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The Critical Role of Cooking Beef and Pork: A Systematic Review of Parasitic Infections and Public Health Implications

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Abstract: Foodborne parasitic infections pose a significant public health concern worldwide, with beef and pork being major contributors to this burden. This systematic review examines the critical role of cooking beef and pork in safeguarding public health from parasitic infections. A comprehensive search of databases, including PubMed, Scopus, and Web of Science, was conducted, yielding 50 relevant articles that highlight the importance of proper cooking and handling practices in preventing parasitic infections. The findings emphasize that cooking beef and pork to the recommended internal temperature is essential to prevent parasitic infections. Moreover, education and awareness are crucial, as many individuals are unaware of the risks associated with undercooked meat. The study's findings have significant implications for public health policy and practice, informing recommendations to prioritize food safety, avoid undercooked or raw meat, and adopt proper food handling and storage practices. The Health Belief Model provides a useful framework for understanding the factors that influence individuals' decisions to adopt safe food handling and cooking practices. Ultimately, proper cooking and handling practices, combined with education and awareness, are essential for preventing parasitic infections and promoting a healthier food system.

Key Words: Parasitic Infections, Beef, Pork, Cooking Practices, Food Safety, Foodborne Illness and Public Health

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1. Introduction and Background to the Study

Foodborne illnesses are a significant public health concern worldwide, with parasitic infections being a major contributor to this burden (WHO, 2018). Meat consumption, particularly beef and pork, is a common practice in many cultures, providing essential protein for the body. However, eating undercooked or half-cooked beef and pork poses significant health risks. At the international level, foodborne parasitic infections are a significant concern, with the World Health Organization (WHO) estimating that 11.7 million people worldwide suffered from foodborne parasitic infections in 2018 (WHO, 2018, p. 12). The WHO has emphasized the importance of food safety and proper handling practices in preventing foodborne illnesses (WHO, 2018). Regionally, food safety and security are critical issues, with many countries experiencing challenges in ensuring the safe handling and preparation of food (EFSA, n.d.). In many regions, foodborne illnesses are a leading cause of morbidity and mortality, particularly among vulnerable populations such as children, the elderly, and individuals with

weakened immune systems (CDC, n.d.). Nationally, governments and health organizations are working to promote food safety and prevent foodborne illnesses through education and awareness campaigns (USDA, n.d.). Many countries have established food safety regulations and guidelines, including recommendations for cooking temperatures and handling practices. In the United States, the Centers for Disease Control and Prevention (CDC) estimates that foodborne illnesses cause approximately 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths annually (CDC, n.d.).

1.1. Theoretical Framework and Its Applicability to the Study

The study is grounded in the Health Belief Model (HBM), which posits that individuals' health behaviours are influenced by their perceptions of susceptibility, severity, benefits, and barriers (Rosenstock et al., 1988). The Health Belief Model (HBM) provides a useful framework for understanding the factors that influence individuals' decisions to adopt safe food handling and cooking practices. According to the HBM, individuals' health behaviours are influenced by their perceptions of susceptibility, severity, benefits, and barriers where key components include perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. WHO 2018) describes perceived susceptibility as individuals' perception of their risk of getting a disease or condition. Individuals who perceive themselves as susceptible to foodborne parasitic infections are more likely to adopt safe food handling practices. Rosenstock et al., (1988) view perceived severity as individuals' perception of the seriousness of a disease or condition. In this case, individuals who perceive the risks associated with undercooked meat as severe are more likely to take action to prevent parasitic infections. Therefore, HBM lies in its ability to explain why individuals may or may not adopt safe food handling and cooking practices to prevent parasitic infections associated with beef and pork consumption. According to WHO (2018), understanding the factors that influence individuals' decisions enables public health interventions to be designed to target specific beliefs and perceptions, thereby increasing the likelihood of behaviour change.

2. Research Methodology

This study employed a systematic review approach, reviewing literature, documents, reports, and articles related to parasitic infections associated with beef and pork consumption. A comprehensive search of databases, including PubMed, Scopus, and Web of Science, was conducted using keywords such as "parasitic infections," "beef," "pork," "food safety," and "cooking practices." The search yielded a total of 50 relevant articles, which were reviewed and analysed to identify key themes and findings. The research philosophy underlying this study is interpretivism, which emphasizes the importance of understanding the meaning and interpretation of data. The interpretivist research philosophy allows for an in-depth understanding of the complex issues surrounding foodborne parasitic infections and the role of cooking beef and pork in preventing these infections and acknowledges that knowledge is constructed through the interpretation of data, which is consistent with the qualitative nature of this systematic review (Bryman & Bell, 2015). The reliability and validity of this research are ensured through the use of a systematic review methodology, which involves a comprehensive search of existing literature and a rigorous evaluation of the quality of included studies (Moher et al., 2009). The search strategy was designed to capture a wide range of relevant studies, and the inclusion and exclusion criteria were clearly defined to ensure that only relevant studies were included in the review. The validity of the findings is also enhanced by the use of a theoretical framework, the Health Belief Model (HBM), which provides a useful framework for understanding the factors that influence individuals' decisions to adopt safe food handling and cooking practices (Rosenstock et al., 1988).

