Annual Review of Food Science and Technology

Change Meat Resistance: Systematic Literature Review on Consumer Resistance to the Alternative Protein Transition

M.C. Onwezen,[1,2] G. Nassar,[1] and J.A. Bouma[3]

[1]Wageningen Economic Research, Wageningen University & Research, The Hague, The Netherlands; email: marleen.onwezen@wur.nl

[2]Marketing and Consumer Behavior Group, Wageningen University & Research, Wageningen, The Netherlands

[3]PBL Netherlands Environmental Assessment Agency, The Hague, The Netherlands

Annu. Rev. Food Sci. Technol. 2025. 16:127–46

First published as a Review in Advance on December 20, 2024

The *Annual Review of Food Science and Technology* is online at food.annualreviews.org

https://doi.org/10.1146/annurev-food-111523-121744

Keywords

meat consumption, plant-based, behavioral economics, opposing, reactance, acceptance, nonacceptance, protein transition

Abstract

Consumer resistance significantly impedes the transition from animal-derived proteins to alternative protein sources through a dual mechanism: consumer reluctance to change entrenched meat-eating habits and hesitation among policymakers, marketers, and practitioners due to anticipated resistance. The concept of resistance is intricate and viewed diversely across research disciplines. We conducted an extensive systematic literature review supplemented by an artificial intelligence–based approach. We evaluated 3,387 studies to identify 51 key papers. The results reveal that resistance is under-researched. Resistance to plant-based diets is associated with practical barriers, whereas resistance to reducing meat consumption is tied more to moral and social aspects. Resistance predominantly manifests among unmotivated meat lovers with strong meat-eating habits. On a positive note, resistance reflects consumer concerns, tends to diminish over time, is overrated, and is specifically linked to specific consumer groups. Thus, addressing resistance is vital, as it facilitates the transition to a more sustainable and healthy food supply that relies less on animal proteins.

1. INTRODUCTION

The world is facing large sustainability and health issues that are related to current food consumption patterns. One of the prominent solutions is reducing meat consumption and moving toward a more plant-based diet (Carlsson-Kanyama & González 2009). Although there has been a modest decline in per capita consumption of ruminant meat in high-consuming nations, overall meat consumption remains high and above the recommended guidelines (Onwezen et al. 2024, Parlasca & Qaim 2022, Willett et al. 2019). The high meat-eating trends are even expected to rise, as factors such as population growth and economic expansion are expected to enlarge the demand for meat in the foreseeable future (e.g., Ganivet 2020).

Owing to the environmental, animal welfare, and health issues associated with increased meat consumption, there is an urgent need for a transition from animal-derived proteins to more sustainable, ethical, and healthy plant-derived proteins, such as those from whole grains, legumes, nuts, and seeds (Aiking & de Boer 2020, Willett et al. 2019). Although hesitant, food policies in Western countries are starting to acknowledge the various benefits of a protein transition (Onwezen & Dagevos 2023). For example, in the Netherlands, this has resulted in a policy objective to shift protein consumption from the current 60% animal and 40% plant protein to a balance of 50% animal and 50% plant protein.

Despite the substantial and consistent body of scientific evidence in recent decades emphasizing the imperative need to shift away from meat-centric diets toward more plant-based diets, behavior change toward more plant-based diets has proved difficult (e.g., Hartmann & Siegrist 2017; Onwezen et al. 2021; Onwezen et al. 2022a,b; Verain et al. 2022). Many food consumers hold deep personal, social, and cultural attachments to their meat-centric eating habits, and these cherished dietary traditions are enforced by a food environment that supports animal-based consumption, e.g., in supermarkets, restaurant menus, and social gatherings (Heiskanen & Laakso 2019, Onwezen 2023). Reshaping meat consumption habits is far from straightforward, and large-scale interventions and policies are needed to stimulate a change in consumers toward more plant-based diets (Stubbs et al. 2018). Although this need is widely addressed and accepted, particular consumer groups show resistance to these policies (Sanchez-Sabate & Sabaté 2019). Moreover, a lack of such policies persists worldwide (Onwezen & Dagevos 2023, Rust et al. 2020), and this is partly due to concerns of governments and nongovernment organizations about being paternalistic (Laestadius et al. 2014, Wellesley et al. 2015) and fears of resistance (Anderson et al. 2013, Bonnet et al. 2020). Thus, resistance slows down the protein transition directly because consumers resist changes in their habits and indirectly in that policymakers, marketeers, and practitioners hold back in their transition efforts because they fear resistance and backlash.

One of the pressing issues in developing strategies to support consumer behavior change to more plant-based diets is a better understanding of consumer resistance. There is a need to understand what drives consumer resistance and what are the possible routes to block, reduce, or counter consumer resistance to meat-reducing policies and interventions, to be able to both better support consumers in their intentions and develop effective protein transition policies.

The body of research on resistance to meat consumption is small, although there is a line of studies focusing on resistance. Various definitions exist, and the most common line of reasoning stems from a psychological foundation and perceives consumer resistance as conflicting thoughts and behaviors, stemming from cognitive dissonance. This conflict results in experienced discomfort (Festinger 1957, Rothgerber 2020). In the context of meat, people who acknowledge the ethical and environmental implications of meat consumption may struggle to align their values with their eating habits, leading to psychological resistance (Rothgerber & Rosenfeld 2021). This implies that consumers who strongly resist interventions or meat-reducing strategies do have inner

Sustainability: meeting present needs without compromising future generations' ability to meet their own, through balanced resource use, including environmental, social, and animal welfare

Plant-based: diet or products derived primarily from plants, excluding animal-derived ingredients

Proteins: essential molecules for life found in foods like meat, beans, and dairy, crucial for body function and growth

Protein transition: shifting dietary intake from animal-based to plant-based proteins, promoting sustainability and health benefits

Animal-based: diet or products derived from animals, including meat, dairy, eggs, and other animal-derived ingredients

Resistance: the mental or emotional conflict leading to opposing thoughts and behaviors, often hindering change or progress

Cognitive dissonance: mental discomfort from simultaneously holding conflicting beliefs, values, or attitudes

ethical values that match these strategies, but they are not sufficient to overcome their resistance to change. This differs from indifferent individuals who do not care at all about the environmental or animal welfare values (Onwezen & van der Weele 2016). Resistance is thus regarded as a strategy to resolve the inconvenient or aversive state of dissonance by downplaying ethical consequences or further committing to or rationalizing habitual animal-based diets (Bastian 2019, de Groeve et al. 2022).

Resistance can also be explained from other perspectives. For example, from a behavioral economics perspective, resistance can be explained as an individual's inclination to oppose or delay behavioral changes, despite potential long-term benefits (e.g., Lattarulo et al. 2019). This resistance may be driven by biases or heuristics such as status quo (preference of maintaining current behaviors), loss aversion (reluctance to give up perceived benefits), and temporal discounting (people prioritize immediate rewards over future gains), which can be related to bounded rationality and bounded willpower (Mullainathan & Thaler 2000). Other reasons for and forms of resistance are less clearly discussed in the literature, and what is currently lacking is a comprehensive overview identifying the different forms of and reasons for resistance against the protein transition. For example, Fransen et al. (2015) defined four clusters of resistance strategies (avoidance, contesting, biased processing, and empowerment) and related these clusters to different motivations for resisting persuasion (threat to freedom, reluctance to change, and concerns of deception), but what different clusters of resistance look like and imply for the protein transition are unclear. There is therefore a need to further understand what drives resistance to reduced meat consumption to fully grasp what the concept means in this context and what approaches can be used to avoid, decrease, or reduce resistance and thereby facilitate or stimulate the protein transition.

We conducted a systematic literature review [traditional approach supplemented with an AI (artificial intelligence)-based approach] to get an in-depth view of the current state of the literature on resistance in the context of the protein transition. We included five research questions to gain insights: (*a*) the importance of resistance for different protein transition strategies; (*b*) different forms of resistance; (*c*) explanatory factors that drive resistance; (*d*) different groups in society and how they associate with resistance; and (*e*) effective interventions and policy instruments for avoiding resistance. These insights indicate the most promising routes to respond to resistance in terms of research and policy.

Behavioral economics: study of how psychological factors affect economic decisions and behaviors, blending insights from psychology and economics

AI (artificial intelligence): technology that enables machines to perform tasks requiring human-like intelligence, such as learning, reasoning, and problem-solving

2. SYSTEMATIC LITERATURE REVIEW

2.1. Overview of Methods

For the systematic review, we used a protocol for identifying, screening, and evaluating the eligibility of articles, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) reporting approach (Rethlefsen et al. 2021). We formulated the research problem, defined the search term, inclusion criteria, and exclusion criteria, and collected empirical studies via a traditional systematic literature search, supplemented by an innovative AI tool. Then, we coded and thoroughly evaluated the included studies, extracted the data, and analyzed the database. The steps are described in detail below.

