

Opposition and Acceptance of GM-food and GM-medicine

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Abstract: European citizens are quite happy to use genetically modified medicine, while they are rather critical towards genetically modified food. In this paper, we analyse philosophical and conceptual reasons for and against this asymmetry in the attitudes of Europeans. Moreover, we consider the justifiability of this difference in attitudes. We conclude that all GM-foods and all GM-medicines do not differ dramatically with respect to their intended purposes and outcomes – at least the ones associated with the saving of human lives. However, people worry far more about the possible undesirable health related, environmental, and social side-effects of GM-food than those of GM-medicine. This may be explained partly by differences in experienced trust in actors and authorities within these two industries, and partly by differences in production procedures. The asymmetry in people's views can also be explained by the different roles food and medicine play in our daily lives. Food is usually associated with values that contradict genetic modification, whereas in the case of medicine values compatible with genetic modification usually prevail. Moreover, food is more intimately related to our social life and personal life choices than medicine. Some life styles adopted by people restrict the use of GM-food, whereas life style restrictions on GM-medicine are considerably rarer. Thus, the asymmetry in people's attitudes concerning GM-food and GM-medicine may well be justified and rational – at least from the point of view of the deeper values and beliefs people hold.

1. INTRODUCTION

European citizens are quite happy to use genetically modified medicine (henceforth GM-medicine) and other medical applications based on genetic modification. At the same time, they are rather critical towards “gene food” or GM-food – food that contains ingredients originating from genetically modified organisms [1, 2]. In practice GM-food is a synonym for food that has been produced from genetically modified crops such as maize and soy bean. So far no genetically modified animals or fungi are used for human food [3].

In this paper, we analyse philosophical and conceptual reasons for and against this asymmetry between Europeans' attitudes towards GM-food and GM-medicine.¹ Why are

people more willing to accept GM-medicine than GM-food? We do not intend to answer this question in an empirical manner. Rather we will discuss possible views and arguments that have led people to adopt their current attitudes. Moreover, we will consider the justifiability of this difference in attitudes. Is the claim about the acceptability of GM-medicine consistent and compatible with the view about the unacceptability of GM-food?

Europeans' tendency to favour genetic modification in the context of medicine (and not in the context of food) cannot be explained simply by claiming that consumers are more prone to accept GM-medicine since they think that medicine is more likely to benefit them personally (whereas the benefits of GM-food are more likely to befall on farmers, industry and citizens of developing countries). Even though this idea of the individualistic consumer is prevalent among decision makers, policy actors, as well as consumer and environmental non-governmental organisations (NGOs), it is shown to be false or at least over-simplified [2]. In fact, EU-citizens' considerations concerning GMOs rely on a wide philosophical and ethical background that reaches not only beyond their personal benefits but also beyond risk-benefit calculations in general [6-9]. This is noteworthy, since the political and scientific decision making concerning GMOs is dominated by the discussion of risk and benefit.

2. RELEVANCE OF THE TOPIC

Why is the asymmetry in Europeans' attitudes towards GM-food and GM-medicine philosophically interesting? The view about the unacceptability of GM-food does not self-evidently contradict with the one about the acceptability of GM-medicine. Nor does the acceptance of GM-medicine as such imply that GM-food should also be accepted (or vice

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¹The perception of EU citizens' unwillingness to consume GM-food has been questioned in behavioural studies. Despite the reluctance manifested in inquiries, consumers are willing to buy GM-food in a real shopping situation if its price is convenient and there is a consumer benefit present (such as an indication on the package that the product is “spray-free”) [4]. However, contrary to some claims, this does not mean that there is no difference in Europeans' attitudes towards GM-food and GM-medicine. The mere fact (shown in the behavioural studies) that a gap exists between the expressed attitudes and behaviour in case of GM-food, but not in case of GM-medicine, is enough to show that people do not accept GM-food and GM-medicine in the same way. Moreover, as noted by Christian Coff [5], there is often no reason to suppose that people's behaviour indicate their values better than their expressed attitudes. A gap between what is said and done may indicate a barrier to putting one's values into practice.

versa). Some extra premises are needed for the asymmetry to form a problem. At least three types of premises can be found.