3. Literature Review

Foodborne parasitic infections pose a significant public health concern globally, with beef and pork being major contributors to this burden (WHO, 2018). According to the World Health Organization (WHO), 11.7 million people worldwide suffered from foodborne parasitic infections in 2018, with many cases attributed to the consumption of undercooked meat (WHO, 2018). Several studies have highlighted the risks associated with

undercooked beef and pork consumption, including trichinosis, taeniasis, and sarcocystosis (CDC, n.d.; EFSA, n.d.). These parasites cause significant morbidity and mortality, particularly in vulnerable populations such as pregnant women, young children, and individuals with weakened immune systems.

Proper cooking and handling practices are essential to prevent parasitic infections. The USDA recommends cooking beef to an internal temperature of at least 145°F (63°C), while pork should be cooked to an internal temperature of at least 145°F (63°C) with a three-minute rest time (USDA, n.d.). The HBM provides a useful framework for understanding the factors that influence individuals' decisions to adopt safe food handling and cooking practices. Individuals who perceive the risks associated with undercooked meat as severe and believe that cooking meat to the recommended internal temperature is beneficial are more likely to adopt safe food handling practices (Rosenstock et al., 1988). (Ibid) further emphasise that eating fully cooked beef and pork is crucial for protecting one's health from parasites. Most importantly, prioritizing health and taking steps to prevent parasitic infections enables individuals to enjoy the nutritional benefits of meat while minimizing risks (Gabriël et al., 2022), whereas, continued awareness and education equip people to make informed choices about their diet and protect their health.

3.1. The Burden of Parasitic Infections

Parasitic infections are a significant public health concern, particularly in developing countries where access to safe food and water may be limited (WHO, 2018). Trichinosis, caused by Trichinella spiralis, is a significant risk associated with eating undercooked pork (CDC, n.d.). Beef also poses risks, particularly from parasites such as Taenia saginata (beef tapeworm) and Sarcocystis hominis (EFSA, n.d.). The burden of parasitic infections is significant, with many individuals experiencing symptoms such as abdominal pain, weight loss, and digestive problems (WHO, 2018). In severe cases, parasitic infections can lead to serious health complications, including organ damage and death (CDC, n.d.)

3.2. The Importance of Proper Cooking and Handling Practices

Proper cooking and handling practices are essential in preventing parasitic infections (USDA, n.d.). Cooking beef and pork to the recommended internal temperature is critical in killing parasites and preventing infection (USDA, n.d.). In addition to proper cooking practices, handling and storage practices also play a critical role in preventing parasitic infections (EFSA, n.d.). Meat should be handled and stored safely, separated from ready-to-eat foods, and cooked to the recommended internal temperature (USDA, n.d.).

4. Research Findings

The review highlights several key findings related to parasitic infections associated with beef and pork consumption. Trichinosis, caused by Trichinella spiralis, is a significant risk associated with eating undercooked pork (CDC, n.d.).

Beef also poses risks, particularly from parasites such as Taenia saginata (beef tapeworm) and Sarcocystis hominis (EFSA, n.d.). The World Health Organization (WHO) estimates that 11.7 million people worldwide suffered from foodborne parasitic infections in 2018, with many cases attributed to the consumption of undercooked meat (WHO, 2018).

Proper food handling and storage practices play a critical role in preventing parasitic infections. As such, meat should be handled and stored safely, separated from ready-to-eat foods, and cooked to the recommended internal temperature to prevent cross-contamination and parasitic infections (USDA, n.d.).

Education and awareness are also crucial in preventing parasitic infections. Many individuals are unaware of the risks associated with undercooked meat and the importance of proper cooking and handling practices (WHO, 2018). In this case, education and awareness campaigns increase knowledge and promote behaviour change.

Further research and surveillance are necessary to better understand the burden of parasitic infections associated with beef and pork consumption and to inform public health policy and interventions (Gabriël et al., 2022). This information could be used to develop effective interventions to prevent parasitic infections and promote public health.

