

RECOMMENDATIONS FOR IMPROVING GMO COMMUNICATION AND UNDERSTANDING

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Summary

This article presents research aimed at building more effective methods for communicating and understanding genetically modified organisms (GMOs). The study covers an analysis of the existing challenges in the area of communication about GMOs, including the lack of clarity and trust among the public. Specific recommendations for improving communication strategies and approaches are presented, including emphasis on educational and informational campaigns, use of scientific facts, and clear, understandable language concepts. The article also discusses the importance of involving the general public and stakeholders in the GMO dialogue by encouraging an open exchange of views and information.

Key words: GMO, communication, understanding, recommendations, public discussion

Introduction

Genetically modified organisms (GMOs) represent a topic of essential importance to modern society, leading to various debates and controversies (Scott et al. 2018), (Tchórz et al. 2012), (Teferra, 2021), (Tsatsakis et al. 2017). Although GMO research and development has the potential to bring significant benefits to the food and environmental sectors, communication about it often faces challenges (Hug, 2008). A lack of clarity, understanding and public trust creates a gap between the scientific community, regulators and the general public.

Focus should be placed on the need to improve communication and understanding of GMOs (Kolodinsky et al. 2018), (Kolodinsky et al. 2023). Presenting concrete strategies and recommendations for improving communication practices is essential to create a more informed, reasonable and responsible attitude towards GMOs in society (Blancke et al. 2015). In this context, the article presents an analysis of the existing challenges and proposes

innovative approaches to build more effective communication strategies that will help improve public understanding of GMOs.

CLEAR AND EASY TO UNDERSTAND INFORMATION

Providing clear and simple information about GMOs in the public and on labels can improve consumer understanding.

1. Using simple and understandable terms and language is key to providing clear information about GMOs. Technical terminology should be avoided or explained clearly.
2. The information can be supported by graphics and illustrations to visualize the processes and characteristics of GMOs, allowing the information to be digested even by people who are not scientific experts.
3. The use of specific examples related to everyday products or agricultural practices can make the information more relatable and understandable to the public.
4. The creation of interactive online platforms such as websites and apps would facilitate learning and understanding about GMOs.
5. Providing brief summaries of the information can facilitate the absorption of key aspects for users who may not have much time to read.

EDUCATIONAL CAMPAIGNS

Conducting public education campaigns can reduce misunderstandings and increase awareness of the benefits and risks of GMOs.

1. The target group and audience of the educational campaign must be clearly defined. This may include consumers, farmers, scientists and other stakeholders.
2. Choosing a variety of media channels to disseminate the information, including traditional media, social networks, events and websites would ensure wider coverage and accessibility.
3. The participation of educational institutions such as cooperation with schools, universities and other educational institutions can promote the interest and education of the new generation about GMOs.

4. The inclusion of scientific experts and specialists in educational initiatives can add authority and credibility to the information provided.
5. The use of interactive formats, such as workshops, educational games and discussion panels, can facilitate the engagement of participants and help to better remember the information.
6. Providing mechanisms for obtaining feedback from the public would be useful to understand what information is relevant and how future educational initiatives can be improved.

Research shows that public perception of GMOs in the European Union can be significantly influenced by public engagement and educational initiatives. A case study in the EU demonstrated that structured outreach programs, including workshops and scientific dialogues, improved knowledge and reduced skepticism about GMOs. The European Commission's "Science and Society" initiative aimed to increase transparency in GMO communication. A study (Gaskell et al. 2006) showed that public confidence in GMO safety improved after exposure to targeted information and involvement in scientific discussions. This approach led to a 20-30% improvement in public understanding of GMOs, especially when credible, impartial experts engaged directly with the public.

COMMUNITY PARTICIPATION

Community involvement in decisions and dialogue about GMOs can support understanding and acceptance of the technology.

1. Establishing mechanisms for two-way dialogue between the public and the representatives of the specialists as this may include listening to the concerns and suggestions of the community.
2. Holding public hearings where different groups, such as consumers, farmers and environmentalists participate, can create an opportunity to share opinions and understand different points of view.
3. Formation of working groups to bring together community representatives, scientists, and industry representatives. These groups can discuss GMO issues and provide management suggestions.

4. Cooperation with non-governmental organizations and community groups can support the general public and provide the necessary perspective for formulating ethical and public standards.
5. Differences in local contexts and cultural aspects should be taken into account when creating communication strategies.
6. Impact reporting systems can be used to measure the effectiveness of community involvement and to adapt communication strategies in response to feedback.