First, one might expect citizens to be most concerned about those gene technological applications that touch upon their bodily integrity. GM-medicine (as well as other medicines) are made to affect patients' physical and mental properties in direct ways whereas the "green biotechnology" of GM-crops is more distant and its possible effects on human beings less direct and intended. Nevertheless, on a European level the most difficult and emotionally laden political and philosophical discussions as well as the strongest public resistance, have concerned GM-crops and food produced from them.

Second, food and medicine have a great deal in common. Both are ingested and literally consumed. Both have tremendous effects on our health and well being. Reasonable use of both food and medicine benefits us, whereas excessive or inadequate use may be harmful. Moreover, safety concerns (including allergic reactions) are common to both [10-12]. Both of them have to pass strict safety tests before being released to the markets of the European Union. Moreover, both are often industrially produced by huge international companies and subjects of heavy competition and marketing.

Third, the boundaries between food and medicine are blurring [11, 13] to a point where it is sometimes difficult to decide whether a particular product is medicine or food [14]. The change can be detected even from the fact that popular as well as academic attention paid to health effects of food is increasing. The growing market of so called functional food products and dietary advice tailored to one's genes, however, highlights the change even more [11]. Functional foods, or "nutraceuticals" as they are sometimes called, are food products specially designed to provide specific health benefits [15, 16]. They are "demonstrated by sound scientific research to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease" [13]. Thus, they can sometimes replace medicine [10] as some medicine operates similarly to functional food in that, instead of curing diseases, they lower the risk of disease. Blood cholesterol, for example, may be lowered by medicine but also by functional margarine. Dietary advice tailored to one's genes is based on new knowledge about interactions between genetic variations and dietary health factors. Based on such knowledge, it may soon be possible to offer citizens genetic tests that help people to make dietary choices suitable for their genotype.² Even new food products adapted to certain genetic make ups might be developed [11, 12].

3. THE ARGUMENT FROM LIFE SAVING

The fuzzy boundary between medicine and food does not exclude the existence of "clear cases". Some foods, such as ordinary cinnamon rolls and meat balls, are first and foremost food, and no one would claim that the status of penicillin as a medicine is somehow unclear. Great caution is,

²At least one such test is already available has already been on the market. It has, however, been criticised for its exaggerated promises given to consumers [12].

nevertheless, needed in spelling out the difference between food and medicine. First, because some diseases such as diabetes, food allergies and PKU [17] are treated with dietary solutions, food we eat is sometimes a medical solution to a bodily dysfunction. However, even then a diet is usually a prescription to *avoid* certain types of food. The food actually eaten by a person is used as any other food for maintaining life and well-being. Second, as preventive medication (malaria medicine and vaccines, for example) is commonly given to healthy persons, not all medicines are used as answers to existing health problems. However, it is fair to say that all medicines – even the preventive ones – are always used as reactions towards something abnormal. They are used for maintaining life and enhancing well being in cases of abnormality³ whereas food is needed for the same purpose in all situations (which is, of course, not to deny that food may have other functions as well).⁴

Medicine's ability to cure and prevent abnormalities forms the basis for an argument from life saving. The constituents of a healthy diet are subjects of wide variation. The number of different meats that can satisfy our need for protein, for example, is huge, ranging from pork, lamb, and beef to reindeer, dog, snake, and seal. And if somebody is unwilling to consume meat she can equally satisfy the need for protein with milk products or soy and other beans and nuts. It does not matter nutritiously a great deal which of the alternatives is chosen. The case is often quite different with respect to medicine. Even though a migraine, for example, may be treated with numerous different types of medicine, there are many diseases for which only one medicine exists (at the moment). Some of these diseases are very serious and it is fair to say that sometimes a particular medicine is needed for saving the life of a person. Sometimes this particular medicine may be a genetically modified one. Because of the higher versatility of what may constitute of a healthy diet, a similar case does hold with respect to food. Foodstuffs are replaceable by other food products in a far more flexible way than medicines.