2.2. Literature Search: Traditional Systematic Literature Research

In August 2023, a literature search was conducted in the electronic databases Scopus and Web of Science using the following search query:

(TITLE-ABS-KEY ("consumer") OR TITLE-ABS-KEY ("citizen")) AND (TITLE-ABS-KEY ("meat reduc*") OR TITLE-ABS-KEY ("meat avoid*") OR TITLE-ABS-KEY ("reduc* meat") OR

ASReview: open-source software utilizing AI to assist in systematic reviews, prioritizing relevant studies for more efficient data analysis

TITLE-ABS-KEY (“less meat”) OR TITLE-ABS-KEY (“low meat”) OR TITLE-ABS-KEY (“decrease meat”) OR TITLE-ABS-KEY (“plant-based”) OR TITLE-ABS-KEY (“veg*n*”) OR TITLE-ABS-KEY (“alternative protein*”) OR TITLE-ABS-KEY (“sustainable protein*”) OR TITLE-ABS-KEY (“meat consumption”)) AND (TITLE-ABS-KEY (“resist*”) OR TITLE-ABS-KEY (“oppos*”) OR TITLE-ABS-KEY (“avoid*”) OR TITLE-ABS-KEY (“backlash”) OR TITLE-ABS-KEY (“refus*”) OR TITLE-ABS-KEY (“reluctance”) OR TITLE-ABS-KEY (“nonaccept*”) OR TITLE-ABS-KEY(“reactance”)) AND (TITLE-ABS-KEY (“tax*”) OR TITLE-ABS-KEY (“intervention*”) OR TITLE-ABS-KEY (“nudg*”) OR TITLE-ABS-KEY (“behav*r change”) OR TITLE-ABS-KEY (“promot*”) OR TITLE-ABS-KEY (“implement*”) OR TITLE-ABS-KEY (“polic*”) OR TITLE-ABS-KEY (“public polic*”) OR TITLE-ABS-KEY (“polic* acceptance”) OR TITLE-ABS-KEY (“curtail*”) OR TITLE-ABS-KEY (“government”) OR TITLE-ABS-KEY (“inform*”) OR TITLE-ABS-KEY (“educ*”) OR TITLE-ABS-KEY (“encoura*”)) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE, “English”))

The search terms were tested and refined through multiple rounds (i.e., balance between manageable and valid results). Consumer and citizen were included to ensure a strong focus on consumers. The various words for meat reduction and protein acceptance were included to incorporate articles that focus on the protein transition. We included multiple words for resistance. Finally, the various words related to interventions and policy were included to ensure a link with interventions. The search terms were included in the keywords, title, or abstract of the articles being searched. Non-English articles, conference papers, and irrelevant subject areas (e.g., biochemistry) were excluded, resulting in a total of 242 articles.

The selection protocol was developed prior to the search. All studies were screened on title, abstract, and keywords by two independent raters following inclusion criteria that were based on the relevant components of PICO (population, intervention, control, and outcome) (see **Table 1**). Interrater agreement resulted in a conformity of >95%. Disagreement was resolved by a discussion resulting in full consensus. Based on this screening, 51 articles were considered relevant and were included in October 2023. Most studies were excluded because they either did not contain empirical consumer data, did not focus primarily on consumers, or did not include any link to resistance.

2.3. Supplemented Literature Research with ASReview

We included an additional search (July 2023) with the AI tool ASReview, which is an open-sourced machine learning tool for screening and systematically labeling a large collection of textual data (**https://asreview.nl/**). In the domain of (behavioral) economics, keywords referring to resistance are usually framed in terms of nonacceptance. For this reason, a supplementary step was used to broaden the search term and ensure all relevant articles were included in the final pool. Using the same databases, we widened the scope to include studies that mention consumers anywhere and

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Empirical data (qualitative and quantitative)	No empirical data
Peer reviewed	
Abstract includes (direct/indirect) link to reactance and/or nonacceptance	No focus on protein consumption No link to resistance
Main focus is on consumers/citizens	
Western countries	No link to reducing meat consumption or replacing meat by alternatives (including plant-based, fish, insects, and cultured meat)
English language	
Date ranges from 2012 to 2024	

include "acceptance," and animal product–related keywords resulting in the following adaptations and additions to the search term:

- (ALL ("consumer") OR ALL ("citizen"))
- OR TITLE-ABS-KEY ("animal product consumption") OR TITLE-ABS-KEY ("animal product*") OR TITLE-ABS-KEY ("animal-based") OR TITLE-ABS-KEY ("meat*"))
- TITLE-ABS-KEY ("accept*"))

This resulted in a database of 3,252 studies. The tool was supported with a set of five relevant and five irrelevant papers. The software learns from decisions made based on the inclusion/exclusion papers and uses this information to reorder more relevant studies and put irrelevant studies in the back of the line. Two independent researchers then screened the abstracts until a saturation point was reached (i.e., usually a cut-off of no relevant studies in a sequence of 150 studies is used). We wanted to ensure we did not miss any study and stopped after 825 subsequent irrelevant studies. This resulted in the selection of 61 studies. In combination with the traditional systematic review, and excluding the overlap, this resulted in 94 papers.

In the last step, full-text papers for the 94 studies were retrieved and read. We further refined the set of included articles by excluding papers based on the inclusion/exclusion criteria (**Table 1**). This final screening resulted in a total of 51 papers included by March 2024. The relevant data were extracted from these papers, resulting in an overview table (for a simplified version of the overview, see **Supplemental Table 1**). See **Figure 1** for an overview of all included steps for the selection of articles.

Supplemental Material >

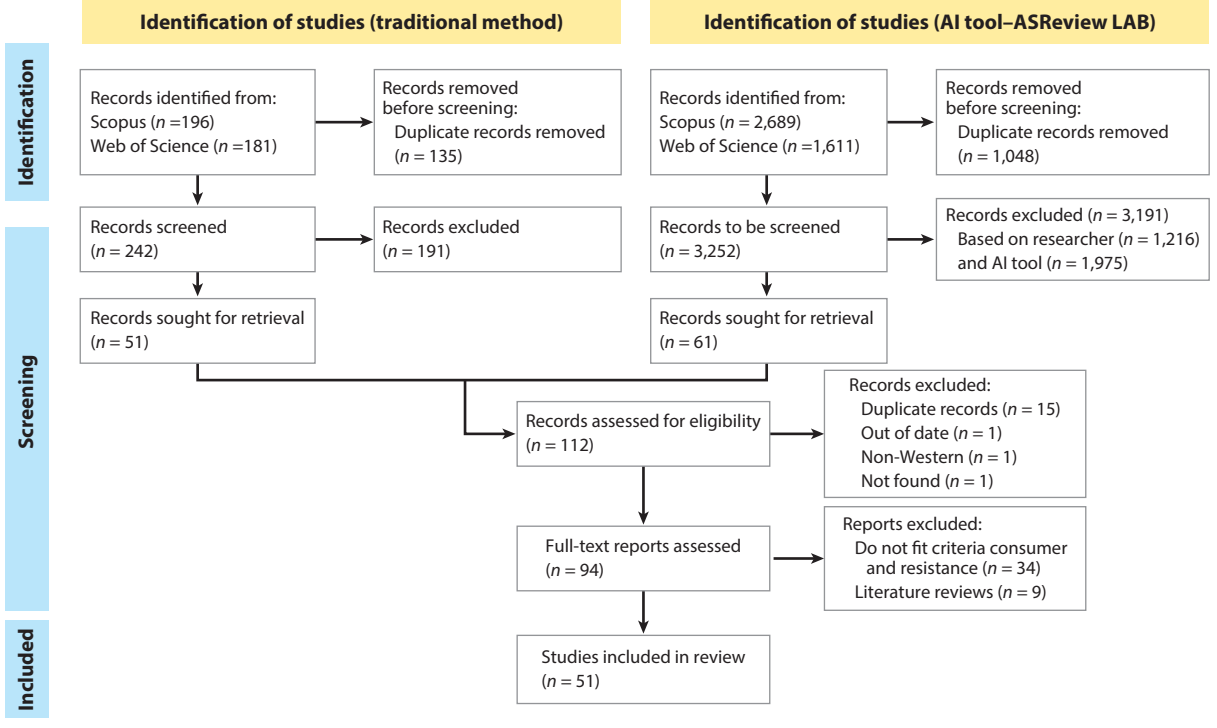

Figure 1

PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 flow diagram for new systematic reviews that included searches of databases, registers, and other sources. Adapted from Page et al. (2021). For more information, visit **http://www.prisma-statement.org/** (CC BY 4.0). Abbreviation: AI, artificial intelligence.