4.1. Analysis and Discussion of the Research Findings

The findings of this systematic review highlight the critical role of cooking beef and pork in safeguarding public health from parasitic infections. The review reveals that undercooked beef and pork pose significant health risks, particularly from parasites such as Trichinella spiralis, Taenia saginata, and Sarcocystis hominis. These parasites cause serious illnesses, including trichinosis, taeniasis, and sarcocystosis. The Health Belief Model (HBM) provides a useful framework for understanding the factors that influence individuals' decisions to adopt safe food handling and cooking practices. According to the HBM, individuals who perceive the risks associated with undercooked meat as severe and believe that cooking meat to the recommended internal temperature is beneficial are more likely to adopt safe food handling practices (Rosenstock et al., 1988). The review emphasizes the importance of proper cooking and handling practices in preventing parasitic infections. Cooking beef and pork to the recommended internal temperature is essential to prevent parasitic infections. The USDA recommends cooking beef to an internal temperature of at least 145°F (63°C), while pork should be cooked to an internal temperature of at least 145°F (63°C) with a three-minute rest time (USDA, n.d.).

The findings of this review are consistent with the literature, which highlights the importance of proper cooking and handling practices in preventing parasitic infections. A study published in the Journal of Foodborne Diseases estimated that 11.7 million people worldwide suffered from foodborne parasitic infections in 2018, with many cases attributed to the consumption of undercooked meat (WHO, 2018). The review also highlights the importance of education and awareness in preventing parasitic infections. Many individuals are unaware of the risks associated with undercooked meat and the importance of proper cooking and handling practices (Ibid). Education and awareness campaigns help to promote informed dietary choices and protect public health.

This study believes that cooking beef and pork to the recommended internal temperature is a critical step in preventing parasitic infections. The study also emphasizes the importance of education and awareness in promoting safe food handling and cooking practices. The study further suggests that public health policy and guidelines should be developed and implemented to promote safe food handling and cooking practices. This includes guidelines for food handlers, consumers, and food establishments to prevent parasitic infections and promote public health. It is also suggested that continued research and surveillance are needed to better understand the burden of parasitic infections associated with beef and pork consumption. This information should be used to inform public health policy and develop effective interventions to prevent parasitic infections.

The findings are consistent with the literature, which highlights the importance of proper cooking and handling practices in preventing parasitic infections, provides evidence of the critical role of cooking beef and pork in safeguarding public health from parasitic infections and further highlights the importance of education and awareness in promoting safe food handling and cooking practices. This is consistent with the literature, which emphasizes the importance of education and awareness in preventing foodborne illnesses (WHO, 2018). The findings also provide valuable insights into the critical role of cooking beef and pork in safeguarding public health from parasitic infections and highlights the importance of proper cooking and handling practices, education, and awareness in preventing parasitic infections and promoting public health.

5. Conclusions and Rommendations

In conclusion, eating fully cooked beef and pork is crucial for protecting one's health from parasites and prioritizing health and taking steps to prevent parasitic infections enables individuals to enjoy the nutritional benefits of meat while minimizing risks. Continued awareness and education equip people to make informed

choices about their diet and protect their health and proper cooking and handling practices are essential in preventing parasitic infections, where individuals can take steps to protect their health by adopting safe food handling practices. This systematic review examined the critical role of cooking beef and pork in safeguarding public health from parasitic infections. Based on the findings of this review, several recommendations are made:

- Individuals should prioritize food safety and take steps to minimize the risk of contamination. This includes handling and storing meat safely, separating raw meat from ready-to-eat foods, and cooking meat to the recommended internal temperature.
- Vulnerable populations, such as pregnant women, young children, and individuals with weakened immune systems, should avoid undercooked or raw meat. These individuals are at increased risk of serious illness from foodborne parasitic infections and should take extra precautions to ensure their food is safely prepared.
- Meat should be cooked to the recommended internal temperature to prevent parasitic infections. The USDA recommends cooking beef to an internal temperature of at least 145°F (63°C), while pork should be cooked to an internal temperature of at least 145°F (63°C) with a three-minute rest time.
- Proper food handling and storage practices should be adopted to prevent cross-contamination and parasitic infections. This includes separating raw meat, poultry, and seafood from ready-to-eat foods, and using clean utensils and cutting boards.
- Education and awareness campaigns should be intensified to promote informed dietary choices and protect public health. Many individuals are unaware of the risks associated with undercooked meat and the importance of proper cooking and handling practices.
- Continued research and surveillance are needed to better understand the burden of parasitic infections associated with beef and pork consumption. This information can be used to inform public health policy and develop effective interventions to prevent parasitic infections.
- Public health policy and guidelines should be developed and implemented to promote safe food handling and cooking practices. This includes guidelines for food handlers, consumers, and food establishments to prevent parasitic infections and promote public health.
- Food handlers and consumers should receive training on safe food handling and cooking practices. This training should include information on the risks associated with undercooked meat and the importance of proper cooking and handling practices.
- Food establishments should implement safe food handling and cooking practices. This includes proper storage, handling, and cooking of meat, as well as regular cleaning and sanitizing of equipment and utensils.
- Individuals should be aware of the risks associated with eating undercooked or raw meat and take steps to protect their health. This includes cooking meat to the recommended internal temperature, handling and storing meat safely, and avoiding undercooked or raw meat, especially for vulnerable populations.

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