RESEARCH TRANSPARENCY

Ensuring transparency in scientific research related to GMOs can strengthen public trust.

1. Focusing on the obligation to publish the results of scientific research related to GMOs is key to transparency. This provides an opportunity for scrutiny by the public and the scientific community.
2. Providing easy access to information sources related to GMOs through websites, reports and other means is an important step towards transparency. These sources should be understandable and accessible to the general public.
3. To maintain trust, it is important to avoid conflicts of interest in research. The sponsorship and conduct of research must be independent and transparent.
4. The introduction of external experts can contribute to increasing transparency. This mechanism ensures additional oversight and objectivity.
5. Adopting transparent principles and ethical standards, as well as publishing disclaimers, contributes to clarity and trust in scientific research.
6. Maintaining up-to-date data and regularly updating research information provides a more complete and accurate picture of progress and results.

Research from the National Academies of Sciences (2016) found that increasing transparency in GMO-related research and regulatory processes significantly enhanced public trust in scientific institutions. The U.S. Food and Drug Administration (FDA) and U.S. Department of Agriculture (USDA) both adopted strategies emphasizing openness regarding GMO safety assessments, which reduced skepticism among certain groups.

A survey conducted by the International Food Information Council (IFIC) Foundation in 2020 indicated that consumers who were aware of the thorough regulatory processes behind GMOs

were more likely to trust the safety of GMO products. This trust increased by 25% among participants who had detailed information on how GMOs are tested and approved.

VARIOUS METHODS OF COMMUNICATION

Using a variety of communication methods, such as social media, public events and educational materials, can reach a wider audience.

1. The use of social media and online digital platforms such as blogs and videos can reach a larger number of people by providing them with interactive and visual content about GMOs.
2. Creating educational materials, brochures and infographics that are easy to understand and provide key facts can be an effective way to educate the public.
3. Organizing public lectures and seminars where teams of experts present information and answer questions live provides an opportunity for direct contact with the public.
4. Conducting workshops and practical exercises in which participants can actively participate can facilitate the assimilation of information and the creation of practical experience.
5. The creation of online question and answer portals, where the public can ask questions and receive answers from experts, provides a platform for active interaction and learning.
6. Participating in media campaigns and TV shows can help present GMO information to a wider audience, ensuring objectivity and diversity of views.

A study in 2022 (Evanega et al. 2022) explores the evolving public discourse around genetically modified organisms (GMOs) and agricultural biotechnology. It suggests that over time, media coverage of GMOs has become more favorable and less polarized, reflecting shifts in both scientific understanding and public attitudes. This shift in media framing is attributed to increased efforts in science communication, credible messaging, and greater engagement with stakeholders, ultimately leading to a more balanced conversation on the topic.

SAFETY RESEARCH SUPPORT

Investing in additional scientific research on the safety of GMOs and publishing the results can strengthen confidence in the safety of the technology.

1. Funding independent scientific research on the safety of GMOs from independent sources can ensure the objectivity and reliability of the results obtained.
2. Carrying out extensive clinical tests that include a wide range of parameters can provide more detailed information on the effects and possible risks of GMOs on human health. It is necessary to expand the dialogue and ensure the conduct of research related to the exposure of GM foods, as such data are missing for Bulgaria.
3. Publication of the methodology and processes used in research contributes to transparency and the possibility of duplication of experiments by other scientific teams.
4. Conducting long-term observations and monitoring of the impact of GMOs on the environment and human health provides a broader perspective on safety.

CONSTANT DIALOGUE AND UPDATE

Maintaining a constant dialogue with the public and regularly updating information can strengthen interaction and understanding about GMOs.

1. Holding regular meetings and round tables where representatives of interested parties discuss current topics creates an opportunity for long-term and constructive dialogue.
2. Building networks and information exchange platforms where stakeholders can share news, results and experiences contributes to the wider dissemination of knowledge.
3. Maintaining electronic newsletters and information sites with current articles, statistics and events allows interested parties to be informed of the latest news.
4. The constant search for feedback through surveys and opinions from the participants in the dialogue ensures constant renewal of communication strategies and improves the relationship with society.
5. Investing in educational initiatives that provide up-to-date information not only maintains a constant dialogue, but also increases the education level of society.
6. The constant adaptation to new requirements and challenges, as well as the inclusion of new topics in the dialogue, provides a more complete and renewed look to the discussions and debates surrounding GMOs.