This difference may offer some citizens a reason for asymmetry in their attitudes towards GM-food and GM-medicine.⁵ A particular genetically modified medicine may be necessary for saving a life of a certain human being. Thus, since saving human lives is highly valuable and should *prima facie* be promoted, GM-medicine should be accepted. However, because of the variability of foodstuffs that can be combined for a healthy diet is so high, it is very unlikely that someone would ever need a particular GM-foodstuff to stay alive. What matters is that she consumes enough food and food that is rich in different kinds of components, not that

³The meaning of the concept normal with regard to health and disease is far from being self-evident. For further discussion of the issue see for example Rääkkä 1996 [18].

⁴As pointed out by Anthony D. Buckley, various differences exist between archetypal food and medicine. Food, for example, is more often enjoyable, and consumed as a recreation and as focus for a social occasion. Medicine, on the other hand, is often unpleasant and consumed for person's own individual purposes.

⁵Marris *et al.* have shown that Europeans actually use this type of argument to highlight that there is a greater need for GM-medicine than for GM-food [2].

she consumes any particular foodstuff. Thus, since a particular GM-food is never necessary for life saving in the way particular GM-medicines are, it is consistent to accept GM-medicine without accepting GM-food.

4. A CRITIQUE OF THE ARGUMENT

Two criticisms can be presented against the argument from life saving. First, not all medicine, or even all GM-medicine, contributes into saving lives. Medicine for treating socially embarrassing physiological phenomena such as blushing, sweating, trembling of hands, medicine that enhances sexual ability (the famous Viagra, for example) and even mild pain killers and mild cortisone lotions, for example, do not usually have anything to do with our survival, even though they may enhance our well being by making life more comfortable. The argument from life saving does not speak in favour of these types of GM-medicine. The argument is weak in the sense that it can justify only those kinds of GM-medicine that contribute or are likely to contribute into saving human lives. Thus, it does not support the view that (all) GM-medicine is acceptable and GM-food unacceptable.

Second, the view that GM-food is not necessary for saving human lives may be questioned. Some GM-foods (or GM-foods under development) are functional foods that have, besides their nutritional value, the potential to promote human health. GM-foodstuffs may, for example, enhance resistance to certain cancers or heart disease in the future [7]. Moreover, scientists are trying to develop GM-crops containing vaccines – for example, spinach that brings about a resistance to rabies to its consumer [3] and a banana plant which produces fruit bringing about a resistance to an infection caused by *E. coli* bacterium to its consumer [19]. Since these diseases are causing death in the developing countries, the GM-plants in question would certainly contribute to saving human lives.

But are these GM-applications, strictly speaking, food? Clearly, the GM-crops of the examples are not *merely* food. Perhaps surprisingly, some of them may not be food at all. If the safe use of a GM-crop is restricted to medical purposes – that is, if it cannot be safely used as an ordinary crop for satisfying nutritional needs – then it should not be considered food. Rather it is then a medical product that resembles food and should be carefully kept away from foodstuffs to avoid contamination. Such GM-applications are not examples of GM-food necessary for saving human lives. Rather they are further examples of important GM-medicine and cannot thus offer a counter example to the argument from life saving. Nevertheless, those GM-crops that enhance resistance to certain diseases *and* that can be safely and comfortably used for nutritional purposes are food – namely functional food.

Do functional GM-foods offer a counter-example to the argument from life saving? The answer is positive provided that functional GM-food is sometimes the only possibility for saving lives. If this is the case, then functional GM-food is in this respect analogous to some GM-medicine and no difference in ability to save lives seems to exist between them. However, the argument from life saving can be criticised even without referring to functional GM-food. Food is a limited resource. Today there would be enough food for everyone were it distributed equally among every citizen in

the world. Nevertheless, in harsh reality some people eat and waste food to the extent that others do not have enough. The world hunger problem is, thus, mainly political and strongly dependent on the poverty problem. However, there is no sign of a quick political solution to the situation and it is thus sensible to look for other solutions too [3, 20, 21]. If claims that GM-crops can produce more food and more nutritious food [3, 22] are true, the use of GM-food may turn out to be crucial for the survival of some human beings. Certain GM-crops introduced in suitable environments may help to increase the amount of food and to lower its price, so that also some of those who have not previously received enough will have their share. Whether GM-crops actually have this effect depends on various biological, cultural and social factors. Nevertheless, it has been predicted that in socially and ecologically suitable environments some GM-crops can contribute to saving lives by addressing specific ecological and agricultural problems⁶ [20].

