2019 Reciprocal Meat Conference – Consumer Topics

Meat and Muscle Biology™

Functional Neuroimaging Reveals Neural Processes Underlying Food Technology Attitudes and Risk Perception

E. S. Beyer[1]*, M. LaCour[2], M. F. Miller[1], T. H. Davis[2], and J. L. Finck[3]

[1]Animal and Food Sciences, Texas Tech University, Lubbock, TX, USA
[2]Psychological Sciences, Texas Tech University, Lubbock, TX, USA
3Research and Development, Merck Animal Health, Madison, WI, USA
*Corresponding author. Email: erin.beyer@ttu.edu (E. S. Beyer)

Keywords: attitudes, fMRI, food technology, human subjects, prefrontal cortex
Meat and Muscle Biology 3(2):19

Objectives

Advances in food technology provide numerous benefits including improvements in sustainability, quality, and food security. However, consumers often perceive such technologies as risky, even when extensively vetted for safety. Neuroimaging has the potential to reveal how the consumer brain processes information about technologies and how this processing relates to their attitudes and risk perception. The current study used functional magnetic resonance imaging (fMRI) to examine how brain activation during processing of infographics about food technologies related to subsequent ratings of risk and attitudes. Based on neuroeconomic research, we hypothesized that the ventromedial prefrontal cortex (vmPFC) would track positive attitudes for the technologies due to its role in computing subjective value and positive affect. In contrast, we predicted that the lateral PFC would track perceptions of risk associated with the technologies due to its role in processing conflict and uncertainty.

Materials and Methods

Participants (n = 53; 31 Female; Age 18- 43) completed a neuroimaging study at Texas Tech Neuroimaging Institute. Participants were scanned while viewing 6 different food technology infographics in 30s blocks: hormone implants, antibiotics, vaccines, GMOs, animal welfare technology, and sustainability technologies. Between viewing blocks, participants answered attitudes and risk perception questions for each technology. The scans were analyzed using a mixed effect implemented in FSL's FEAT software and corrected for multiple comparisons ($p < 0.05$) using cluster-based thresholding with a primary threshold of z = 3.1 ($p < 0.001$).

Results

Participants had lower attitudes and higher risk perception for antibiotics and hormones relative to GMOs and vaccines (risk perception: $t(52) = 5.07$, $p < 0.001$; attitudes: $t(52) = 8.35$, $p < 0.001$) and animal welfare and sustainability technologies (risk perception: $t(52) = 6.60$, $p < 0.001$; attitudes: $t(52) = 7.65$, $p < 0.001$). Consistent with our predictions, a cluster in lateral PFC (1496 voxels, $p < 0.001$) was positively associated with between-infographic differences in risk perception (and negatively associated with attitudes) such that it was most highly activated for the hormones and antibiotics and less so for the lower perceived risk technologies. Additionally, we observed a cluster in vmPFC (648 voxels, $p < 0.001$) that was positively associated with attitudes and thus was most highly activated for the lower perceived risk and higher attitude technologies. Several additional areas were associated with risk and attitudes including lateral parietal cortex, precuneus, occipital, and middle temporal gyrus ($p < 0.05$).

Conclusion

Our results present a critical step forward in understanding how consumers process information about food technologies. We found areas of the vmPFC tracked positive attitudes and lateral PFC tracked perceptions of risk and lower attitudes. These findings are important because they suggest that PFC regions may contribute to how consumers process information about food technologies, which can affect how they retain and use information to update their beliefs. Future research should examine whether fMRI may be useful prospectively for predicting consumer responses to information campaigns about food technologies.