

Perspective
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How and why disgust responses underlie prejudice *Evidence from the field*

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Editor's note:

In 2018, the Association for Politics and the Life Sciences held its 35th Annual Meeting at DePaul University in Chicago. A highlight of this event was the keynote address by Michael Bang Petersen of Aarhus University on "How and Why Disgust Responses Underlie Prejudice." This Perspective piece is based on that talk. In many respects, Petersen's address is a story about research: how the pursuit of a single question can result in a series of scientific problems that push the boundaries of contemporary knowledge. Although that was not Petersen's explicit intention, this story conveys a concomitant message about the need for the social sciences to evolve its approach to, and understanding of, human behavior.

Petersen's work centers on the relationship between biology and human behavior. Drawing from his own empirical research as well as the research of others, Petersen connects racial prejudice to disgust sensitivity and the misfiring of the "behavioral immune system," which refers to the psychological mechanisms that are thought to enable the recognition of potential disease-causing pathogens, creating a stronger disposition toward physical and social avoidance. Petersen argues that a significant proportion of racial prejudice can be explained by individual variation in disgust sensitivity. The problem he identifies is that for some highly disgust-sensitive individuals, the cognitive system used to recognize pathologically afflicted members of an ethnic in-group is also applied to healthy members of an ethnic out-group. This miscategorization results in misfiring of the "behavioral

immune system." Peterson's work explores how this response is misapplied to ethnic out-groups.

Petersen's research has important social and political consequences, with implications for policy development and implementation. As Petersen points out, while we know that out-group exposure and socialization can significantly reduce prejudice, the problem with prejudice linked to disgust sensitivity is that the misfiring of the behavioral immune system results in strong social avoidance behavior, which makes these individuals less likely to obtain the socialization required to overcome their prejudices.

In this respect, Petersen's research not only challenges existing perspectives but also highlights key problems to be considered in the development of policy initiatives, such as those related to immigration. For example, if antiprejudice programs operate predominantly through education and socialization models but individuals with high disgust sensitivity are motivated by their misfiring behavioral immune system to avoid out-group socialization, education and socialization are not likely to be effective. The upshot is that the enriched understanding of disgust sensitivity and the misfiring of the behavioral immune system provided by Petersen's research gives policy researchers a more palpable mechanism to study when developing policies to combat prejudice than the comparatively immaterial processes of socialization.

Thank you very much for this invitation and introduction. It is an honor being here and addressing you. The topic of this talk is how and why disgust responses underlie prejudice.

Prejudice can be many things. People can be prejudiced against people who are of another sex or another sexual orientation, for example. Today, however, I focus on a particular type of prejudice: prejudice toward people from another ethnic or racial group. My aim is

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to convincingly argue that we can understand variation in such prejudice by considering the challenges that our ancestors faced over evolutionary history. In particular, I will focus on a perhaps surprising type of challenge, namely, the challenges stemming from diseases and pathogens and the evolved disgust responses that these challenges have selected for.

In contemporary politics, how we should — and should not — react to people from other groups constitutes one of the most hotly debated issues. Europe, for example, is in the middle of what is being called an immigration or refugee crisis, facing streams of refugees as a result of the war in Syria. Most dramatically, the summer of 2015 saw large numbers of refugees arriving on the shores of Europe by boat and then walking across the continent on foot by highway. Of course, immigration and refugees are not just European issues; they are also issues in the United States. A focal point of the 2016 U.S. presidential election was whether or not to build a wall to keep out Mexican immigrants.

As a political scientist, the most interesting observation about the issue of immigration is what different reactions it elicits in different people. Some people react to refugees and immigration by opening their arms. In the summer of 2015, public demonstrations were held in Europe, with people holding signs saying “Refugees are welcome.” At the central railway station in Copenhagen, people were seen holding signs saying “Welcome to Denmark. We love refugees” and “Welcome, the food is for you,” while handing out food to the newcomers.

But that is not the only type of reaction that we have seen. There have been opposite reactions, too. One picture illustrating those reactions made it into the international news. It was a picture of a Hungarian journalist trying to push over a refugee girl who was running across the border into Hungary. Another picture made the Danish news. In this picture, a man was standing on top of a highway bridge, spitting on the refugees who walked underneath.