Table 2 Overview research question and main conclusions

Research question	Main conclusions
How important is resistance in increasing plant-based versus reducing meat consumption?	Two forms of resistance seem to pop up: Resistance to stop eating meat Resistance to start eating plant-based
Are there different forms of resistance?	Resistance seems to differ according to different phases of behavior change (protect self-image versus specific barriers)
What are explanatory factors associated with consumer resistance?	The following categories of explanatory factors seem to pop up: Demographics and characteristics like age, gender, and education Moral considerations like activated moral values Sustainability values like environmental concerns Emotional responses like negative affect Social environment like social and cultural norms Beliefs like health and taste
How do different groups in society associate with resistance?	Demographics (like age, masculinity, and gender), environmental and moral values, and strong beliefs (taste) are important indicators of resistance groups
What are effective interventions and policy instruments for reducing or avoiding resistance?	Identify and target consumer groups (stages of change) Deal with sensitivities up-front (in communication and policy design) Do not force people; freedom of choice is important Resistance is not stable and reduces over time

3. RESULTS

Supplemental Material >

The results start with a generic description of the included studies. We then discuss the five research questions based on the selected studies (**Table 2**; see Sections 3.2–3.6). Finally, we supplement our analysis of the literature with an AI-based analysis (using ChatPBL; for more details, see **Supplemental Appendix 1**) of the key articles (see Section 3.7).

3.1. A Description of the Included Studies

We start with a description of the included key studies. The outcome of our search suggests that consumer resistance to the protein transition is under-researched. We did an extensive literature search and found only 51 studies related to resistance, and only a few of these studies had a core focus on resistance. Empirical data were collected in the United States (7 studies), Germany (7 studies), the United Kingdom (6 studies), Australia (5 studies), the Netherlands (4 studies), Switzerland (3 studies), and Sweden (3 studies). Other countries such as Finland, France, Denmark, Brazil, Canada, Italy, and Norway were represented with one or two studies.

Most of the included studies used quantitative methods, which is to be expected as one of the exclusion criteria was no empirical data. Of these, 41 studies used quantitative designs, including surveys (e.g., choice and condition experiments, qualitative), interventions, and discourse analysis; 7 studies used qualitative designs, including focus groups and in-depth and ethnographic interviews; and 3 studies used mixed designs.[1] Generally, the consulted literature is experimental in nature, assessing stated preferences.

[1] Studies that include multiple experiments are included as one study.

3.2. How Important Is the Role of Resistance in Protein Transition, and Is There a Difference Between Increase of Plant-Based Consumption and Decrease of Meat Consumption?

The role of consumer resistance in the protein transition has rarely been explicitly explored in the literature. Many studies that explore meat consumption and reduction hint at the relevance of resistance by exploring how it relates to a wide range of relevant concepts, e.g., meat-related cognitive dissonance (Buttlar et al. 2023, Gaspar et al. 2016, Graça et al. 2014, Rothgerber 2014), gender identity (Boenke et al. 2022, Camilleri et al. 2023, Hinrichs et al. 2022, Mertens & Oberhoff 2023, Stanley et al. 2023), and moralization of animal consumption (Arora et al. 2017, Espinosa & Nassar 2021, Grünhage & Reuter 2021, Pohlmann 2022), but they do not explicitly analyze the relative importance of resistance in stimulating or facilitating the reduction or avoidance of meat consumption, or focus deeply on understanding the resistance to reducing or avoiding consumption of meat. For example, the literature does not compare the role of resistance to other drivers that influence behavior or change of habits, nor does it explore effect size or the underlying mechanisms. Hence, resistance has been more touched upon rather than deeply investigated.

Resistance is also alluded to in studies that explore various kinds of interventions targeting reduction of meat and meat consumption, ranging from food choice restriction (Lombardini & Lankoski 2013) to guided self-examination or introspection (Frank et al. 2022) and message framing, which was the most heavily researched (Boenke et al. 2022, Hinrichs et al. 2022, Pechey et al. 2022, Sprengholz et al. 2023, Weingarten & Lagerkvist 2023). These studies state the relevance of exploring how interventions are impacted by resistance, but they rarely analyze the phenomenon of resistance itself.

Two approaches can be distinguished in the literature: resistance to increased plant-based consumption and resistance to decreased meat consumption. The approaches are distinct; in the plant-based consumption literature, resistance can be seen as reluctance to adopt plant-based alternatives among different consumer segments and barriers to integrating more plant-based meals in diets (e.g., Carlsson et al. 2022, Collier et al. 2021), negative taste associations (e.g., Brunelle et al. 2017, Carlsson et al. 2022), and stigma toward vegetarians (e.g., Bogueva et al. 2020, Buttlar et al. 2023, Markowski & Roxburgh 2019). Resistance in the meat-reduction literature, in contrast to resistance to consuming more plant-based foods, focuses more on moral disengagement and motivated reasoning (e.g., Graça et al. 2014, Hagmann et al. 2019, Mertens & Oberhoff 2023, Pohlmann 2022), meat-centric ideologies that normalize meat (e.g., Mertens & Oberhoff 2023, Rothgerber 2014, Stanley et al. 2023), cultural and social environments (e.g., Buttlar et al. 2023, Culliford & Bradbury 2020, Dagevos & Voordouw 2013, Lacroix & Gifford 2019, Mackenzie & Shanahan 2018, Markowski & Roxburgh 2019), and backlash to meat curtailment policies (e.g., Michielsen & van der Horst 2022).

3.3. What Are Different Forms of Consumer Resistance to Eating Less Meat?

A very limited number of studies dive deeper into understanding the different forms of consumer resistance. The current overview suggests that resistance differs according to different phases of behavior change. For example, several studies indicate that consumers may first not be open to change, then become more acceptant to change, and finally change their behavior (Carlsson et al. 2022, Edenbrandt & Lagerkvist 2022). More specifically, individuals may initially resist altering their meat consumption habits to protect their self-image (Carlsson et al. 2022). Individuals perceive low social support to change, social pressure to eat meat (Camilleri et al. 2023, Kildal & Syse 2017), and familiarity with meat (e.g., Culliford & Bradbury 2020). At later stages, they may be hindered by other considerations such as habit and willpower that relate more to barriers to performing a specific behavior.

Consumer segments: groups of individuals sharing similar characteristics or behaviors, used for targeted marketing and product development strategies

Vegetarians: individuals who abstain from consuming meat, including red meat, poultry, and seafood, but may consume dairy products and eggs

Social environment: the surroundings, circumstances, and interactions involving individuals, groups, and communities, influencing behavior, attitudes, and development

3.4. What Explanatory Factors Are Associated with Consumer Resistance to Reducing Meat Consumption (e.g., Psychological, Socioeconomic, Societal)?

Demographics: statistical data relating to the population's characteristics, such as age, gender, income, education, and geographic location

Moral values: perceptions and principles guiding right and wrong behavior and shaping ethical conduct and decision-making

The relevant explanatory factors identified can roughly be placed into six categories. The first major category is demographics and characteristics. Many studies reveal that demographic factors such as age, gender, education level, and political orientation significantly influence resistance to meat consumption. In general, younger generations tend to be more open to reducing meat consumption (Arora et al. 2017, Edenbrandt & Lagerkvist 2022) and men show higher resistance (Edenbrandt & Lagerkvist 2022, Gutkowska et al. 2018, Hinrichs et al. 2022, Mertens & Oberhoff 2023, Stanley et al. 2023), which has been linked to the role of masculinity (Buttlar et al. 2023, Kildal & Syse 2017, Mertens & Oberhoff 2023, Stanley et al. 2023). Moreover, political orientation (Culliford & Bradbury 2020, Dagevos & Voordouw 2013, Grünhage & Reuter 2021, Michielsen & van der Horst 2022), living in larger cities (Espinosa & Nassar 2021), and educational backgrounds (Carlsson et al. 2022) have also been reported to play a role in shaping resistance behavior.

