Dr Jennifer Norton Bsc, PhD, AFHEA

Research Fellow II

School of Chemical Engineering (/schools/chemical-engineering/index.aspx)

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About

Jennifer Norton has been a Research Fellow within the School of Chemical Engineering since January 2011, and in December 2014 was promoted to Research Fellow II. She conducts research in the area of food microstructural engineering, including edible Pickering stabilised emulsions. She has multidisciplinary experience having a background in psychology, food engineering and sensory science. Her primary research interests are in emulsion design and food microstructure, and understanding the relationship between food microstructure, sensory perception and appetite.

Qualifications

- PhD in Chemical Engineering, University of Birmingham, 2012
- Post Graduate Certificate in Sensory Science (Pass with Merit), University of Nottingham, 2010
- BSc (2:1, Hons.) in Psychology, Bangor University, 2007

Biography

Jennifer Norton graduated with a BSc (2:1, Hons.) in Psychology from the University of Bangor in 2007. She went on to study for a PhD within the School of Chemical Engineering at the University of Birmingham, graduating in 2012. Her multidisciplinary project, entitled “Fat reduction in chocolate: a multidisciplinary approach considering emulsion science and consumer expectations”, was supervised by Prof. Peter Fryer from University of Birmingham and Dr John Parkinson from Bangor University. She considered both emulsion science and the possible ways of reducing fat within chocolate (including running scale-up pilot plant trials with an industrial partner), and the consumer perception towards fat reduction in chocolate. Her work resulted in a patent, and the funding of a subsequent research project. She also won the IChemE Award for innovation and excellence 2010, Food and Drink Processing.

Whilst completing her PhD Jennifer also completed the PGCert in Sensory Science at the University of Nottingham; her research project was supervised by Dr Joanne Hort.

Following her PhD her role has been as an industrially funded Research Fellow within the same school. Her current Research Fellow position is on an industrially-led TSB funded project, which focuses on the design and production of edible Pickering particles for stabilisation of novel double emulsions. She conducts research in this area, and is responsible for managing the interaction and disseminating research findings to the industrial partner. From December 2014 she has more widely coordinated the research activity of the Microstructure Group.

Her research interests led her to design and facilitate the installation of a food grade kitchen with sensory booths within the school that she now manages. She supervises two PhD students who work at the interface between food processing, microstructure, sensory perception and appetite. She has also designed a research-led module (Food Structure and the Consumer; an M Level 10 credit module offered to 4th year MEng, EngD and MSc students) for which she is module coordinator, which focuses on the effect of food structure on appetite and sensory perception.

Teaching

Jennifer teaches in a number of undergraduate and postgraduate programmes, including:

- Food Structure and the Consumer (Module Coordinator)
- Food Microstructure and Flavour
- Process and Project Management

Jennifer has also completed the Foundation of Learning and Teaching in Higher Education (the first module of the Postgraduate Certificate in Academic Practice Program), and was awarded HEA Associate Fellow Status.

Postgraduate supervision

Jennifer co-supervises a number of postgraduate students within the Microstructure Group within the School of Chemical Engineering.

Research

Research themes

- Formulation and processing of novel emulsions – edible particle stabilised (Pickering) emulsions; crystallisation in emulsions;
- Food structure and sensory perception relationships – food microstructure effects on sensory properties (textural/mouthfeel and flavour related), and the relationship between instrumental measures (e.g. tribology) and oral processing;
- Food structure effects on appetite - the effect of food microstructure on satiation and satiety;
- Formulation engineering for functionality in the GI Tract - acid gelation of hydrocolloids in the stomach for positive effects on appetite and macronutrient delivery (e.g.

glucose).

Research activity

In collaboration with with Dr Tom Mills (Chemical Engineering, UoB) Dr Gareth Wallis (Sport, Exercise and Rehabilitation Sciences, UoB), Professor Penny Gowland, Dr Luca Marciani, Dr Caroline Hoad, Professor Robin Spiller (all University of Nottingham) Jennifer has been investigating the self-structuring (i.e. gelation of hydrocolloids within the acidic environment of the stomach) of foods for controlled nutrient delivery with the aim of improving metabolic control and satiety. She was the PI on an EPSRC Portfolio Activities 2011-2012 pump-priming fund for Bridging The Gap projects to support interdisciplinary translational research in food manufacturing. Jennifer was also a CoI on a Birmingham-Nottingham (Universities) Strategic Collaboration Fund to develop MRI methods for gastro-intestinal tract imaging.

In addition, Jennifer has been collaborating with Prof Martin Yeomans from the University of Sussex, and Prof Jason Halford from the University of Liverpool on projects investigating the effect of food structure on appetite; she co-supervises two PhD students in this area of research.

Jennifer has also collaborated with Laura Lee (University of Birmingham), Ian Fisk and Nicole Yang (both University of Nottingham) to investigate flavour release from emulsions.

Other activities

Jennifer has presented at a number of conferences, including Food Structure and Functionality (Poster Session Judge; Winner of Best Oral Presentation, 2013), The International Symposium on Food Rheology and Structure (ISFRS), Food Oral Processing, EuroSense (European Conference on Sensory and Consumer Research) and British Feeding and Drinking Group (BFDG) Conference (Poster Session Judge 2012).

Jennifer is on the organising committee for the **2nd UK Hydrocolloids Symposium (/schools/chemical-engineering/news/events/hydrocolloids-symposium.aspx)** .