Importantly, the reactions that we observe here are not just very different. Their intensities are also strong and clearly emotion based, independent of whether the reaction is to open one’s arms or to react aggressively. How can we explain this variation? How can we explain the fact that some people react in one way and some people react in quite another way? If we look to the standard accounts within political science, this variation is often explained with reference to factors such as income: people who are worse off in economic terms might be more reluctant to let in immigrants.

Political scientists also explain variation by making reference to education: people who have lower levels of education might have fewer multicultural values and therefore might be more reluctant to value open borders. A third factor that political scientists point to is ideology: people who are left leaning might be more open to refugees and immigrants than people on the right. All these factors are important. Still, in order to understand the intensity of, in particular, prejudiced reactions, we have found it fruitful to look at another type of factor. Together with my colleagues Lene Aarøe from Aarhus University and Kevin Arceneaux from Temple University, I have delved into how individual differences in disgust sensitivity are a major cause of variation in reactions to immigrants.¹

Disgust and immigration

Why should we expect that something like disgust is related to opposition to immigration? In order to understand this, we need to start with one of the most fundamental problems that our ancestors faced over human evolutionary history: the threats associated with pathogens. While the existence of the physiological immune system is well known — that is, the existence of a dedicated, evolved system designed to combat viruses and bacteria once they enter the body — it is seldom realized just how fundamentally the threats from pathogens have shaped the human condition. One example is the existence of so-called gendered reproduction — that is, the fact that human reproduction requires both males and females. One key explanation within evolutionary biology as to why gendered reproduction evolved is that it constitutes a defense against pathogens. The fact that we need both males and females to reproduce implies that there is a constant reshuffling of the genome, such that pathogens do not have one stationary genetic target to which they can become adapted.² Another example of the importance of the threat from pathogens comes from more recent history: the European conquest of the Americas. One common lay conception of that conquest is that Europeans fought their way through the Americas with superior weapons. In reality, a smallpox epidemic that the Europeans brought to the New World wiped out 90% of the native population.³ Pathogens have thus constituted a major threat to humans — both ancestrally and today.

Within psychology, it is increasingly recognized that the selection pressures associated with pathogenic threats

have left us with more defense systems than just the physiological immune system. Most notably, there is considerable emerging evidence that we have evolved a so-called behavioral immune system.⁴ The function of this behavioral immune system is different from the functions of the physiological immune system. The physiological immune system works by targeting pathogens that enter the body, while the behavioral immune system works by generating motivations to not put ourselves in situations that involve pathogens. Thus, the behavioral immune system aims to ensure that the pathogens never enter the body in the first place.

The basic psychological mechanism that the behavioral immune system works through is broadly recognized as the emotion of disgust.⁵ When we feel disgust toward human feces, toward blood or rotten food, and so forth, this reflects adaptations designed to ensure that we do not come into contact with materials that, over evolutionary history, have constituted disease vectors. However, while all of us feel some disgust toward objects such as these, there is substantial variation in how much disgust each one of us feels. Some people have a very active behavioral immune system and are easily disgusted by pathogen-related stimuli; other people have a less active behavioral immune system and are not so easily disgusted. For example, some people would find it disgusting to drink from a glass that another person has taken a sip from, but others might not have a problem with it. Similarly, some people would be worried about sitting on the toilet seat in a public restroom, while others would not worry about it at all. Thus, some people are more disgust sensitive than others.

In 2004, Faulkner and colleagues published a paper in which they argued that such individual differences in disgust sensitivity are politically important.⁶ Specifically, they argued that individual differences in xenophobic attitudes — that is, how prejudiced people are toward foreign groups — to a significant extent reflect individual variation in disgust sensitivity. Across a series of studies, Faulkner *et al.* showed that individuals who were higher in disgust sensitivity were also more xenophobic. Since this initial study, 67 studies in psychology journals as of 2016 had examined this potential association between disgust sensitivity and attitudes related to xenophobia. While disgust sensitivity is thus a relatively standard predictor of prejudice within psychological science, few studies within political science had — at that time — considered the potential role of the emotion of disgust in intergroup attitudes. There might be several reasons for this disjunction between psychology

and political science, including that political scientists simply were not aware of this line of research. One reason, however, is that not all parts of the literature are sufficiently persuasive to skeptical political scientists.

As part of our initial work in this field, we carried out a meta-analysis of the published studies and observed several methodological choices that could raise concerns. First of all, the sample sizes tended to be small. Almost all of the studies used samples of fewer than 150 participants; therefore, it is very difficult to generalize the findings from these sets of studies.