The second major category involves moral considerations. Many studies link resistance to some form of morality. Moral values are frequently mentioned as motivations to reduce meat consumption (e.g., Graça et al. 2014, Hagmann et al. 2019, Mertens & Oberhoff 2023, Pohlmann 2022). The literature refers to a range of possible triggers that activate moral values. For example, receiving more knowledge and information on animal welfare or sustainability aspects (Graça et al. 2014) and seeing or hearing about vegetarians (Bogueva et al. 2020, Rothgerber 2014), being confronted with different policy perspectives (Espinosa & Nassar 2021), or a scientific source authoritatively stating how to act (Espinosa & Treich 2021) have all been reported to activate moral values. Resistance forms one of the strategies to deal with activated moral values. This overview provides empirical verification that moral values may indeed activate an inner conflict surrounding meat consumption (Rothgerber 2014). Individuals use several strategies to resolve these inner conflicts (Barboza & Veludo-de-Oliveira 2023, Graça et al. 2014, Weingarten & Lagerkvist 2023), like motivated reasoning aimed at protecting one's image of oneself and one's society (Carlsson et al. 2022), strategies to justify behavior (Boenke et al. 2022, Carlsson et al. 2022, Dagevos & Voordouw 2013, Mertens & Oberhoff 2023, Pohlmann 2022), or moral disengagement to protect the self (Graça et al. 2014).

Morality may also play a role in that individuals experience moral superiority from others, which may also trigger resistance. This may be through exposure to vegetarians, appeals to stop eating meat, and information provision (Rothgerber 2014, Sprengholz et al. 2023, Weingarten & Lagerkvist 2023).

The third major category is the relevance of sustainability values. As the meat-related environmental impacts become more apparent, some consumers are increasingly concerned about the sustainability and ethical implications of their food choices (Apostolidis & McLeay 2019, Dagevos & Voordouw 2013, Graça et al. 2014, Koch et al. 2022, Mertens & Oberhoff 2023) to mitigate the harm on nature (Edenbrandt & Lagerkvist 2022, Götze & Brunner 2021). This is depicted by the number of studies that specifically address the meat paradox—which refers to the clash between the co-occurring love for meat and love for animals (Brunelle et al. 2017, Espinosa & Nassar 2021, Frank et al. 2022, Mackenzie & Shanahan 2018, Markowski & Roxburgh 2019)—food choice motives (Lacroix & Gifford 2019, Larsson & Vik 2023), and climate mitigation (Dagevos & Voordouw 2013, Edenbrandt & Lagerkvist 2022).

The fourth category embodies emotional responses. Emotional experiences, such as negative affect (Hinrichs et al. 2022), ambivalence (i.e., awareness of conflict about an object) that results in aversive feelings (Pechey et al. 2022), or disgust (Koch et al. 2022, Liu et al. 2023) triggered by taste, graphic warnings, or perceptions of cultured meat, can also influence resistance behaviors (Hinrichs et al. 2022, Koch et al. 2022, Liu et al. 2023).

The fifth category involves the social environment. Norms, both social and cultural, can either support or stigmatize meat-reduction behaviors, influencing perceived social support and familial resistance (Buttlar et al. 2023, Culliford & Bradbury 2020, Dagevos & Voordouw 2013, Lacroix & Gifford 2019, Mackenzie & Shanahan 2018, Markowski & Roxburgh 2019). For example, a lack of social acceptance for vegetarian males (Buttlar et al. 2023), the importance of changing norms over time (i.e., dynamic norms) (Boenke et al. 2022), stigmatization of vegetarians (Culliford & Bradbury 2020), low perceived social support (Dagevos & Voordouw 2013, Lacroix & Gifford 2019), and the importance of cultural and social values (Kildal & Syse 2017, Macdiarmid et al. 2016). These norms can act as a barrier, although also as a possible route for change by highlighting dynamic social norms to reduce meat consumption or emphasizing the need for support rather than the stigma for individuals considering dietary changes (Markowski & Roxburgh 2019). The social norm also sets a standard, and a wide range of studies are linked to perceiving meat as familiar and normal, resulting in more resistance regarding reducing meat consumption. The results indicate the relevance of habits (Camilleri et al. 2023, Dagevos & Voordouw 2013, Lacroix & Gifford 2019), familiarity with meat (Edenbrandt & Lagerkvist 2022), high levels of knowledge and experience necessary to adopt a vegetarian diet, and meat attachment (Lacroix & Gifford 2019) in shaping resistance.

The final category involves beliefs and preferences. A wide range of factors relate to overall beliefs that having a diet that includes a lot of meat is more positive than a diet with less or no meat. This is, for example, visible in individual beliefs regarding meat being more healthy (Camilleri et al. 2023, Lacroix & Gifford 2019), preferences for meat because it is perceived as being more tasty (Camilleri et al. 2023, Edenbrandt & Lagerkvist 2022, Hagmann et al. 2019, Lacroix & Gifford 2019), skepticism about the nutritional adequacy of a meat-free diet (Macdiarmid et al. 2016, Malek & Umberger 2021), inconvenience of preparing vegetarian meals (Dagevos & Voordouw 2013), and the belief that personally reducing meat consumption will not make a significant difference on a global scale (Edenbrandt & Lagerkvist 2022). The resistance seems deeply rooted and reflected in many arguments and beliefs (Götze & Brunner 2021).

Social norms: shared expectations within a community regarding appropriate behavior, values, beliefs, and attitudes, shaping social interactions and conformity

Beliefs: personal convictions encompassing preferences for taste, convenience, and values that influence decisions and behaviors

Meat lovers: individuals who have a strong preference for meat and consume it as a significant part of their diet

Flexitarians: individuals who primarily follow a vegetarian diet but occasionally consume meat or fish

3.5. What Groups in Society Can We Distinguish with Regard to Meat Eating, and How Does This Relate to Consumer Resistance? What are the Main Differences Between These Groups (e.g., Age, Education, Gender, Ethnicity, Other)?

There are quite a few papers that focus on the differences between meat eaters, meat reducers, and meat avoiders (Apostolidis & McLeay 2019, Dagevos & Voordouw 2013, Edenbrandt & Lagerkvist 2022, Lacroix & Gifford 2019, Verain & Dagevos 2022), and between omnivores and vegetarians (Buttlar et al. 2023, Grünhage & Reuter 2021, Malek & Umberger 2021). Most of these papers analyze what distinguishes the different groups in terms of socio-demographics, motivations, attitudes, and beliefs. The relevant demographics are age (Apostolidis & McLeay 2019, Carlsson et al. 2022, Culliford & Bradbury 2020, Dagevos & Voordouw 2013, Hielkema & Lund 2021, Knaapila et al. 2022, Liu et al. 2023, Malek et al. 2019), income (Apostolidis & McLeay 2019, Carlsson et al. 2022, Culliford & Bradbury 2020, Knaapila et al. 2022), and gender (Bogueva et al. 2020, Camilleri et al. 2023, Stanley et al. 2023). Another factor is living in urban areas (Apostolidis & McLeay 2019, Götze & Brunner 2021, Hielkema & Lund 2021), and there are a few papers that focus on specific subgroups, like students (Schenk et al. 2018), people working in the agricultural sector (Mackenzie & Shanahan 2018), and right-wing, nationalist groups (Michielsen & van der Horst 2022).

The papers that analyze the responses of different consumer groups, e.g., meat lovers, flexitarians, and vegetarians, do not have a core focus on resistance but can be informative in indicating

which consumer groups are more or less willing to change meat consumption (Carlsson et al. 2022, Culliford & Bradbury 2020, Edenbrandt & Lagerkvist 2022, Götze & Brunner 2021, Hagmann et al. 2019, Hielkema & Lund 2021, Liu et al. 2023, Malek et al. 2019, Schenk et al. 2018). The literature suggests that consumers who are not aware of the health and environmental impacts of (red) meat consumption (Carlsson et al. 2022, Culliford & Bradbury 2020, Edenbrandt & Lagerkvist 2022, Götze & Brunner 2021, Macdiarmid et al. 2016, Malek & Umberger 2021, Schenk et al. 2018), derive part of their identity from consuming meat (Bogueva et al. 2020, Camilleri et al. 2023, Hall et al. 2021, Stanley et al. 2023), and are habitual meat eaters, with no experience in trying meat substitutes (Apostolidis & McLeay 2019, Carlsson et al. 2022, Dagevos & Voordouw 2013, Edenbrandt & Lagerkvist 2022, Götze & Brunner 2021, Hielkema & Lund 2021, Lacroix & Gifford 2019, Verain & Dagevos 2022), are the least willing to change. In fact, all these studies show that unless people have strong health, environmental, or moral reasons not to consume meat, they find it difficult to reduce their meat consumption because of strong beliefs; they like the taste of it, find it normal to eat meat, are used to eating meat, and believe it is healthy (Apostolidis & McLeay 2019, Carlsson et al. 2022, Dagevos & Voordouw 2013, Edenbrandt & Lagerkvist 2022, Hagmann et al. 2019, Macdiarmid et al. 2016, Pauer et al. 2022).