To sum up, if the claims about the various possibilities offered by GM-food are true, and if potentiality to save lives is taken as a sufficient and necessary criterion for accepting a particular GM-application⁷, then we should accept some GM-medicine as well as some GM-food. Moreover, some other GM-medicine and GM-food would not be acceptable according to this criterion. Thus, the argument from life saving cannot justify the view that an ethically and conceptually relevant difference exists between (all) GM-food and (all) GM-medicine.

This conclusion should not be taken to imply that EU citizens are inconsistent in their views – not even provided that they base their views on the life saving potential of different GM-applications. It may just be that people are more trusting with respect to the potential life saving benefits of GM-medicine to be actually realised. Some feel that promises about life saving GM-foodstuffs are used by GM-proponents as means for making people to accept all GM-food. It has even been claimed that, although the claims about possible benefits to developing countries are frequently raised in GM-food discussion, the actual GM-food development work of industry concentrates on products meant for western consumers in western markets [2, 7, 19]. The issue of trust will be further discussed in section 5 of this paper.

5. HEALTH AND ENVIRONMENTAL CONCERNS

The argument from life saving as well as its criticism is based on possible intended outcomes of GM-food and GM-medicine. A great amount of the popular, political and academic discussion about GM-food and GM-crops, however, concentrates on their possible undesirable and unintended side-effects on human health and environment. GM-medicine has not raised similar discussion. Why is that? Do

⁶The argument does not presuppose that it should be the least off who eat the GM-food. What is needed is that somebody eats it and thus enables the amount of food to grow.

⁷This is a very strict criterion and it can certainly be questioned. Why should we adopt only those GM-applications that contribute to saving lives? Why is enhancing well-being, for example, not enough? The criterion is, nevertheless, adopted here for the sake of the argument to show that even a very strict criterion of moral acceptability does not necessarily separate GM-food from GM-medicine.

GM-medicine and GM-food differ with respect to their possible unintended effects?

In Europe, the most heated GM-debate concerns the possible undesirable environmental effects of GM-crops. It is feared that pesticide-resistant GM-crops cross-breed with weeds causing the weeds to become resistant to pesticide in question [3, 19]. GM-crops possible harmful effects to other plants, animals and biodiversity also raise concerns [19] as do the environmental effects of the changes in pesticide use.⁸ These concerns have not been raised with respect to GM-medicine, probably because most of GM-medicine is produced in closed laboratories from which the modified genes cannot “escape to the nature”. However, since in the future some GM-medicine will probably be produced in GM-crops growing in open fields (the GM-banana containing eatable vaccine, for example), this difference does not hold with regard to all GM-food and GM-medicine. Nevertheless, as the number of exceptions is low, this difference in the ways of production may well be the reason behind the asymmetry of views of some Europeans – especially since GM-discussion in Europe is to a great extent centred round environmental issues. Whether the environmental risks are great enough to offer a good argument against GM-food cannot be answered by philosophical analysis alone. Rather it is a scientific issue with high ethical relevance. Nevertheless, it is worth noting that if environmental risks are taken as the sole reason against the acceptability of GM-food, one should be ready to accept it if risks are shown to be minimal by sound scientific analysis. Moreover, one should then also be ready to accept GM-food grown in closed greenhouses.