Second, almost all of the studies — 93% — were student convenience samples. The remaining 7% were adult convenience samples, but there were no nationally representative samples and no cross-national samples at this point in the literature. Again, this raises the question of whether the findings of the literature really generalize. These types of features call into question the external validity of the literature, but there are also reasons to question the internal validity of existing research.

Thus, our third observation is related to the particular research designs that these studies used. Half of them used, simply, bivariate correlations between measures of disgust sensitivity and xenophobic attitudes. The other half used multivariate techniques. But most of these multivariate studies did not control for social demographics and other potential confounds. Rather, they controlled for other, rival measures of disgust sensitivity than the measure that this particular study aimed to promote. Only one study controlled for education, a basic sociodemographic factor and key predictor of prejudice according to political science studies; no study controlled for income; and no study controlled for both education and income. On this basis, our initial focus was to employ standards that would convince political scientists and test whether there is in fact an association between these individual differences in disgust sensitivity and opposition to immigration, one major component of xenophobia.

We fielded large-scale, nationally representative surveys in two distinct countries, the United States ($N = 1,321$) and Denmark ($N = 2,005$). To this set of surveys, we added a sociodemographically varied convenience sample from the United States. In this additional sample, space constraints were fewer. We could enhance measurement validity by including more of the rival measures of disgust sensitivity, and we were able to include further control variables. Overall, we relied on self-reported measures of disgust sensitivity in these

web surveys. Specifically, we used Haidt, McCauley, and Rozin's⁷ scale of contamination disgust sensitivity in all surveys and added Tybur, Lieberman, and Griskevicius's⁸ scale of pathogen disgust sensitivity and Duncan, Schaller, and Park's⁹ scale of germ aversion in the convenience sample. All of these scales are overlapping in content and ask how well a range of statements — such as “I never let any part of my body touch the toilet seat in public restrooms” — describe the respondent.

Finally, in order to obtain an even more valid measure of disgust sensitivity than such self-reported measures, we also ran a smaller laboratory study in Denmark in which we implemented physiological measures of disgust sensitivity. In the laboratory study, we obtained individual differences in skin conductance responses (a unobtrusive measure of emotional arousal) to disgusting pictures of, for example, a vomiting person and a rotten wound. In all samples, we were able to control for all the usual suspects in political science research, including sex, age, education, income, and ideology. In the American samples, we additionally controlled for race. Finally, in the American convenience sample, we were able to control for general personality factors in the form of the Big Five inventory.

Across the samples, measures, and extensiveness of the control variables, we found a significant and positive association between individual differences in disgust sensitivity and opposition to immigration (with effect sizes ranging between 0.10 and 0.24). Thus, even when we use standards that should satisfy most political scientists, the role of disgust responses in the production of prejudice seems robust.

At the same time, it is reasonable to argue that the generalizability of these findings is still limited. Hence, in the foregoing analyses, we only examined opinions in two countries, the United States and Denmark. These countries are indeed different in a number of aspects, but in the end, they are both what some researchers call WEIRD — Western, educated, industrialized, rich democracies.¹⁰ Can we move further? Can we establish more cross-cultural evidence? One recent article in which I was involved did precisely this.¹¹ The lead author of the article Joshua Tybur, organized a huge data collection effort in which researchers across the globe joined forces and were able to collect data on political attitudes and disgust sensitivity in 30 nations. The article focused on endorsement of traditional values. We demonstrated that across the 30 nations, there was a systematic association between being high in

disgust sensitivity and having more traditional values. An endorsement of traditional values does not equal prejudice or opposition to immigration, but in the underlying questionnaire, respondents were directly asked a question about whether they opposed immigration. Unpublished analysis of their answers demonstrated that, on average, there was a positive and significant association between disgust sensitivity and opposition to immigration across these countries (effect size = 0.09, $p < 0.001$). Furthermore, while the association was not significant in all countries and the association varied in size across the countries, in none of the countries did we observe a negative association between disgust sensitivity and opposition to immigration. Hence, there does seem to be a cross-culturally robust pattern to the association between disgust sensitivity and indicators of prejudice such as traditional values and opposition to immigration.

Challenges to peaceful ethnic diversity

Even if the role of disgust in the production of prejudice is a genuine phenomenon, we still might ask: so what? Why should we care about this particular variable compared with the traditional variables within political science such as education and ideology? What we have been arguing is that, in fact, we should care a lot. If prejudice emerges from disgust responses, this fundamentally changes the challenges that we are facing in achieving peaceful ethnic diversity.