This probably also explains why many people are ambivalent about eating meat (Buttlar et al. 2023, Camilleri et al. 2023, Malek & Umberger 2021, Pauer et al. 2022) and why conformity to one's social or political surroundings (Camilleri et al. 2023, Edenbrandt & Lagerkvist 2022, Hall et al. 2021, Lacroix & Gifford 2019, Mackenzie & Shanahan 2018, Malek et al. 2019, Michielsen & van der Horst 2022, Stanley et al. 2023) plays an important role in explaining resistance to change. In fact, political ideology and the idea that one should be free to choose what to consume and not be affected by one's gender or cultural identity (Camilleri et al. 2023, Hinrichs et al. 2022, Michielsen & van der Horst 2022) also seem to be important factors in understanding the resistance to reducing (red) meat consumption.

3.6. What Effective Interventions and Policy Instruments for Changing Food Consumption Behavior (Including Avoiding Resistance) Are Described in the Literature?

The most studied interventions focus on information, marketing, and awareness campaigns (Apostolidis & McLeay 2019, Arora et al. 2017, Bertolotti et al. 2020, Boenke et al. 2022, Götze & Brunner 2021, Hall et al. 2021, Hinrichs et al. 2022, Knaapila et al. 2022, Pauer et al. 2022, Pechey et al. 2022).

Regarding information, studies that focus on environmental and health awareness show that people who do not want to change tend to ignore information (Edenbrandt & Lagerkvist 2022, Gaspar et al. 2016, Weingarten & Lagerkvist 2023) and that when beliefs and preferences are strong, they are difficult to change (Brunelle et al. 2017, Malek & Umberger 2021, Yule & Cummings 2023). Because of this, information is not always effective: For example, information provision (Graça et al. 2014) and medical recommendations (Gutkowska et al. 2018) were not effective in supporting behavior change.

The studies considering communication and marketing strategies are unanimous in agreeing that targeting marketing and communication strategies to specific consumer groups is key. Several studies show that different groups of consumers are sensitive to different labels or messages (Apostolidis & McLeay 2019, Arora et al. 2017, Bertolotti et al. 2020, Götze & Brunner 2021, Hall et al. 2021, Pauer et al. 2022): Health-oriented consumers are sensitive to messages that stress health impacts, environmental-oriented consumers are sensitive to messages that underline the environmental effect, and culturally tailored messaging is more effective than messaging that does not consider the variety in social norms.

Regarding price, changing prices may reduce resistance, as lower prices for meat substitutes will entice people to try them, and with increased experience, resistance is reduced (Carlsson et al. 2022).

This overview suggests that to address resistance, some considerations should be taken into account. First, given that changing habits is a slow process, it is important to distinguish consumer groups in terms of stages of change (Dagevos & Voordouw 2013, Hielkema & Lund 2021). One paper suggests explicitly focusing interventions on middle groups (Knaapila et al. 2022), as frontrunners are already changing and those resistant to change are unlikely to respond. Second, it is important to be aware of how (social) messaging may backfire if the reasons why people are reluctant to change are not acknowledged up-front (Boenke et al. 2022, Hinrichs et al. 2022, Knaapila et al. 2022, Sprengholz et al. 2023, Weingarten & Lagerkvist 2023, Yule & Cummings 2023): Identity, freedom to choose, and perceived moral superiority are important sensitivities to be aware of. Third, in terms of policy acceptance, people want effective policies, but they do not want to be forced to change their behavior (Espinosa & Treich 2021, Pechey et al. 2022). Forcing choices results in more resistance (Lombardini & Lankoski 2013), whereas policies that are softer, like providing information or more holistic approaches are more accepted compared to policies that are harder, like taxes (Boenke et al. 2022, Gaspar et al. 2016, Lombardini & Lankoski 2013, Pechey et al. 2022). Conversely, resistance is not a stable phase. An experiment in school canteens in Finland suggests that resistance reduces over time and can even be avoided when faced up-front (Lombardini & Lankoski 2013).

3.7. Supplementary Results from an Artificial Intelligence Perspective

We used an AI-based approach, namely ChatPBL, to supplement our results (for details, see **Supplemental Appendix 1**). We used ChatPBL to reflect upon the same five research questions mentioned above. First, ChatPBL generated results, per question and per paper, for the given questions. Second, ChatPBL generated a synthesis per question, integrating the answers from all papers into one overview (all details are reported in **Supplemental Appendix 1**). The results reveal some overlap and some differences with the results we draw from the synthesis ourselves; we briefly discuss the findings per question below.

Supplemental Material >

Regarding the questions about the importance of resistance for behavior and whether there are different forms of resistance, ChatPBL focused on answering the second part of the question; the first part of the question (how important the role of resistance is) remains unanswered by ChatPBL. Furthermore, whereas we earlier saw a clear distinction in resistance to meat reduction versus resistance to adopting a plant-based diet, ChatPBL bundles these papers. ChatPBL did not provide an answer on different forms of resistance, although it identified five forms of drivers (this answer relates more to question 3: What are explanatory factors of resistance?): (*a*) cultural beliefs, psychological barriers, and campaign effectiveness; (*b*) societal opposition, ingrained habits, and perceptions of entitlement; (*c*) psychological reactance, desire for consistency, and perceptions of moral superiority; (*d*) health concerns, taste preferences, and habits; and (*e*) ethical concerns, environmental sustainability, and individual beliefs. Although ChatPBL mentions all drivers, they are grouped into different categories, and these categories are not always straightforward. For example, culture and beliefs are included with campaigns, and societal opposition and habits are included in one category, as are health concerns and (again) habits.

Regarding the question about the explanatory factors of resistance, ChatPBL provided three levels of drivers: psychological factors (e.g., emotional attachment, cognitive dissonance), socioeconomic factors (e.g., cost, availability, and societal influences), and societal factors (e.g., cultural norms, ethical considerations, and environmental concerns). It seems ChatPBL answered this

question by following the suggestion of categories mentioned in the question very strictly, which may have left other possible levels of drivers unexplored.

Regarding the question about how different groups of consumers associate with resistance, ChatPBL identified seven clusters: sociodemographic factors, attitudes and beliefs, behavioral patterns, cultural and social influences, psychological factors, policy and communication, and gender and masculinity. These clusters are relevant and similar to the identification variables we identified. Although there is a difference in groups versus identification variables, the results indicate similar relevant indicators to identify relevant groups in association with resistance.

Regarding the question about effective interventions for reducing or avoiding resistance, ChatPBL comes up with three clusters without labels that are difficult to clearly differentiate. In essence, all relevant interventions and instruments, including the relevant examples, are mentioned, although the differentiation in clusters does not provide a meaningful distinction. The first cluster seems more related to the food environment, such as nudging and menu-based interventions. The second cluster is more related to tailored approaches, including psychological barriers, demographics, and norms. The third cluster seems more associated with information and education, although it also mentions habits and social barriers.

4. DISCUSSION

Although there is substantial scientific evidence underscoring the benefits of meat reduction, a significant portion of the population exhibits resistance to adopting such dietary changes. This systematic review identified 51 relevant studies to develop an overview of consumer resistance and how this knowledge can be used to develop policies and interventions that support the protein transition. Below, we discuss our main findings.

4.1. Breaking Down Resistance: Differentiating Resistance to Reduction of Meat Consumption versus Resistance to Adoption of a Plant-Based Diet

Our literature review highlights that resistance is an under-researched topic. Although many studies hint at the relevance, and we were able to identify 51 studies that include resistance-related aspects, there were only a few studies that thoroughly researched the relevance of resistance for the protein transition. We observed that the literature on protein transition uses resistance from different perspectives (meat reduction versus acceptance of plant-based foods). The resistance observed in individuals to meat reduction appears to be strongly associated with protecting the self-image. The maintenance of a positive self-image aligned with moral beliefs and traditions (e.g., Graça et al. 2014, Hagmann et al. 2019, Mertens & Oberhoff 2023, Pohlmann 2022) and deeply ingrained individual and social values. Pressure to deviate from these beliefs and values seems to clash with the perceived identity (e.g., Buttlar et al. 2023, Lacroix & Gifford 2019, Mackenzie & Shanahan 2018, Markowski & Roxburgh 2019). Conversely, the resistance to the adoption of a plant-based diet appears to be primarily influenced by more practical barriers, like preferences, habits, taste expectations (e.g., Brunelle et al. 2017, Carlsson et al. 2022), and perceived inconvenience in meal preparation and sourcing of plant-based foods (e.g., Carlsson et al. 2022, Camilleri et al. 2023) as well as insufficient family support or social acceptance and stigma of plant-based choices within personal networks (e.g., Buttlar et al. 2023, Markowski & Roxburgh 2019).

