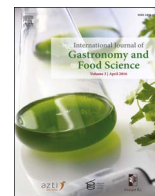




Contents lists available at ScienceDirect

International Journal of Gastronomy and Food Science

journal homepage: www.elsevier.com/locate/ijgfs

Review article

Breakfast: The most important meal of the day?

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ARTICLE INFO

Keywords:

Breakfast
Time of day
Alertness
Performance
Health
Chronogastronomy

ABSTRACT

Stating the obvious, we typically eat different foods at different times of day. But why should that be so? While much of this variation is likely down to cultural factors, the dietitians also have plenty to say on the matter of *what* we should be eating and drinking *when*, in order, for instance, to lose weight, or else to help enhance our cognitive performance during the course of the day. In recent years, many of the larger food companies have become increasingly interested in trying either to break into the profitable, not to mention growing, market for breakfast foods, or else to figure out how to convince more consumers to eat 'breakfast foods' at other times of day. In this review, I want to take a closer look at the psychological science behind the first meal of the day, highlighting why it may be even more important than most people think – both to the consumer but also the food industry more generally. Finally, I summarize a number of the current trends in the kinds of breakfast items that are becoming more/less popular, and consider what may be driving them.

Introduction

Breakfast is often described as the most important meal of the day, providing as it does sustenance and energy (i.e., calories) for whatever activities lay ahead. As nutritionist Adelle Davis famously put it back in the 1960s: “Eat breakfast like a king, lunch like a prince and dinner like a pauper.” (Sifferlin, 2013).¹ According to the latest evidence, we should all be aiming to consume around 15–25% of our daily energy intake at breakfast (i.e., 300–500 calories for women and 375–625 for men; Spencer, 2017; though see also Betts et al., 2014). And yet the evidence from largescale surveys suggests that somewhere in the region of 18–25% of adults (Haines et al., 1996; Kant and Graubard, 2006; Spencer, 2017), and as many as 36% of adolescents in North America skip this putatively ‘most important’ meal (Seiga-Riz et al., 1998).²

There is, undoubtedly much cultural variation in the kinds of foods that different people like to eat at different times of day, as anyone who has stumbled across the sticky, slimy fermented soy bean dish known as *natto* at the breakfast buffet in Japan will know only too well. How could anyone contemplate eating *that* first thing in the morning? In fact, it would seem likely that there are more pronounced differences in

how appropriate we find it to eat different foods at *this* time of day, as compared to at others, such as, for lunch or dinner, say. Despite these cultural differences, there is nevertheless a good deal of consistency within (and, on occasion, between) different cultures in terms of the kinds of items they choose to consume at the start of the day, not to mention growing interest in this meal (Cloake et al., 2017).

There have, of course, also been significant changes over the course of history. What we in the West eat for breakfast today is certainly very different from what previous generations would have thought it appropriate to eat. For instance, the notion that breakfast cereals constitute standard fare is something that has only been common practice since the closing years of the 19th Century / early 20th Century (see Gitlin and Ellis, 2012; Severson, 2016a, for a history of breakfast cereals). As we will see later, though, the last few years have seen a dramatic drop in sales of both breakfast cereals and orange juice, both of which would have been stalwarts of the breakfast table only a few decades ago.

A large and growing body of scientific evidence now supports the claim that breakfast really is a very important meal. The first thing to take note of here is how the failure to eat something at the start of the

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¹ According to press reports, the astronauts on NASA's planned long distance Orion mission around the far side of the moon are going to be given a calorie-dense food bar for breakfast. Each bar containing somewhere in the region of 700–800 calories. The flavours that are currently on offer include banana nut, orange cranberry, ginger vanilla, and barbecue nut (see Mathewson, 2016). These breakfast bars have been especially designed to deliver the fuel that the astronauts will need at the start of their day, while at the same time minimizing the space/mass required to deliver all the nutrition that will be needed in the small spacecraft for the duration of the astronauts' journey.

² Though, the situation may have changed over the last 15 years if the results of surveys conducted by the NPD group are to be believed (see Chamlee, 2016). According to these surveys, the average number of breakfast meals eaten by North Americans in 2015 was 361 – that is almost every day!

day can have surprisingly serious health consequences for those concerned. For instance, Cahill et al. (2013) documented a 27% increase in coronary heart disease amongst those North American men who regularly failed to eat a meal at the start of the day.³ Though, on the negative side, eating high-fat breakfasts too often has recently been demonstrated to increase the risk of atherosclerosis (see McFarlin et al., 2016).