A traditional argument within the tolerance literature is that one of the main pathways to achieving peaceful immigration is to have close intergroup contact.¹² If we interact with each other, we will come to realize that the other group is not as bad as we think, and tolerance will emerge. However, if prejudice is really motivated by disease avoidance, the last thing people want is close intergroup contact. After all, contact is the main way to obtain an infection.

To examine how disgust sensitivity shapes motivations for contact, we asked respondents in a nationally representative survey of Danes to react to a number of different scenarios that would either increase how close they were to immigrants or increase the distance between themselves and immigrant groups.¹ We asked about how people would feel if someone in their immediate family married an immigrant, how they would feel if more immigrants moved into their neighborhood, and other situations that would decrease distance. We also asked about how they would feel if immigrants moved

away from cities to other neighborhoods and gathered in their own community, and how they would feel if immigrants stopped shopping in their local grocery store and instead patronized shops owned by other immigrants. In the latter scenarios, we were basically asking how our respondents would feel about segregation.

We then correlated these reactions with the usual suspects from political science — ideology, income, and education — and a measure of disgust sensitivity. For the usual suspects, the correlations were small, non-significant, and in all directions. For disgust sensitivity, in contrast, the pattern was exceptionally clear. For all the situations that involved decreased social distance, people who were high in disgust sensitivity disapproved. But there were two situations that people high in disgust sensitivity approved of: those that involved higher segregation. In other words, if you are motivated by disgust and pathogen avoidance, the last thing you want is the close intergroup contact, which we know will facilitate tolerance.

We have also examined another pathway to tolerance. Previous research has shown that if immigrants are perceived to be hardworking and willing to contribute to society, then tolerance is often triggered. As long as immigrant groups are perceived to contribute, the native population tends to be open to letting them in, as this alleviates concerns about free-riding.¹³ But the calculus looks different from a disease-avoidance perspective. People motivated by disease avoidance are not really worried about whether immigrants are hardworking or not; they are not worried about whether immigrants have good intentions or bad intentions. Instead, they worry about the autonomous pathogens that the immigrants are perceived to host and that constitute a threat independent of the immigrants' intentions. From a disease-avoidance perspective, the real threat, in a very literal sense, is not the immigrants themselves but what they are perceived to carry with them. To test this prediction, we conducted an experiment in which a nationally representative sample of Americans was exposed to an immigrant who varied in his intentions and willingness to contribute. For those low in disgust sensitivity, the willingness to let the immigrant enter the country depended significantly on his or her intentions. As predicted, however, those high in disgust sensitivity were opposed regardless of whether the immigrant was well meaning. In this way, disgust responses block several pathways to peaceful ethnic coexistence.

Is disgust-driven prejudice against out-groups an adaptation?

Up until this point, I have avoided one of the more fundamental questions: why. Why is it that the behavioral immune system shapes the way people react to immigrants?

In the previous literature, one particular explanation has been promoted. This explanation states that the association between disgust responses and prejudice reflects the existence of a dedicated adaptation — that is, the role of disgust in out-group prejudice is a design feature of the human mind. In a nutshell, the argument goes something like this: over human evolutionary history, out-groups have carried pathogens that in-group members have not adapted to. As a consequence, out-groups carry particularly dangerous pathogens, and it has therefore been a fitness-enhancing strategy among those motivated by pathogen avoidance to avoid out-groups. The paradigmatic illustration in the literature is the previously mentioned smallpox epidemic after the invasion of the Americas. Here, with a fatal result, the native population was exposed to a pathogen threat from another group that they had not developed immunity against. We can call this explanation the *adaptation-for-groups* explanation, as it emphasizes that the operations of the behavioral immune system are adapted to factor in cues of group membership.