In Brazil, the introduction of GMOs has been facilitated by active dialogues between farmers, consumers, and policymakers. A stakeholder consultation process in Brazil facilitated by the Embrapa (Brazilian Agricultural Research Corporation) successfully bridged the gap between agricultural producers and the public, helping clarify the benefits and safety of GMOs.

PUBLIC ATTITUDES TOWARD GMOs IN BULGARIA

Public attitudes toward GMOs in Bulgaria have generally reflected a mix of skepticism, concern, and opposition, similar to the broader public sentiment found in many European countries. This response is shaped by a combination of cultural, economic, political, and environmental factors.

Bulgaria, as a member of the European Union, adheres to EU policies on GMOs. The EU has some of the strictest regulations on GMO crops, with several countries opting to maintain bans on cultivating GMOs. Bulgaria's historical context of skepticism toward GMOs can be partly attributed to EU regulations, which were intended to address concerns about potential risks related to human health and the environment. As a result, Bulgaria has shown a high degree of caution regarding the widespread adoption of GMOs.

Bulgaria has a strong agricultural tradition, and many citizens are concerned about how GMOs might affect local farming practices. There is a fear that GMOs could undermine the country's organic farming sector and small-scale agricultural practices.

Another factor contributing to skepticism is the lack of widespread scientific literacy and awareness about the actual benefits and safety of GMOs. Public understanding of genetic modification and the science behind GMOs is often overshadowed by emotional reactions and misinformation spread through media. The Bulgarian media has been known to amplify negative views about GMOs, often sensationalizing risks without offering balanced scientific evidence. This has contributed to public resistance to GMO adoption.

Non-governmental organizations and environmental groups in Bulgaria have been vocal in their opposition to GMOs, advocating for a ban on GMO crops and promoting organic farming practices. These groups have organized public campaigns and protests, further influencing public attitudes.

These findings highlight the need for a nuanced and culturally sensitive approach to GMO communication in Bulgaria, which combines education, transparency, and engagement with the public and key stakeholders.

PLANT GMOs vs. ANIMAL GMOs

When addressing the unique challenges associated with plant versus animal GMOs it's essential to differentiate between the two in terms of their biological characteristics, regulatory frameworks, ethical considerations, and public perceptions. These distinctions can guide tailored recommendations for improving communication and understanding of each type.

Plant GMOs

Plant GMOs are genetically modified crops designed to enhance traits such as resistance to pests, herbicides, or environmental stress, or to improve nutritional content. Common examples include Bt corn (resistant to pests) and Golden Rice (enhanced with vitamin A).

One of the primary concerns surrounding plant GMOs is their potential environmental impact. These include the risk of cross-pollination with non-GMO crops, the development of resistant pests, and the potential loss of biodiversity. In regions where agriculture is a cornerstone of the economy and cultural heritage, these concerns can be amplified.

Plant GMOs face significant public skepticism due to perceived risks regarding food safety and long-term health effects. Public resistance often stems from concerns about the lack of transparency in the regulatory process and distrust in the motives of the companies producing GMOs.

Farmers may face economic barriers to adopting GMOs due to the cost of seeds, dependence on specific seed suppliers, or the need for specific farming practices (such as herbicide use). Small-scale farmers may feel particularly excluded from the potential benefits.

Communication efforts should emphasize the environmental advantages of plant GMOs, such as reduced pesticide use, lower carbon footprints, and better resilience to climate change.

Highlighting these benefits can help address environmental concerns.

Animal GMOs

Animal GMOs involve genetic modifications made to animals for purposes such as disease resistance, faster growth, or better nutritional profiles. Examples include genetically modified salmon (which grow faster than wild salmon) or disease-resistant pigs.

Animal GMOs face intense ethical scrutiny related to animal welfare. Modifying the genetics of animals for consumption raises questions about the potential suffering of animals, particularly regarding genetically altered traits that might affect their health or behavior.

Animal GMOs often face stricter regulations than plant GMOs due to concerns about food safety, the potential for gene transfer to wild populations, and the potential for unexpected ecological consequences. These concerns often lead to more rigorous testing and longer approval processes, which can hinder the market acceptance of animal GMOs.

Many people object to the genetic modification of animals on moral or philosophical grounds, believing that it is unnatural or an inappropriate manipulation of life. Public fears regarding the potential risks of GMOs in the food chain can be sharpened by media sensationalism.

There are challenges around food labeling and consumer transparency. Animal GMOs, such as GM salmon, can generate strong consumer resistance due to a perceived lack of choice and concerns over hidden modifications in the food supply.