These different perspectives on resistance are further underscored by the fact that there were few studies that suggest that different forms of resistance align with different phases of behavior change. Specifically, during the initial stages of behavior change, individuals may resist altering their meat consumption habits to safeguard their self-image or because they do not like meat

alternatives. In later stages, practical considerations pose significant hindrances, but exposure to plant-based meat substitutes can help reduce the barriers to resisting a more plant-based diet (Carlsson et al. 2022, Edenbrandt & Lagerkvist 2022). This nicely resonates with the stages of the behavioral change model (e.g., Bamberg 2013) and other related models like the transition literature (Prochaska & Norcross 2001), stating the relevance of fitting approaches to specific phases of behavior change. More research is needed to fully grasp these processes.

Emotions: complex psychological and physiological states that involve feelings, thoughts, and behavioral responses, often in response to stimuli or experiences

4.2. The Bright Sides of Resistance: Avoiding Versus Catalyzing Resistance to Change

Resistance slows down the protein transition directly because consumers resist changing their habits and indirectly because policymakers, marketers, and practitioners hold back in their transition efforts for fear of resistance and backlash. Although resistance is commonly perceived as a barrier to progress, it is important to critically examine whether resistance can also be seen as a starting point for meaningful exchange. Here, it is important to note that resistance is not a stable end-state and tends to decrease over time (Lombardini & Lankoski 2013). It is vital to find routes that catalyze emotions of resistance toward openness and adapted interventions. For example, it is interesting to explore whether avoiding resistance versus discussing the tensions, emotions, beliefs, and preferences is a valuable way to stimulate and facilitate behavioral change.

Our review reveals that resistance especially occurs when the freedom of choice is impaired (Espinosa & Treich 2021, Lombardini & Lankoski 2013, Pechey et al. 2022). This fits an underexplored aspect of prospect theory stating that individuals primarily react to changes in their situation rather than to absolute outcomes (Kahneman & Tversky 2013). Consequently, individuals are expected to exhibit more resistance to the change itself rather than to specific measures or the underlying rationale of the change. Although more research is needed, this would have important implications, indicating that up-front resistance may be higher than resistance in hindsight and that individuals get used to a new standard, resulting in a natural process in which resistance reduces over time, which is shown in a limited number of studies in the review.

4.3. Resistance Is More Prevalent Among Specific Consumer Groups: Meat Lovers with Strong Habits

The literature highlights that resistance is more prevalent among specific consumer groups. Based on the current overview, we can state that consumers who are most sensitive to forming resistance to meat-reducing initiatives are consumers who are not aware or not motivated in terms of health or the environment (e.g., Carlsson et al. 2022, Culliford & Bradbury 2020, Edenbrandt & Lagerkvist 2022), identify themselves as meat eaters (Bogueva et al. 2020, Camilleri et al. 2023, Hall et al. 2021, Stanley et al. 2023), are habitual meat eaters, with no experience in trying meat substitutes (Apostolidis & McLeay 2019, Carlsson et al. 2022), and consider eating meat as normal and part of their identity (Macdiarmid et al. 2016, Pauer et al. 2022). Our review also highlights that these characteristics are more prevalent among specific demographic groups (e.g., older men). The findings indicate the relevance of group-specific or personalized approaches. This is fully in line with the segmentation literature (Lacroix & Gifford 2019, Onwezen 2018), and the intervention literature stating the relevance of developing interventions that match the underlying motives of the specific target group (Michie et al. 2011). All in all, this indicates the relevance of adapting interventions to specific groups and their current drivers and behavior while taking the importance of traditions and motivations into account, as these might operate as key triggers for either openness and change or strong resistance.

4.4. Resistance Is Not Only an Individual Process but Also a Social and Societal Process

Our literature review demonstrates that resistance associates with a wide range of drivers, including personal, social, cultural, and societal factors. This highlights that addressing resistance requires more than a strategy oriented toward individuals alone. Resistance is a theme around which groups of people converge through shared ideologies (Michielsen & van der Horst 2022). The current social environment, cultural habits, and food landscape (e.g., Sievert et al. 2021) set an animal-based norm. Policies and regulations (Espinosa & Treich 2021, Kiesselbach & Pissarskoi 2021, Larsson & Vik 2023) that counter animal-based norms might therefore easily result in resistance, as individuals might feel they conflict with societally accepted norms. This is fully in line with recent studies indicating the relevance of interventions that consider not only individual-level factors but also societal- and system-level factors influencing behavioral change (Chater & Loewenstein 2023). Future research should approach resistance more as a social process that is influenced by our physical and social environment, thus allowing future interventions to find innovative ways to activate the protein transition.

4.5. A Policy Perspective: How to Deal With and Reduce or Avoid Resistance?

Our review also reveals that the number of studies that link resistance to policies is limited, and so more work is needed to address the current resistance to reducing meat consumption. The recommendations arising from our review are summarized in **Table 3**.

4.6. Adding an Artificial Intelligence Perspective to Systematic Literature Reviews

We used an AI perspective to supplement our systematic literature review, specifically ASReview for the selection of articles and ChatPBL for the analyses of articles. The approach had some important advantages but also some limitations. An important advantage is that using ASReview

Table 3 Overview of policy recommendations

Policy recommendations	Protein transition and examples
Target specific consumer groups with information and marketing campaigns	Differentiate between groups that differ in their phase of behavior change, such as meat lovers, flexitarians, and vegetarians. For example, specific communication campaigns
Unmotivated meat lovers are the group with the highest risk of resistance responses	Develop intervention strategies that fit readiness for change and have special attention for unmotivated meat lovers. For this group, interventions that focus on small steps and fit with their values and habits seem more appropriate.
Strong interventions that intervene with the freedom of choice have the highest risk of a resistance response	Soft interventions, such as placing plant-based as the default, communicating a positive story on plant-based, and promoting only plant-based, are less risky. Hard interventions like taxes or restricting choice on meat seem more risky in terms of resistance.
Acknowledge relevant factors that might induce resistance up-front	Identity, freedom of choice, and perceived moral superiority are important sensitivities to be aware of in terms of resistance. It is relevant to take these into account up-front in the development of communication, interventions, and policy.
Resistance is not a stable phase; resistance reduces over time	Resistance and perceptions of resistance seem overestimated up-front; consumers are more flexible and, in hindsight, more acceptant over time.

allowed us to widen our search. By extending our search from resistance to nonacceptance, a broader literature was included in our analysis. An advantage of using ChatPBL is the possibility to supplement the analyses of papers with a less subjective lens to answer the key research questions. In reviewing the selected papers on content, the use of ChatPBL showed some limitations as well. Initially, the AI results looked promising but after taking a deeper look at some of the findings, they proved difficult to interpret or seemed to simply repeat the research question. Reflecting on the added value of using AI tools in systematic literature reviews, we believe that at this moment, ASReview is a very useful supplementary tool. Including ASReview broadened the scope of our review and made it possible to include different literatures on the role of resistance (and nonacceptance) in the protein transition. In analyzing the selected papers, further development of ChatPBL seems necessary to improve both the process and results.

4.7. Limitations: Limited Research and Misjudging Resistance

Our study also had some limitations. The number of studies that focused on resistance as a key concept in their studies was limited. No structured comparison or meta-analysis was possible because of the limited number of studies, the different designs used, and the lack of studies that included resistance as a core measure. Given that most of the consulted studies reach their conclusions in a hypothetical, experimental setting, it is important to acknowledge that actual lessons for policymaking and marketing are limited. Finally, most studies focus on the willingness to reduce meat consumption, not on the resistance to change. Also, there is little work on the differences between socio-cultural and political–economic groups, and, except for research on the impact of masculinity, there is little research on the resistance to change meat consumption behavior between groups.

5. CONCLUSION

In conclusion, consumer resistance to reducing meat consumption is a complex and pervasive issue with far-reaching implications for the protein transition. By examining what is known about resistance, researchers and policymakers can develop evidence-based interventions to facilitate the transition to more plant-based diets. There tends to be an overestimation and an oversimplification of the role and importance of resistance in the policy domain. Resistance to adopting plant-based diets is frequently rooted in practical obstacles, whereas resistance to reducing meat consumption is intricately linked to moral values and strategies to protect self-identity. Importantly, our review reveals the catalytic opportunities of resistance by revealing that resistance reflects genuine consumer concerns and tends to decrease over time and is specifically linked to certain consumer groups. By broadening our understanding of resistance, we can identify underlying barriers and develop targeted interventions to overcome them: Thus, when behavior change "meats" resistance, this is not an endpoint but rather a starting point for the protein transition.

SUMMARY POINTS

1. The systematic review identified 51 relevant studies on consumer resistance, highlighting its under-researched nature.
2. Resistance to reducing meat consumption is a significant barrier despite substantial scientific support for the benefits of protein transition.
3. Resistance manifests itself differently: Reluctance to reduce meat consumption is tied to identity and moral beliefs, whereas resistance to plant-based diets relates to practical barriers like taste and convenience.