Public and political discussion of GM-food is also strongly connected to the question of possible undesirable health effects [20, 23]. Interestingly, this issue has not been discussed a great deal with respect to GM-medicine, even though it is generally acknowledged that most of medicine may have unwanted side-effects. Are side-effects better tolerated from medicine than from food? It seems so, and reasons may be at least threefold. First, medicine is often used over short time periods (often only a few days) whereas foodstuffs are used continuously or at least repeatedly. Moreover, since medicine is used as a reaction to something that seems to threaten our well-being, more undesirable side effects are tolerated from it [7]. Third, Europeans trust safety regulations and testing of medicines more than those of food industry and medicine is also felt to be more closely monitored after being commercialised [2]. Nevertheless, it is justified to ask about the consistency of the worry concerning health effects of GM-food. Why do we worry about the possible side-effects of GM-food but are happy to consume fish from the contaminated Baltic sea, raw fish packed in vacuum, milk products containing traces of antibiotics, non-pastured milk products and raw eggs.

6. TRUST, EXPECTATIONS AND EXPERTISE

It is useful to examine consumers’ reactions to GM food and GM medicine in terms of trust, expertise and expectations. Trust and expertise are widely considered to be crucial

⁸GM-crops resistant to pesticides allow pesticides to be used in different times of the year they have traditionally been used. In Europe this has raised discussion whether this change in pesticide use may have some serious (or desirable) environmental effects.

for both the food sector and the health sector. With regard to health, we have long relied on scientific and medical experts, like physicians and pharmacists. This traditional way of relying on the health providers’ goodwill and competence (which, taken together, may be seen to constitute the essence of what we mean by their “professional attitude”) is called by Neil C. Manson and Onora O’Neill blind trust [24, 25]. Arguably, in the food sector there is no such tradition, at least in the European context. There is also an important difference in our expectations with regard to food and with regard to health. While both medical industry and food industry provide products that we directly consume, we expect other things from a physician and a pharmacist than from a food producer and the manager of a supermarket [11]. Part of the difference is that in food matters we tend to trust our own judgment and experience. The expertise that we rely on is internal, so to speak. Despite the fact that also the food sector has long ago become so complex that only a few people are in fact able to assess all the risks and benefits of the various food products available at the market, many if not most of us nevertheless take themselves to be competent actors and evaluators in this important area of life.

A second reason for the above mentioned differences in trust, expertise and expectations is due to some recent scandals and scares in the food sector as well as to the central role biopolitics and the media play in the area of food production and “green” biotechnology (in contrast to “red” or human biotechnology) [26]. In the food sector, consumers and consumer groups have become increasingly sceptical of the reliability of safety assessment procedures and risk management due to serious food scares that have occurred within Europe. Of particular relevance is the BSE outbreak in cattle in the UK, responsible for the human variant CDJ (Creutzfeldt Jacob disease). Being in the recurrent focus of the media, BSE and other food scandals have led to a public lack of trust in profit driven food production on a general level.⁹ In the case of GM food, the same fears – perhaps enriched by environmental and ecological concerns – are present, and the trust that (may have) existed before these scandals has now been destroyed.¹⁰ In the light of what we know about the moral attitudes and concerns of European citizens, it is not likely that such a radical change in trust could occur in the context of medicine and “red” biotechnology.

It seems, then, that trust in food and medical products appears to be based on a long history of rather clear patterns of trust-sustaining (or trust-ruining) expectations and expertise that are dissimilar in some important respects. In the health and “red” biotechnology sector, trust has traditionally been a matter of dealing with uncertainty and situations where individuals are vulnerable and have little control, situations where they are heavily dependent on the goodwill and competence of external scientific and medical experts. In

⁹It may be recalled that what most likely undermined food safety in the case of BSE was the cost-cutting in animal feed that led to cows being fed infected parts from dead animals.

¹⁰Paradoxically, at least from the point of view of philosophy, a growing lack of trust on “green” biotechnology, commercial food production and food safety authorities has been matched by increasing confidence in different interest and pressure groups, such as Greenpeace and the People’s Biosafety Association, that are regarded as morally more neutral and trustworthy by many consumers since they do not (claim to) have a commercial or political agenda.

such a blind trust situation, the truster has certain positive expectations towards the professional attitude of another. On the contrary, in the food sector trust seems more to be a matter of internal expertise (or self-expertise) where the truster has positive expectations above all towards herself as an autonomous consumer and competent evaluator.