However, there are several problems with the *adaptation-for-groups* explanation if we scrutinize it more carefully from an evolutionary perspective. One problem is that the European conquest of the Americas is not a good model for how intergroup exchange or intergroup contact has happened over human evolutionary history. The Europeans were able to travel great distances because of the invention of the ship, but ancestrally, migration rates and distances would have been much smaller, as our ancestors primarily traveled by foot. As a consequence, they would seldom come into contact with groups that had a completely different pathogen ecology than the in-group. Another problem is that differences in immunity within short geographic distances are typically associated with highly infectious disease, which were rare ancestrally because of low population densities and a lack of interaction with livestock.¹⁴ A final and more fundamental problem is that even if there were ancestral differences in pathogen ecologies for in- and out-groups, this might not imply that the out-group pathogens are more dangerous for the in-group. Rather, the pathogens arguably have been

selected to optimally exploit the out-groups and hence may be less lethal for in-group members.¹⁵

The importance of these theoretical arguments notwithstanding, I have been working with colleagues to develop empirical tests to provide direct traction on the question of whether there is an adaptation for avoiding out-groups specifically on the basis of pathogen concerns. In a recent article with Florian van Leeuwen, we sought to make the most basic test possible of the key claims of the adaptation explanation.¹⁶ If an adaptation for avoiding out-groups because of pathogen concerns exists, then people who are concerned about pathogens should be more likely to avoid physical contact with out-group members than with in-group members. To examine this, we designed a randomized experiment in which respondents were asked to imagine that they were interacting with one of four people: a healthy-looking white American; a white American with a disease cue photoshopped onto his face (specifically, a strong rash); a healthy-looking East Indian; or an East Indian with a similar disease cue. We conducted this experiment in two countries: the United States and India. The in-group individuals for the American respondents were thus the out-group individuals for the East Indians and vice versa.

If the adaptation-for-groups explanation is correct, then Americans, especially those high in disgust sensitivity, should react with aversion to the East Indian individuals. They should not necessarily react with aversion to the white Americans. East Indians high in disgust sensitivity, in contrast, should react with aversion to the Americans but not necessarily to the East Indian individuals. The results of the experiment, however, did not corroborate these expectations. People — particularly those high in disgust sensitivity, independent of whether they were from the United States or India — reacted with avoidance to targets with disease cues, and they did so no matter whether these targets were American or Indian (overall effect of disease cue on comfort with contact: $r = -0.34$, $p < 0.001$). People did not react to the healthy-appearing individuals with avoidance, no matter whether they were American or Indian (overall effect of group cue on comfort with contact: $r < -0.01$, $p = 0.68$). Basically, people who were motivated by pathogen avoidance just wanted to avoid people with cues of disease. Contrary to the adaptation explanation, these people did not factor in the group membership of the target.

Together with colleagues at Aarhus University, I created another empirical test of the role of pathogen-

avoidance motivations in which we experimentally manipulated this motivation.¹⁷ In this test, respondents were randomly assigned to listen to a radio spot or were assigned to a control group that did not listen to anything. The radio spot was made by a professional journalist and involved a mock news story that focused on an emerging disease epidemic. Hence, listening to this story should activate pathogen-avoidance motivations. After our participants had listened to the radio spot (or done nothing in the control group), they were asked a series of questions about their motivations to engage in contact with other people. Importantly, we asked these questions in two different versions; respondents were randomly assigned to complete just one of the versions. In one version, we asked about contact with out-group individuals. In the other version, we asked about contact with in-group individuals.

In our analyses, we compared contact-seeking motivations in the control group with the group that had listened to the radio spot and therefore had heightened motivations of disease avoidance. We found a negative and significant effect of disease-avoidance motivations on contact seeking with out-groups (effect size = -0.06 , $p = 0.006$). While this might seem consistent with the adaptation-for-groups explanation, we also found that disease-avoidance motivations similarly suppressed motivation to seek contact with in-group members (effect size = -0.10 , $p < 0.001$). In other words, if you are worried about disease, it is not out-groups you want to avoid specifically — you just want to avoid people. Contrary to the adaptation-for-groups explanation, the behavioral immune system does not seem to be an adaptation for out-group avoidance.

Disgust-driven prejudice as a by-product

If the behavioral immune system is not adapted to avoid out-groups, then why does it produce prejudice? That is, why do we react with prejudice toward out-groups when we have a higher activation of the behavioral immune system if this is, in fact, not something that the behavioral immune system is designed to do? To address this question, I have sought to promote the argument that this does not reflect an adaptation but a by-product of an adaptation designed for other purposes. The argument is that out-group prejudice is not a natural or adapted product of the behavioral immune system but reflects a misfiring of the system.

It is people who are infected, not out-groups, that the behavioral immune system is designed to avoid.