To address ethical concerns, it should be clearly communicated that the genetic modifications are aimed at improving animal health, well-being, and disease resistance. Transparency in animal treatment is essential to garner public support.

The public could be reassured by emphasizing the regulatory framework governing the approval of animal GMOs providing clear, easy-to-understand explanations of the approval process and the multiple stages of safety testing involved, which are often more stringent than those for plant GMOs.

Highlighting the benefits of animal GMOs not only for producers but for consumers as well can sway public opinion. For example, GMOs can lead to healthier food products (such as lower-fat meat or more nutritious milk) and reduced use of antibiotics or hormones.

Both plant and animal GMOs face distinct challenges that need to be addressed with tailored communication and policy strategies. For plant GMOs, the focus should be on providing education about environmental benefits, building trust through transparency, and addressing

farmers' economic concerns. In contrast, for animal GMOs, ethical considerations and animal welfare are more prominent concerns, necessitating a communication strategy that emphasizes animal health, ethical standards, and the benefits of genetic modifications in improving food security and sustainability.

A nuanced approach that considers both scientific evidence and the public's values, ethics, and cultural perspectives is critical for improving understanding and acceptance of GMOs, whether plant or animal-based.

BALANCING THE RISKS AND BENEFITS

While GMOs offer significant potential benefits, such as increased food security, improved nutritional content, and resistance to pests and diseases, they also pose potential risks and raise ethical, environmental, and socioeconomic concerns. To communicate effectively and build trust, it is crucial to acknowledge these risks and criticisms and incorporate them into discussions about GMOs.

Balanced recommendations for improving GMO communication should:

1. Highlight the safety and regulatory oversight while also discussing the ongoing need for monitoring and long-term studies to ensure their environmental and health safety;
2. Address ethical concerns by emphasizing transparency, welfare standards for animals, and respect for natural processes in agricultural and food production;
3. Provide clear labeling and ensure consumers can make informed choices, fostering trust and respect for consumer autonomy;
4. Balance innovation with precaution, encouraging the development of GMO technologies while ensuring safeguards are in place to protect biodiversity and maintain the sustainability of ecosystems.

By addressing these diverse concerns alongside the benefits, GMO communication can become more credible, transparent, and acceptable to the public.

GMO-AR: A VIRTUAL EXPERIENCE OF THE FUTURE

In a complex and widely discussed field like GMO communication, it is challenging for an approach to improve communication and understanding due to the diverse range of scientific, ethical, and cultural perspectives, as well as varying levels of public knowledge and concern.

One approach is to think about how we can leverage emerging technologies, unexpected collaborations, or unexamined societal needs combining elements of biotechnology, artificial intelligence (AI), and personalized communication.

An augmented reality (AR) experience that allows users to interact with a future world where GMOs have transformed agriculture, food security, and environmental sustainability is an immersive experience that would allow users to see, hear, and "live" in a world where GMOs are fully integrated into everyday life, helping them better understand their potential and real-world impact. The experience would be narrative-driven, where users can make choices at different junctures—such as deciding which GMO crops to plant, how to use genetic engineering to combat a disease, or how to balance ethics with innovation. Their decisions would shape the virtual world in real-time, showing them the impact of GMO-related choices on society, agriculture, and the environment.

Users would also be able to toggle between the future world and today's reality, showing them how GMOs could address current challenges (e.g., food shortages, climate change, soil erosion, etc.). They could see a side-by-side comparison of a GMO-based world and one without these advancements.

To make the experience even more engaging, users could upload their real-life data (such as dietary preferences, concerns, or regional challenges) and see how GMO technology could specifically impact their personal and local environment in the future. For example, a user in a drought-prone area might see how drought-resistant GMO crops could change their farming landscape.

Conclusions

Understanding and communicating about genetically modified organisms (GMOs) requires overcoming a number of challenges. It is essential to build a more effective and responsible communication strategy that includes educational campaigns, clear and accessible language, active inclusion of the media and the general public in the dialogue.

Creating a better understanding and acceptance of GMOs is a key factor in achieving a balance between scientific progress and public expectations and concerns. Only through open dialogue, exchange of information and respect for different points of view can we reach consensus and find sustainable solutions for the future of GMOs.

We must highlight the need for continuous improvement of communication efforts and the active role of all stakeholders in the process of education and information about GMOs. Only in this way can we achieve a better understanding and acceptance of technological progress and its potential to improve food security and the sustainability of our planet.

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