4. Understanding resistance stages can aid in tailoring interventions; initial resistance often centers on self-identity, whereas later stages focus on practical obstacles.
5. Resistance can impede both consumer behavior changes and policy efforts, yet it can also catalyze meaningful dialog and adaptation.
6. Certain consumer groups, such as dedicated meat lovers, show heightened resistance, which is influenced by habits, identity, and societal norms.
7. Addressing resistance requires strategies beyond individual behavior change that consider cultural, social, and contextual factors.
8. Integrating artificial intelligence into systematic reviews expands their scope but requires refinement; limitations include interpretive challenges.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

The review was conducted as part of a project, funded by the Dutch Ministry of Agriculture, Nature, and Food Quality (Project: Policy Perspectives for Sustainable Protein Consumption). The authors would also like to thank the AI experts Stefan Troost, Christoph Krüger, and Rens van der Schoot for their help with ASReview, the ChatPBL analysis, and their further contributions, support, and inspiring ideas.

LITERATURE CITED

Aiking H, de Boer J. 2020. The next protein transition. *Trends Food Sci. Technol.* 105:515–22

Anderson K, Rausser G, Swinnen J. 2013. Political economy of public policies: insights from distortions to agricultural and food markets. *J. Econ. Lit.* 51(2):423–77

Apostolidis C, McLeay F. 2019. To meat or not to meat? Comparing empowered meat consumers' and anti-consumers' preferences for sustainability labels. *Food Qual. Prefer.* 77:109–22

Arora AS, Bradford S, Arora A, Gavino R. 2017. Promoting vegetarianism through moralization and knowledge calibration. *J. Promot. Manag.* 23(6):889–912

Bamberg S. 2013. Changing environmentally harmful behaviors: a stage model of self-regulated behavioral change. *J. Environ. Psychol.* 34:151–59

Barboza RA, Veludo-de-Oliveira TM. 2023. Vive la haracteri animal! Using storytelling to explore prefigurative practices in consumer activism. *J. Mark. Manag.* 39(9–10):879–900

Bastian B. 2019. Changing ethically troublesome behavior: the causes, consequences, and solutions to motivated resistance. *Soc. Issues Policy Rev.* 13(1):63–92

Bertolotti M, Carfora V, Catellani P. 2020. Regulatory focus and the effect of nutritional messages on health and well-being: the case of red meat intake. *Appl. Psychol. Health Well-Being* 12(1):212–30

Boenke L, Panning M, Thurow A, Hörisch J, Loschelder DD. 2022. Who can nudge for sustainable development? How nudge source renders dynamic norms (in-)effective in eliciting sustainable behavior. *J. Clean. Prod.* 368:133246

Bogueva D, Marinova D, Gordon R. 2020. Who needs to solve the vegetarian men dilemma? *J. Hum. Behav. Soc. Environ.* 30(1):28–53

Bonnet C, Bouamra-Mechemache Z, Réquillart V, Treich N. 2020. Regulating meat consumption to improve health, the environment and animal welfare. *Food Policy* 97:101847

Brunelle T, Coat M, Viguié V. 2017. Demand-side mitigation options of the agricultural sector: potential, barriers and ways forward. *OCL* 24(1):D104

Buttlar B, Pauer S, Ruby MB, Chambon M, Jimenez-Klingberg A-K, et al. 2023. The meat ambivalence questionnaire: assessing domain-specific meat-related conflict in omnivores and vegans. *Collabra Psychol.* 9(1):73236

Camilleri L, Gill PR, Scarfo J, Jago A. 2023. Resolving the masculinity dilemma: identifying subtypes of male meat consumers with latent profile analysis. *Food Qual. Prefer.* 108:104890

Carlsson F, Kataria M, Lampi E. 2022. How much does it take? Willingness to switch to meat substitutes. *Ecol. Econ.* 193:107329

Carlsson-Kanyama A, González AD. 2009. Potential contributions of food consumption patterns to climate change. *Am. J. Clin. Nutr.* 89(5):1704S–9S

Chater N, Loewenstein G. 2023. The i-frame and the s-frame: how focusing on individual-level solutions has led behavioral public policy astray. *Behav. Brain Sci.* 46:e147

Collier ES, Oberrauter L-M, Normann A, Norman C, Svensson M, et al. 2021. Identifying barriers to decreasing meat consumption and increasing acceptance of meat substitutes among Swedish consumers. *Appetite* 167:105643

Culliford A, Bradbury J. 2020. A cross-sectional survey of the readiness of consumers to adopt an environmentally sustainable diet. *Nutr. J.* 19(1):138

Dagevos H, Voordouw J. 2013. Sustainability and meat consumption: Is reduction realistic? *Sustain. Sci. Pract. Policy* 9(2):60–69

De Groeve B, Bleys B, Hudders L. 2022. Ideological resistance to vegan advocacy: an identity-based motivational account. *Front. Psychol.* 13:996250

Edenbrandt AK, Lagerkvist C-J. 2022. Consumer perceptions and attitudes towards climate information on food. *J. Clean. Prod.* 370:133441

Espinosa R, Nassar A. 2021. The acceptability of food policies. *Nutrients* 13(5):1483

Espinosa R, Treich N. 2021. Moderate versus radical NGOs. *Am. J. Agric. Econ.* 103(4):1478–501

Festinger L. 1957. *A Theory of Cognitive Dissonance*, Vol. 2. Stanford: Stanford Univ. Press

Frank P, Heimann K, Kolbe V, Schuster C. 2022. Can guided introspection help avoid rationalization of meat consumption? Mixed-methods results of a pilot experimental study. *Clean. Responsible Consum.* 6:100070

Fransen ML, Smit EG, Verlegh PW. 2015. Strategies and motives for resistance to persuasion: an integrative framework. *Front. Psychol.* 6:146377

Ganivet E. 2020. Growth in human population and consumption both need to be addressed to reach an ecologically sustainable future. *Environ. Dev. Sustain.* 22(6):4979–98

Gaspar R, Luís S, Seibt B, Lima ML, Marcu A, et al. 2016. Consumers' avoidance of information on red meat risks: information exposure effects on attitudes and perceived knowledge. *J. Risk Res.* 19(4):533–49

Götze F, Brunner TA. 2021. A consumer segmentation study for meat and meat alternatives in Switzerland. *Foods* 10(6):1273

Graça J, Calheiros MM, Oliveira A. 2014. Moral disengagement in harmful but cherished food practices? An exploration into the case of meat. *J. Agric. Environ. Ethics* 27(5):749–65

Grünhage T, Reuter M. 2021. What makes diets political? Moral foundations and the left-wing-vegan connection. *Soc. Justice Res.* 34(1):18–52

Gutkowska K, Czarnecki J, Glabska D, Guzek D, Batóg A. 2018. Consumer perception of health properties and of other attributes of beef as determinants of consumption and purchase decisions. *Rocz. Państw. Zakł. Hig.* 69(4):413–19

Hagmann D, Siegrist M, Hartmann C. 2019. Meat avoidance: motives, alternative proteins and diet quality in a sample of Swiss consumers. *Public Health Nutr.* 22(13):2448–59

Hall ED, Ma M, Azimova D, Campbell N, Ellithorpe M, et al. 2021. The mediating role of family and cultural food beliefs on the relationship between family communication patterns and diet and health issues across racial/ethnic groups. *Health Commun.* 36(5):593–605

Hartmann C, Siegrist M. 2017. Consumer perception and behaviour regarding sustainable protein consumption: a systematic review. *Trends Food Sci. Technol.* 61:11–25