The problem, however, is that it is computationally very difficult to determine whether a person is infected unless he or she has some radical infection symptoms. We cannot see the underlying causes — the pathogens — but only their effects — the symptoms. Furthermore, it might be computationally difficult to determine whether something is indeed a symptom. Pathogens can give rise to an exceptionally varied range of symptoms, and hence there is no finite checklist of very concrete things to look for. Thus, pathogen detection is a classical signal detection problem. Yet, while pathogen detection is difficult, it was at the same time costly for our ancestors — indeed, potentially fatal — to make a false negative judgment in a world without modern medical treatment. In contrast, making a false positive judgment (i.e., mistakenly attributing some physical attribute to an infection) might have meant that social interactions were forgone but would seldom imply death. Accordingly, the adaptive solution to the signal detection problem of pathogen detection is to operate in a better-safe-than-sorry manner. That is, there are evolutionary reasons to expect that the behavioral immune system is designed to bias our responses such that we tend to identify infections when there are none rather than the opposite.

A key argument within the disgust literature is that this better-safe-than-sorry mode of operation creates a hyperactive behavioral immune system. This hyperactive behavioral immune system tags multiple features as signals of infection that are not really true signals of infection. In the psychological literature, features such as obesity, physical disabilities, and large birthmarks have been shown to be processed as pathogen related despite the fact that they are not. Seemingly, physical deviations from the normal phenotype within a given group are implicitly tagged as potential signs of infection. What happens when we take this hyperactive behavioral immune system and place it in a multicultural and multiracial environment? Potentially, it runs amok and processes the fact that there are groups of people who look different from the self as a cue that these people are infected. In that perspective, the association between disgust sensitivity and out-group prejudice would not reflect a dedicated adaptation but a by-product of the hyperactive behavioral immune system.

To provide an empirical test of this by-product perspective, I have been digging into the deeper psychological operations of the behavioral immune system.¹⁸ Specifically, the adaptation-for-groups perspective implies that infected out-group individuals are particularly

dangerous, and hence they ought to be represented in the mind using specialized mental categories. In contrast, a by-product perspective entails that we do not have a dedicated mental category for reasoning about infected out-group members. Instead, physical or behavioral deviations from the prototypical in-group member are taken as an infection cue, just like any other cue of infection. Out-group members are not special but are treated as any other instance of the category of infected individuals. In terms of mental categorization, this implies that people should use the same mental category to represent (a) in-group members who are manifestly infected and (b) out-group members who are healthy but deviate physically from the in-group.

To test this specific prediction, I utilized the “Who Said What?” memory confusion protocol. This protocol involves three distinct phases that a research participant must pass through. In the first phase, the participant is presented with a conversation between a number of individuals. In turn, each of these individuals is shown in a picture and a statement attributed to them. In this phase, participants are simply asked to form impressions of the presented individuals. The second phase is a distractor phase to avoid rehearsal effects. Finally, the third phase is a surprise recall phase. In this phase, participants are presented with each of the statements from the conversation in turn and asked to pick the picture of the individual who made the given statement (hence the name of the protocol: “Who Said What?”).

This is a difficult task, and participants make a lot of errors in the recall phase. These errors are the focus of the analyses, as they provide an implicit measure of how participants formed impressions during the initial presentation phase. For example, if people are presented with white individuals and black individuals, there will be a tendency to confuse the statements of black individuals with other black individuals and the statements of white individuals with other white individuals, but not across racial boundaries. Thus, by looking for patterns in the recall errors, the protocol provides a way to identify what mental categories participants use to form impressions of the individuals in presentation phase.

This particular version of the protocol involved an experiment with two experimental conditions: a control condition and a treatment condition. In both conditions, people were presented with conversations between white Americans and East Indians. In the control condition, both the white Americans and the East Indians were healthy looking; there were no signals of disease. In the treatment condition, the faces of the

white Americans were photoshopped with a disease cue (specifically, a large red rash). The research participants were themselves white Americans, and hence the treatment condition presented the participants with an in-group member who was manifestly infected and a healthy out-group member.

If the participants are using the same mental category to represent a sick in-group member and a healthy out-group member, then we should observe an effect of the experimental condition on the recall errors. Specifically, participants should begin to confuse these two groups of people in the treatment condition relative to the control condition. Note that this would be somewhat paradoxical, as it implies that by making the in-group members visually more similar (by giving them all a manifest sign of infection), they are actually made psychologically less different from the out-group members. This is what was found across two separate studies, each with about 600 participants: when infection cues were present, white Americans and East Indians were indeed categorized as more similar. Specifically, the number of statements from Americans that were attributed to East Indians (or vice versa) increased ($p < 0.001$ for both studies with effect sizes around one-third of a standard deviation). Hence, these studies provide further evidence against the adaptation-for-groups perspective and support a key implication of the by-product perspective on the origins of the association between disgust responses and out-group prejudice.