Jennifer is an editor and chapter author of the book Formulation Engineering of Foods (2013), Wiley-Blackwell.

Jennifer has peer-reviewed papers for Food & Function, Soft Matter, Journal of the Science of Food and Agriculture and Appetite.

Jennifer has been media trained, has been involved in a number of public engagement activities, including National Women in Engineering Day (Invited Publication; 2014), Edinburgh International Science Festival (Invited Speaker; 2014), 'Brum Dine With Me' (Principle Coordinator; 2012).

Publications

Books Edited

1. Formulation Engineering of Foods. (2013) Ed. Norton, J.E., Fryer, P.J. & Norton, I.T., Wiley-Blackwell. 328 pages (ISBN: 978-0-470-67290-7)

Joint Articles Published

1. Rizzo, G., **Norton, J.E.**, & Norton, I.T. (2015). Emulsifier effects on fat crystallisation, Food Structure, *accepted*.
2. **Norton, J.E.**, Wallis, G.A., Spyropoulos, F., Lillford, P.J. & Norton, I.T. (2014). Designing Food Structures for Nutrition and Health Benefits, Annu. Rev. Food Sci. Technol., 5, 177-195.
3. **Norton, J.E.** (2013). Design of food structures for consumer acceptability, in Formulation Engineering of Foods, in Norton, J.E., Fryer, P.J. and Norton, I.T., Wiley-Blackwell.
4. Beri, A., **Norton, J.E.** & Norton, I.T. (2013). Effect of emulsifier type and concentration, aqueous phase volume and wax ratio on physical, material and mechanical properties of water in oil lipsticks, Int. J. Cosmet Sci., 35(6): 613-21.
5. Cooper, C., **Norton, J.E.**, Marshman, C. & Norton, I.T. (2013). The acoustics of friction and microstructure of model and apparel fabrics, Textile Res. J., DOI: 10.1177/0040517513495948
6. di Bari, V., **Norton, J.E.** & Norton, I.T. (2014). Effect of processing on the microstructural properties of water-in-cocoa butter emulsions, J. Food Eng., 122: 8-14.
7. **Norton, J.E.**, Fryer, P.J. & Parkinson, J. (2013). The effect of reduced-fat labeling on chocolate expectations. Food Qual. Prefer., 28(1): 101-105.
8. **Norton, J.E.** & Fryer, P.J. (2012). Investigation of changes in formulation and processing parameters on the physical properties of cocoa butter emulsions, J. Food Eng., 113: 329-336.
9. **Norton, J.E**., Norton, I.T. (2010). Designer Colloids – Towards healthy everyday foods? Soft Matter, 6 (16): 3735-3742.
10. **Norton, J.E**., Fryer, P.J., Parkinson, J. & Cox, P.W. (2009). Development and characterization of tempered cocoa butter emulsions containing up to 60% water. J. Food Eng., 95 (1): 172-178.

Review Articles

1. **Norton, J.E.**, Gonzalez Espinosa, Y., Watson, R., Spyropoulos, F & Norton, I.T. (2015). Functional food microstructures for macronutrient release and delivery, Food & Function, *accepted.*
2. Douaire, M., di Bari, V., **Norton, J.E.**, Sullo, A., Lillford, P. and Norton, I.T. (2014). Fat crystallisation at oil-water interfaces. Adv. Colloid Interface Sci., 203, 1-10.

Articles and book chapters submitted or in preparation

1. Lett, A.M., **Norton, J.E.**, Yeomans, M.R. & Norton, I.T. Influence of oil droplet size on the rheological and tribological properties of oil-in-water emulsion systems in relation to sensory perception, Food Structure, *submitted*.
2. Lett, A.M., **Norton, J.E.**, Norton, I.T. & Yeomans, M.R. Enhancing expected food intake behaviour, hedonics and sensory qualities of oil-in-water emulsion systems through microstructural properties: oil droplet size and flavour, *in preparation*.
3. Lett, A.M., Yeomans, M.R., Norton, I.T. & **Norton, J.E.**, Iso-viscous and Iso-friction oil-in-water emulsions: The contribution of viscosity and friction in sensory perception, *in preparation*.
4. Yang, N., Lee, L., **Norton, J.E.** & Fisk, I. Flavour release from nanoemulsions through static headspace analysis and in-vivo analysis: impact of aroma compound physiochemical properties, oil fractions and droplet sizes, *in preparation*.
5. Duffus, L. **Norton, J.E.**, Smith, P., Norton, I.T. & Spyropoulos, F. A comparative study of the suitability of a range of food-grade particles for use in Pickering emulsions, *in preparation*.
6. **Norton, J.E.**, Duffus, L., Zafeiri, I., Smith, P., Norton, I.T., Mills, T.B. & Spyropoulos, F. Tribological and rheological behabviour of edible Pickering stabilised oil-in-water emulsions, *in preparation*.

List of Patents

1. Inventor on two patents: Norton, I.T. & **Norton, J.E.**, (2012). **Low Fat Bakery Product (http://www.google.com/patents/US20130052323)** . US Patent App. 13/660,241
2. Cox, P.W., Le Reverend, B.J.D., Norton, I.T. & **Norton, J.E.** (2010). **Low fat chocolate (http://www.google.com/patents/US20120177801)** . US Patent App. 13/261,084;

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