

Actually, natural is neutral

Most people in the Western, developed world prefer natural things, especially foods. We posit that there is neither theoretical nor empirical support for the widespread beliefs about the superiority of natural entities with respect to human welfare. Nature is not particularly benevolent.

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There is a widespread preference for naturalness, especially for natural food, in the Western, developed world. Most people are willing to pay more for foods that are labelled 'all natural' and 'organic'. Foods with these types of labels (sometimes called 'clean labels') are not only strongly preferred, but also increasingly prevalent^{1,2}. Beyond food, many people regularly use natural and herbal medicines and natural personal care products. People are drawn to these natural labels because they think nature is safe and benevolent. However, these beliefs are often wrong. Nature did not evolve to help mankind. Nature is not particularly benevolent.

Lay conception of natural

To understand people's preferences for natural, it is helpful to think about what 'natural' means to the average person. Research suggests that the history of an entity is critical in determinations of perceived naturalness^{1,3}. For example, naturalness is defined as "from nature; not artificial or involving anything made or caused by people" (Cambridge Dictionary) and "existing in or formed by nature" (Dictionary.com). In the lay mind, naturalness is destroyed by almost any process that involves human intervention. The history of processing is more important than the actual content of a product for determining naturalness. Consider a tomato paste with sugar added. Unsurprisingly, it is less natural than the untouched tomato paste. However, if the tomato paste has the sugar subsequently removed, it has the same content as the original tomato paste. This tomato paste—which has undergone two processes but has the same original content—is less natural than the tomato paste with the sugar additive—which has undergone one process and has different content³. Thus, when process and content are dissociated, processing appears to be more important. The centre of the lay definition of naturalness, in other words, is about being untouched by humans. The lay definition of naturalness is not obviously problematic or internally inconsistent.

However, consumers do make problematic inferences about natural things.

Consider, for example, the widespread belief in the benevolence and gentleness of nature. Once an entity is deemed natural, consumers make inferences about other attributes, such as safety and healthfulness. Many lay people believe natural chemicals are safer than manmade chemicals, even though experts generally do not believe this⁴. Because naturalness judgments are based on the history of human intervention in a product, consumers even believe differences exist between what are described as chemically identical natural and synthetic products. When a natural vitamin and a synthetic vitamin are described as chemically identical, people believe the natural one is safer and prefer the natural one. Some people may not even believe that a natural and synthetic vitamin can be truly identical⁵.

Moral meanings in the modern mind

Naturalness has moral meanings in the modern mind. To most people from Western, developed countries, naturalness is morally superior. We do not know the origins of these moral beliefs. They may in part be related to the inferences we discussed earlier. Harm is quintessentially immoral, so people might view safer entities as more moral. Moral beliefs may be buttressed by beliefs that human intervention is malevolent, evidence for which comes from the negative consequences of industrialism, capitalism and war. Regardless of the origin, we believe the 'natural = moral' heuristic goes beyond consequence-based inferences. Many people think natural is inherently better, above and beyond its risks and benefits.

This issue plays out most clearly in the substantial opposition in Western, developed countries to genetically modified (GMO) foods. Evidence suggests these products are as safe for human health as conventionally bred foods, and can have advantages in disease resistance, shelf life and nutritional quality⁶. The same people who oppose GMO foods cheerfully

eat corn, tomatoes and chicken, all of which are highly domesticated and have been subject to extensive human-caused genetic modification, by selective breeding, over time.

In many cases, the opposition to genetically modified foods has a moral basis, largely independent of risks and benefits. The majority of GMO opponents, for example, agree that they would be opposed to GMO food "no matter how great the benefits and minor the risks from allowing it" and that "this would be wrong even in a country where everyone thought it was not wrong"⁷. It is possible that many people who agree with those statements are not taking them literally, but are merely expressing their view that consequences do not weigh heavily in their reactions to unnatural entities. But even that suggests something like a moral force.

The moral aspects of GMO opposition suggest that the innovation of CRISPR, which makes genetic editing more targeted, precise, accessible and affordable, might be met with similar opposition. If people are opposed to GMOs based on a moral intuition that it is wrong for humans to directly tamper with the blueprint of an organism, they might also view CRISPR as much less acceptable than selective breeding. We suspect that such moral intuitions lead people to think less about the specifics of how the tampering is done, or its risks and benefits, and to rely more on a gut, moral belief.

The effect of pro-natural beliefs on attitudes may be more important now than it was generations ago. In the industrialized world, people have become more separated from nature. Increased separation from nature may lead to idealized views of nature and to the strengthening of beliefs or heuristics like natural = benevolent and natural = moral. Relatedly, the increased separation from the origins of food may produce nostalgia for obtaining food from its source and a heuristic that foods that come directly from the source are better. Consumers may not understand the degree to which they are relying on heuristics about

naturalness when evaluating their food, instead thinking that they know more than they do. For example, extreme opponents of GMO foods think they know more about genetic modification than supporters do, but these extreme opponents actually know less⁸.

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Our claim is that nature was not evolved to be good or bad for humans. The belief that nature is benevolent is misguided. Nature is the product of the interaction over time of physical features of the earth, physical features of the atmosphere and biological evolution. The belief that nature is benevolent causes us to focus on the dangers of unnatural entities and to overlook the dangers of natural entities.

Consider the case of the pesticides that we ingest in food. We focus on thoroughly testing and regulating commercial pesticides. Yet plants naturally produce pesticides to protect themselves from fungi, insects and animal predators. In fact, 99.99% of the pesticides we consume (by weight) are natural. These natural pesticides, in addition to being much more prevalent, are no less dangerous. Natural pesticides yield similar levels of carcinogenicity as existing commercial pesticides⁹.

Another illustrative case is that of medical products and natural supplements. When evaluating the efficacy and safety of medical products, we focus on testing and regulating human-made substances. For example, in the 1990s some herbal weight loss remedies (such as Metabolife) contained ephedra, a shrub-like plant

native to central Asia. Using ephedra is dangerous, and its use was linked to dozens of deaths in the United States before being banned in 2003. People did not realize that this natural, amphetamine-like compound could constrict blood vessels and increase the risk of stroke. More broadly, natural and herbal supplements like ephedra-based weight-loss drugs are exempt from the US Food and Drug Administration (FDA)'s pharmaceutical jurisdiction, in part, again, because natural is believed to be safe. Consumers assume a degree of safety in these supplements, but they cause about 23,000 emergency room visits annually in the United States alone¹⁰.

Many, including scientists, fear the unanticipated consequences of human interventions. For example, some are concerned about genetic pollution or unanticipated side effects of GMO food on the environment. Of course, unwanted side effects are possible, but fears about unanticipated future effects are a possibility for anything new and could have served in the past to block advances such as antibiotics, water filtration and computers. Those who worry about unanticipated future effects of human interventions might be heartened by the reminder that, especially in the history of the last hundred years, many negative side effects of new technologies have been reduced or eliminated by further technological advances. In part because of technological advances in public health and medicine, American life expectancy rose about 30 years over the 20th century.

In sum, nature brings us beautiful mountain vistas, waterfalls, birds and sunsets. It also brings us earthquakes, floods and death itself. It does not exist to help us or to harm us. Nature is neither inherently good nor inherently bad for humans. The evaluation of the risks and benefits of any product, natural or unnatural, has to be made on a case by case basis. Actually, nature is neutral. □

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Competing interests

The authors declare no competing interests.