When people are confronted with individuals who look different, these individuals are mentally and subconsciously tagged as a disease threat — not because they are in fact a threat but merely because they look different and these differences in skin pigmentation and so forth are taken as cues of infection by the behavioral immune system. This is one of the key reasons why the behavioral immune system produces prejudice.

Conclusions

The body of evidence that has been presented shows that pathogen-avoidance motivations are consistent cross-cultural predictors of prejudice toward other groups, including other ethnic and racial groups. Yet despite being a popular argument in the evolutionary psychological literature, this form of out-group prejudice is not an adapted output of the behavioral immune system. Most likely, this system is not designed by natural selection to treat the pathogens of out-groups as more dangerous and hence to specifically avoid

out-group members. Instead, the behavioral immune system is adapted to motivate avoidance of everybody. When the behavioral immune system is brought online in a person, this person is simply less inclined to interact with others (in particular, infected others). In itself, this can account for a large portion of the observed prejudice. When disgust reactions and avoidance motivations are activated, they easily spill over to other types of negative affect, the acceptance of stereotypes, and the formation of overall negative judgments. All such considerations can serve as justifications for the lack of motivation to engage with a person or group, and the behavioral immune system can anchor the need for such justifications for a very large range of groups — both those who look like oneself and those who do not. At the same time, there are reasons to expect that the behavioral immune system generates heightened avoidance motivations for unfamiliar groups such as ethnic out-groups. One key reason is the hypersensitivity of the behavioral immune system, which as a by-product tags people who deviate physically or behaviorally from the expected phenotype as pathogenic threats.

These arguments and findings leave a number of outstanding questions that are crucial to address in future studies. One question relates to cultural variability. While disgust sensitivity does seem to be a cross-culturally robust correlate of prejudice, there is also substantial variation in the exact size of the correlation. What we know less about is whether this variation reflects random noise or whether it reflects systematic effects. For example, one factor that might condition the association between disgust sensitivity and prejudice is the level of ethnic homogeneity in a country. If the by-product explanation is true, it is plausible that exposure to many people who look different will at some point create a habituation effect, such that physical and behavioral differences are less likely to be associated with pathogen threat. Cross-country variation could also reflect more traditional cultural processes related to elite rhetoric. Many political entrepreneurs have sought to mobilize against out-groups by associating them with words such as “vermin,” “plague,” and other disease-related concepts. Potentially, we might see stronger associations between disgust sensitivity and prejudice in countries where political entrepreneurs are directly targeting the behavioral immune system with their rhetoric.

Another question is whether the behavioral immune system produces other politically relevant outputs

besides prejudice. If so, it is relevant to ask whether these outputs reflect dedicated adaptations, even if out-group prejudice is a mere — but politically important — by-product. One potential line of research could focus on the association between individual differences in the endorsement of traditionalism and individual differences in disgust sensitivity. While this association seems to be empirically robust,¹¹ we know less about the exact psychological processes that generate it. Potentially, the activation of the behavioral immune system could lead to increased efforts to coordinate around norms that facilitate high hygiene. This would be consistent with the fact that a number of key cultural norms and taboos traditionally relate to disease vectors such as sex and food and seek to regulate behavior such that transmission risk is decreased.¹⁹ Could it be that the effect of the behavioral immune system on traditionalism reflects adaptations to uphold the norms that secure hygiene within the group? This is a possibility that warrants future empirical tests.

A final question is whether there are ways to diminish normatively undesirable effects of the behavioral immune system. The arguments put forth here do not imply that there are not relevant reasons to be opposed to immigration. Yet the relationship between disgust sensitivity and opposition to immigration does not seem to reflect such relevant reasons. Is there anything we can do to address that? People have sophisticated abilities for emotion regulation but only employ them if they understand that their emotions are leading them away from valuable goals. For example, could a crash course in the mismatches between the behavioral immune system and modern multiethnic environments motivate such emotion regulation among lay individuals? If so, understanding the deeper psychological bases of prejudice — and disseminating that understanding — is not just academically important but also will enable us to directly combat prejudice and its undesirable effects. In my view, this and related paths to emotion regulation are worth addressing in future studies. And with that I want to thank you for your attention.

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