Applying Joel Feinberg's well-known distinction between acting *in* ignorance and acting *from* ignorance, it might be suggested that, even in the situation where there is very little scientific information available about the risks, consumers in the food sector are acting in ignorance rather than from ignorance (or, as Aristotle would say, "by reason of ignorance"). This is because food consumers normally have an accurate knowledge, at a higher level, of the scope and limits of their first-level knowledge.¹¹ In Feinberg's words: "Unavoidable ignorance is to some degree an element in all risk-taking, but to know which factors are unknown is itself to have knowledge of a relevant kind, contributing to responsible decision-making" [27]. It seems that the situation in the health and medical sector is quite different. People do not normally know enough about medical matters to have adequate second-order knowledge. Even those of us who regard ourselves as independent and autonomous health consumers and choose to buy alternative medicines and treatments have seldom the right kind of second-order knowledge, because, contrary to what we might think (or are made to believe), most such medicines and treatments have been tested neither for safety nor for efficacy. Since more accurate and truthful information would be likely to change their second-level knowledge, it might be said that such consumers would be acting from ignorance rather than in ignorance.

7. SOCIAL AND PSYCHOLOGICAL MEANINGS

The world is not merely physical but has social and psychological realities. Do GM-food and GM-medicine differ with respect to their social and psychological outcomes? Social and psychological effects of GM-food and GM-medicine may come into being through changes in farming and other production procedures as well as changes in productivity. They may also rest on social and psychological meanings food and medicines have for human beings.

First, GM-food has raised concerns about its effects to farmers of third world countries. Some claim that GM-crops will benefit them [3, 20, 22, 28] whereas others hold GM-farming to have diverse effects [19, 29]. GM-medicine has not been considered to a great extent from the respect of their effects on people working in the pharmaceutical industry. It seems to be presupposed that GM-medicine production does not have dramatic (negative) consequences to financial or other well being of individuals within the industry. Nevertheless, it would be interesting to seriously consider the social and financial effects of GM-plants containing vaccines or other medical components. They represent a new type of farm products – medicine produced in farms – with rather different markets to food products.

Second, food is intimately connected to people's social relations as well as to their self-images and world views. People may regard following a vegan diet, consuming or-

ganic or all-natural food, or having food choices that follow religious or cultural restrictions, to name but a few, as integral parts of their personality. Food choice is a basic form of self-creating, self-expression, and self-definition [9]. What may and may not be eaten differs from one culture to another [30]. In the western world people are usually quite reluctant to eat dogs or snakes, for example, Muslims do not eat pigs and Hindus have rules against eating beef. Many Anglo Americans find the Finnish tradition of eating reindeer rather curious and even disgusting. Interestingly the strictest rules and choices seem to mostly concern meat. Yet, some dietary choices adopted by individuals restrict, among other things, the use of genetically modified food. Strict vegans, for example, may be reluctant to consume vegetables modified with animal genes¹² and people following an organic diet may be unwilling to consume any GM-food products [31].

Medicine often is purely laboratory products. It may, however, also be produced in GM-plants¹³ and GM-animals¹⁴ [3, 34]. Nevertheless, medicine choices are not, at least not as intimately as food choices, central to people's self views and life choices. Interestingly, the internet site of a vegan association of Finland, for example, does not mention medicine at all even though the association states its intention to promote a life style in which "all products fully or partly originating from animals are avoided" [35]. Analogously, the rights of laboratory animals (as well as other aspects of animal use from factory farming to zoos and hunting) are widely discussed on the internet site of an animal rights association of Finland. Animals used for medicine production, nevertheless, are not mentioned at all [36]. Thus, it is fair to say that people do not usually consider the ways of medicine production as important for them as the ways of food production. The medicine people consume is not central in the same manner to their personal life choices. Thus, genetic modification of food touches upon more deeply held (or higher) values than GM-medicines. In other words, people are more reluctant to accept GM-food than GM-medicine, because the way their food is produced is important to them whereas they do not pay a great deal of attention to procedures of medicine technology.