Heiskanen E, Laakso S. 2019. Editing out unsustainability from consumption: from information provision to nudging and social practice theory. In *A Research Agenda for Sustainable Consumption Governance*, ed. O Mont, pp. 156–71. Northampton, MA: Edward Elgar Publ.
Hielkema MH, Lund TB. 2021. Reducing meat consumption in meat-loving Denmark: exploring willingness, behavior, barriers and drivers. *Food Qual. Prefer.* 93:104257
Hinrichs K, Hoeks J, Campos L, Guedes D, Godinho C, et al. 2022. Why so defensive? Negative affect and gender differences in defensiveness toward plant-based diets. *Food Qual. Prefer.* 102:104662
Kahneman D, Tversky A. 2013. Prospect theory: an analysis of decision under risk. In *Handbook of the Fundamentals of Financial Decision Making: Part I*, ed. LC MacLean, WT Ziemba, pp. 99–127. Hackensack, NJ: World Sci. Publ.
Kiesselbach M, Pissarskoi E. 2021. Lowering the consumption of animal products without sacrificing consumer freedom—a pragmatic proposal. *Ethics Policy Environ.* 1:34–52
Kildal CL, Syse KL. 2017. Meat and masculinity in the Norwegian armed forces. *Appetite* 112:69–77
Knaapila A, Michel F, Jouppila K, Sontag-Strohm T, Piironen V. 2022. Millennials' consumption of and attitudes toward meat and plant-based meat alternatives by consumer segment in Finland. *Foods* 11(3):456
Koch JA, Bolderdijk JW, van Ittersum K. 2022. Can graphic warning labels reduce the consumption of meat? *Appetite* 168:105690
Lacroix K, Gifford R. 2019. Reducing meat consumption: identifying group-specific inhibitors using latent profile analysis. *Appetite* 138:233–41
Laestadius LI, Neff RA, Barry CL, Frattaroli S. 2014. "We don't tell people what to do": an examination of the factors influencing NGO decisions to campaign for reduced meat consumption in light of climate change. *Glob. Environ. Change* 29:32–40
Larsson J, Vik J. 2023. Meat or mitigation? That's the question: storylines in the Norwegian agricultural policy discourse on meat reduction. *J. Rural Stud.* 100:103016
Lattarulo P, Masucci V, Pazienza MG. 2019. Resistance to change: car use and routines. *Transp. Policy* 74:63–72
Liu J, Almeida JM, Rampado N, Panea B, Hocquette É, et al. 2023. Perception of cultured "meat" by Italian, Portuguese and Spanish consumers. *Front. Nutr.* 10:1043618
Lombardini C, Lankoski L. 2013. Forced choice restriction in promoting sustainable food consumption: intended and unintended effects of the mandatory vegetarian day in Helsinki schools. *J. Consum. Policy* 36:159–78
Macdiarmid JI, Douglas F, Campbell J. 2016. Eating like there's no tomorrow: public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. *Appetite* 96:487–93
Mackenzie M, Shanahan L. 2018. Attitudes to meatless meals: a comparison of the general public and those with links to the agricultural economy. *Nutr. Food Sci.* 48(6):858–72
Malek L, Umberger WJ. 2021. Distinguishing meat reducers from unrestricted omnivores, vegetarians and vegans: a comprehensive comparison of Australian consumers. *Food Qual. Prefer.* 88:104081
Malek L, Umberger W, Goddard E. 2019. Is anti-consumption driving meat consumption changes in Australia? *Br. Food J.* 121(1):123–38
Markowski KL, Roxburgh S. 2019. "If I became a vegan, my family and friends would hate me:" anticipating vegan stigma as a barrier to plant-based diets. *Appetite* 135:1–9
Mertens A, Oberhoff L. 2023. Meat-eating justification when gender identity is threatened—the association between meat and male masculinity. *Food Qual. Prefer.* 104:104731
Michie S, van Stralen MM, West R. 2011. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement. Sci.* 6:42
Michielsen YJ, van der Horst HM. 2022. Backlash against meat curtailment policies in online discourse: populism as a missing link. *Appetite* 171:105931
Mullainathan S, Thaler RH. 2000. *Behavioral economics*. NBER Work. Pap. 7948
Onwezen M. 2018. Including context in consumer segmentation: a literature overview shows the what, why, and how. *Methods Consum. Res.* 1:383–400
Onwezen M, Dwyer L, Verain M, Kremer F, van den Puttelaar, et al. 2024. *Pilot Protein monitor 2023: insight into the relationship between vegetable and animal proteins in supply and demand.* Rep., WUR, Wageningen. **https://edepot.wur.nl/653869**

Onwezen MC. 2023. Goal-framing theory for sustainable food behaviour: the added value of a moral goal frame across different contexts. *Food Qual. Prefer.* 105:104758

Onwezen MC, Bouwman EP, Reinders MJ, Dagevos H. 2021. A systematic review on consumer acceptance of alternative proteins: pulses, algae, insects, plant-based meat alternatives, and cultured meat. *Appetite* 159:105058

Onwezen MC, Dagevos H. 2023. A meta-review of consumer behaviour studies on meat reduction and alternative protein acceptance. *Food Qual. Prefer.* 114:105067

Onwezen MC, van der Weele CN. 2016. When indifference is ambivalence: strategic ignorance about meat consumption. *Food Qual. Prefer.* 52:96–105

Onwezen MC, Verain MCD, Dagevos H. 2022a. Positive emotions explain increased intention to consume five types of alternative proteins. *Food Qual. Prefer.* 96:104446

Onwezen MC, Verain MCD, Dagevos H. 2022b. Social norms support the protein transition: the relevance of social norms to explain increased acceptance of alternative protein burgers over 5 years. *Foods* 11(21):3413

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, et al. 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 372:n71

Parlasca MC, Qaim M. 2022. Meat consumption and sustainability. *Annu. Rev. Resour. Econ.* 14:17–41

Pauer S, Rutjens BT, Ruby MB, Perino G, van Harreveld F. 2022. Meating conflict: toward a model of ambivalence-motivated reduction of meat consumption. *Foods* 11(7):921

Pechey R, Reynolds JP, Cook B, Marteau TM, Jebb SA. 2022. Acceptability of policies to reduce consumption of red and processed meat: a population-based survey experiment. *J. Environ. Psychol.* 81:101817

Pohlmann A. 2022. The taste of compassion: influencing meat attitudes with interhuman and interspecies moral appeals. *Appetite* 168:105654

Prochaska JO, Norcross JC. 2001. Stages of change. *Psychother. Theory Res. Pract. Train.* 38(4):443–48

Rethlefsen ML, Kirtley S, Waffenschmidt S, Ayala AP, Moher D, et al. 2021. PRISMA-S: an extension to the PRISMA statement for reporting literature searches in systematic reviews. *Syst. Rev.* 10(1):39

Rothgerber H. 2014. Efforts to overcome vegetarian-induced dissonance among meat eaters. *Appetite* 79:32–41

Rothgerber H. 2020. Meat-related cognitive dissonance: a conceptual framework for understanding how meat eaters reduce negative arousal from eating animals. *Appetite* 146:104511

Rothgerber H, Rosenfeld DL. 2021. Meat-related cognitive dissonance: the social psychology of eating animals. *Soc. Pers. Psychol. Compass* 15(5):e12592

Rust NA, Ridding L, Ward C, Clark B, Kehoe L, et al. 2020. How to transition to reduced-meat diets that benefit people and the planet. *Sci. Total Environ.* 718:137208

Sanchez-Sabate R, Sabaté J. 2019. Consumer attitudes towards environmental concerns of meat consumption: a systematic review. *Int. J. Environ. Res. Public Health* 16(7):1220

Schenk P, Rössel J, Scholz M. 2018. Motivations and constraints of meat avoidance. *Sustainability* 10(11):3858

Sievert K, Lawrence M, Parker C, Baker P. 2021. Understanding the political challenge of red and processed meat reduction for healthy and sustainable food systems: a narrative review of the literature. *Int. J. Health Policy Manag.* 10(12):793–808

Sprengholz P, Tannert S, Betsch C. 2023. Explaining boomerang effects in persuasive health communication: how psychological reactance to healthy eating messages elevates attention to unhealthy food. *J. Health Commun.* 28(6):384–90

Stanley SK, Day C, Brown PM. 2023. Masculinity matters for meat consumption: an examination of self-rated gender typicality, meat consumption, and veganism in Australian men and women. *Sex Roles* 88(3–4):187–98

Stubbs RJ, Scott SE, Duarte C. 2018. Responding to food, environment and health challenges by changing meat consumption behaviours in consumers. *Nutr. Bull.* 43:125–34

Verain MCD, Dagevos H. 2022. Comparing meat abstainers with avid meat eaters and committed meat reducers. *Front. Nutr.* 9:1016858

Verain MCD, Dagevos H, Jaspers P. 2022. Flexitarianism in the Netherlands in the 2010 decade: shifts, consumer segments and motives. *Food Qual. Prefer.* 96:104445

Weingarten N, Lagerkvist C-J. 2023. Can images and textual information lead to meat avoidance? The mediating role of cognitive dissonance. *Food Qual. Prefer.* 104:104747

Wellesley L, Happer C, Froggatt A. 2015. *Changing climate, changing diets: pathways to lower meat consumption*. Rep., Chatham House, London. **https://eprints.gla.ac.uk/113170/1/113170.pdf**

Willett W, Rockström J, Loken B, Springmann M, Lang T, et al. 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* 393(10170):447–92

Yule JA, Cummings KH. 2023. Conservative consumer disinterest in plant-based meat: a problem of message incongruence. *Appetite* 187:106574