by those who were concerned about ecological issues (Part. Corr.: −0.09).

If these two dimensions are compared—expectations, on the one hand, and acceptance on the other—it looks as if the expectations-question triggers pictures that associate biotechnology above all with health and medical applications. In contrast, the question concerning people’s personal attitudes towards biotechnology still seems to affect perceptions concerning risk and moral judgments about which they feel much more ambivalent. This phenomenon is called priming in the agenda-setting theory. It means that certain topics, such as medical applications, as opposed to GMO food or crops that were high on the media agenda, also influence attitudes, since they were used by people as standards for the evaluation of the general phenomenon “biotechnology.” This interpretation seems to be confirmed by a look at the evaluation of specific applications of biotechnology measured in our surveys. Here, our data indeed demonstrates that it depends largely on the specific application as to how usefulness, risk, moral acceptability, and encouragement are evaluated by the public. However, based on our two surveys, it is difficult to prove this hypothesis conclusively.

5. Public perceptions: focus group findings

5.1. Studying focus groups as a further source of data

In addition to the survey, focus groups were conducted to get a more in-depth view of the attitudes widespread among the Swiss, and the types of argument they used to justify them.

The four focus groups had a total of 29 participants (6–8 per group). Participants were recruited by phone from a random sample of households, and selected according to the following criteria: sex, age, education, and attitudes towards biotechnology (supporters, opponents and those undecided). The discussion was led by a moderator, and covered the same areas as the survey. For each biotechnology application, participants were asked whether they...
had heard about it, its advantages and disadvantages, and whether they would personally be willing to buy or use the specific application. In this section, a few, but typical results from Switzerland will be presented in the form of quotes from the focus groups.

5.2. Biotechnology: ambivalent evaluations prevail

Biotechnology has polarized Swiss public opinion in the past. This conflict has given rise to the impression that there are only pure supporters or opponents of this technology. However, the reality is more complex, and Swiss attitudes tend to be much more diverse and ambivalent. The Swiss population tends to distinguish clearly between the various applications of biotechnology.

5.3. Negative attitudes towards agricultural and food applications

Applications of biotechnology in the agricultural and food domain were predominantly rejected. This attitude was not justified because of the specific risks of biotechnology, but rather with a general rejection of industrial agriculture. The following quote illustrates this view:

Ms. Meierhofer* “I’m convinced that nature is absolutely perfect. I don’t like it when men think they can make it more perfect, I’m scared by this development.”

In addition to this “leave nature alone” argumentation, some focus group participants also took a more pragmatic stand, saying that genetically modified food currently offered no advantages with regard to either quality nor quantity.

The hope that global hunger problems could be solved by means of biotechnology was mentioned several times, but not evaluated as very realistic because participants thought that farmers would become increasingly dependent on seed-producing companies.

5.4. Ambivalence or support in the medical realm

The attitudes in the medical realm were less clear-cut and rather more ambivalent. There was strong rejection of genetically modified animals for medical experiments in laboratories. Genetic testing of adults to yield diagnostic information was viewed quite favorably, but such tests were only considered as beneficial as part of the treatment of the specific disease. Simply knowing one had a hereditary tendency, with a certain probability of developing an illness but without having a means of treating it, was considered rather unhelpful and abstract information.

Several focus-group participants were able to talk about their own experiences with biotechnology (gene tests) or transplantation. Their personal experiences added a personal quality to the focus-group exchange, which was often on a general and political level. The discussions showed consensus within the groups that individual health was so important that there should be no restrictions (e.g., forbidding the use of biotechnology in medical research) that might limit treatment possibilities. Any moral or ethical dilemma should be addressed at the individual level of the persons concerned, but not at a general political level. The following quote illustrates this view:

Mr. Mueller* “If you need it, you would be willing to apply any technology that is currently available. But if you don’t need it, you are rather skeptical and you might say no, and prevent progress in developing other possibilities. I consider this very dangerous.”
5.5. Concerns about biotechnology: moral rather than technical arguments

Rejection of biotechnology was rarely justified using arguments referring to specific biological or technical risks. Instead, objections tended to be based on moral or ethical concerns. These ethical arguments were not related to strictly religious values, but beliefs about nature and about how the natural world should be respected. The following quote illustrates this view:

Ms. Arter* “We don’t have sufficient evidence, and that creates fears; for you, for your children and grandchildren, and for the environment. For me, it means a big ethical intrusion into God’s creation. I’m not a believer at all, but that’s my view. And one could quote from Goethe, “I can’t get rid of the ghosts that I called upon.”

While the technical risks of biotechnology were not a dominant issue, the risks to society were addressed quite often. Genetic tests gave rise to concerns about the privacy of such information. Genetically modified crops were discussed with respect to their economic impact on farmers, and the possibility that they would make farmers increasingly dependent on seed-producing companies.

5.6. Conclusion: labile public opinion

In comparison to other countries, biotechnology in Switzerland has been publicly debated very intensively. Two popular initiatives and the referenda (1992, 1998) concerning biotechnology are probably the main reasons for this public interest. One would expect, because of these intensive debates, that the process of individual opinion formation would be highly advanced, and that attitudes would be rather stable. However, our findings from both the surveys and the focus groups suggest that the opposite is true, that public opinion is rather labile.

The following quote, an answer to the question about who can be trusted to tell the truth about biotechnology, illustrates the prevailing uncertainty and wavering:

Ms. Leutenegger* “Nowhere is it written very clearly, what it actually is. You don’t know whether you can believe or not. It is not explained properly.”

Mr. Wehrli* “Yes, indeed, there is a lack of orientation (...). And this ambivalence makes me uncertain. Therefore, when I think about biotechnology, I’m always thinking about uncertainty.”

There were several sources of this uncertainty. One is the very complexity of the technology itself, while another is the ongoing dynamics of biotechnology, with new technological developments raising new and challenging questions for society.

6. Summary and conclusion

Compared to other European countries, the public debate on biotechnology has been relatively intense in Switzerland. An interesting lesson to be learned from it is that this public controversy did not result in an anti-science shift, but instead to an increasing public understanding of science, and the promotion of informed democratic decision-making. After the two referenda in 1992 and 1998, the debate has since slowed down somewhat. There has been less coverage of the issue in the media, and as a result, people now have less knowledge about both facts (text book knowledge) and opinions (biotechnology as a media issue).

Currently, the public debate in Switzerland is no longer characterized by street demonstrations, but rather by legal and technical discussions typically taking place in regulatory and administrative offices. This relative calm could be interpreted as meaning that the issue
of biotechnology has lost its potential for stimulating public debate. The future is, of course, uncertain, but we are not convinced that the public debate on biotechnology has ended in Switzerland, rather it is likely to gain new momentum and continue to arouse strong feelings among the Swiss public.

* The names of the focus group participants were changed in order to guarantee anonymity.

References


4 Ibid.

5 Bonfadelli, “Switzerland: National profile.”

6 Artificial weeks are built by starting on any weekday and jumping to the following weekday in the following week. The result is a balanced sample regarding weekdays.


10 That means that the coding was deductive. The frames were defined inductively beforehand.

11 Durant, Biotechnology in the public sphere.

12 The Tages-Anzeiger has a readership of 14 percent, and is the most important newspaper for the greater area of Zürich.


22 Braun, “Lessons from the Swiss biotechnology referendum.”
Authors

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