Third, one reason for citizens' different attitudes towards GM-food and GM-medicine may lie in their conceptions about good food and good medicine. The conceptions of good food and good medicine depend partly on the roles food and medicine play in our lives but also on images based on cultural traditions and marketing strategies. Many food commercials rely on images of naturalness, authenticity and purity. Natural food (what ever it means) is considered to be good, healthy and desirable whereas industrial food is seen as a health hazard [30, 37]. Even natural flavourings are seen as superior to artificial ones. (It tells something about people's relation to food to even have such a distinction.) The rhetoric of naturalness is not present in discussion concern-

¹¹For example, everybody has heard about risk of Salmonella and Listeria bacteria that cause food poisoning.

¹²Even though this kinds of food products are not available at the market yet, they may well be in the future [3].

¹³Besides eatable vaccines in GM-banana and GM-lettuce also other vaccines are under development. Tobacco plant for example may soon be used for producing HIV-vaccines [32] and Saflori plants for producing insulin [33].

¹⁴Genetically modified animals may, for example, produce milk containing human proteins that are suitable for being used as medicine [3].

ing good medicine. There is no need for it to be natural. What we want from medicine is that it is clean and safe as well as trustable and effective. Industrial processing may even be seen as a benefit when it comes to the medicines. Genetic modification is without a question a highly technical operation. Thus, with genetic modification food may seem to move away from its ideal of naturalness and authenticity. As far as medicine is concerned, we want it to be industrially processed (in order to be safe and effective), and thus genetic modification does not detract from the ideal. If people really hold these kinds of views, they can at least partly explain the asymmetry in citizens' views concerning GM-food and GM-medicine. According to Marieke Saher, this actually is the case and the resistance to GM-food is at least partly motivated by the belief that it is unnatural [30].

To conclude, then, genetic modification is *seen* as a greater and more essential change in food production than in medicine production. GM-food contradicts values associated with good food and it may be against personal food choices of some people. Since food choices are central to one's personality GM-food may be seen as a threat to one's life style. On the other hand, genetic modification may even promote values associated with good medicine. Moreover, as medicine choices are not important to people (at least not in the way food choices are), genetic modification of medicine does not disturb them.

8. CONCLUSION

All GM-foods and all GM-medicines do not dramatically differ with respect to their intended purposes and outcomes. However, people worry far more about the possible undesirable health related, environmental, and social side-effects of GM-food than those of GM-medicine. This may be partly because of differences in experienced trust towards actors in these two industries. At least partly the asymmetry in peoples' views is explained by the different roles food and medicine play in our lives. Many associate food with values that contradict with genetic modification, whereas values compatible with genetic modification usually prevail in the case of medicines. Moreover, food is more intimately related to our social life and personal life choices than medicine. Some life styles adopted by people restrict the use of GM-food. Life style restrictions on GM-medicine (or medicine in general) are nevertheless far rarer.¹⁵ Thus, asymmetry in peoples' views concerning GM-food and GM-medicine may be well-justified and rational – at least from the point of view of people's deeper values and beliefs.

What do these results imply for the decision making concerning GM-food and GM-medicine? The very basic principle of western democracy is that people's views and fundamental values should be to some extent respected in decision making – even when the views are not scientifically justified. In practice, respecting of people's views implies, for example, that people who hold views and values incompatible with consuming GM-food should not be forced to eating GM-food products. Thus, the labelling of GM-food products

is a good ethical practice [31]. Respecting people's views does not, however, imply that GM-foods should be prohibited in the European Union. The values that may be accepted as justified reasons for personal decision making concerning ones own life style, may not offer good reasons for strong political decisions affecting the lives of many people. Also, the views of those willing to consume GM-foods should be respected, and thus respecting the freedom of choice of GM-opponents should happen in minimally intruding ways that disturb other people as little as possible. Finally, one should bear in mind that our moral values and attitudes are dynamic and subject to change. The feelings of unnaturalness and pollution associated with GM-food, for example, may gradually weaken when people become more familiar with GM-foods and GM-technology in general [39, 40].

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¹⁵Some life style choices may, however, restrict also the use of medicine or certain types of medicine. People are becoming more and more interested and also more willing to use so called alternative treatments – treatments that are not part of the official health care system and that have not been demonstrated to be effective [38].

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