Of course, what we consume first thing in the morning is as much about mental alertness as it is about providing fuel for the body. Many people drink coffee because they believe, erroneously as it turns out, that it improves their alertness.⁴ Intriguingly, the evidence from an analysis of three large-cohort studies (N > 200,000 North American men and women) conducted by the Harvard School of Public Health demonstrated that consuming a couple of cups of caffeinated coffee a day literally halved the suicide rate (Lucas et al., 2014). The suggestion being that the moderate consumption of caffeine has a mild anti-depressant effect. So, taken together, the epidemiological research clearly suggests that what we eat and what we drink first thing in the morning can both exert a pretty dramatic effect on both our health and mental well-being.

The general advice from the health experts is to eat a substantial well-balanced breakfast, one that delivers its energy slowly over the course of the morning.⁵ Indeed, the failure to eat (a well-balanced) breakfast has been documented to have a deleterious impact on cognitive performance, with the academic performance of school-aged children being the focus of much of the research in this area (e.g., Mahoney et al., 1998; Murphy et al., 1998; Wesnes et al., 2003). The argument is that improving cognitive performance may be especially important amongst those of school age (see Adolpus et al., 2013; and Pollitt and Mathews, 1988, for reviews). However, the latest epidemiological results from Finland suggest that eggs can also enhance cognitive performance in middle-aged men too (Ylilauri et al., 2017).

One of the latest statistics that is giving many healthcare professionals real cause for concern is that British children under 10 years of age are currently consuming more than 50% of the recommended daily allowance of sugar at breakfast (c. 11 g) in the form of sugary cereals, drinks, and spreads (see Taylor, 2017).⁶ Such patterns of consumption obviously fall a long way from the notion of a healthy, well-balanced breakfast that we often hear about. And perhaps most worrying of all, a recent survey conducted for Public Health England's Change4Life campaign found that many parents were unsure as to what makes up a healthy breakfast for their children. Specifically, 84% of parents whose children were found to be consuming more than 50% of their

³ Cahill et al. (2013) also documented a 55% higher incidence of coronary heart disease amongst those men who ate after going to bed as compared to those who did not. You have been warned!

⁴ Contrary to the everyday intuition, though, the evidence suggests that while caffeine can help stave off caffeine-withdrawal in those who are regular consumers but who have been deprived, it doesn't actually increase alertness (see Rogers et al., 2010). One important point to note about the latter study is that the participants were given pills (either caffeinated or placebo). Hence, it remains unclear, on the basis of just this study, whether specifically coffee aroma might exert an alerting effect over people's performance (though see Smith et al., 1992, for evidence that it really is the caffeine, rather than the coffee aroma, that is doing the work). Though, the suggestion not to drink caffeinated coffee before going to sleep does appear to have a sound scientific footing (e.g., Drake et al., 2013).

⁵ Hence, why oatmeal is often championed over ready to eat breakfast cereal (or, worse still, no breakfast). The former breakfast provides a slower and more sustained source of energy, and consequently results in more prolonged cognitive enhancement as compared to those who were given low-fiber high glycemic ready-to-eat cereal (Mahoney et al., 2005; see also Benton et al., 2007; Ohlsson et al., 2016).

⁶ And, worse still, by the end of the day they will likely have consumed three times the recommended daily intake. Of course, it is hard not to consume too much sugar when the average serving of cereal actually contains a whopping 12g of sugar, all added (Lustig, 2017). Furthermore, according to a commentary by Lustig that appeared recently in *The Guardian* newspaper, in the US, the Environmental Working Group (2011): "identified 17 breakfast cereals marketed to children in which added sugar constituted more than 50% of calories, and 177 with 40% or more." A subsequent report published in 2014 argued that nothing had changed in the intervening 3 years (see Environmental Working Group, 2014).

daily recommended dose of sugar before school started, actually considered that their child's breakfast was healthy (see Public Health England, 2017)!.

Matters are unlikely to be helped by a recent report from Japan suggesting that eating ice-cream on waking-up helps make people smarter (at least temporarily).⁷ Note that although this story was widely covered by the global press (e.g., Pettit, 2016), it is hard to find a peer-reviewed academic research study to back-up this particular claim. Perhaps this is, in part, because Prof. Kago, the researcher behind the project, apparently only compared brain activity in those who ate ice-cream with those who ate nothing. If so, it would be impossible to say for sure whether it was ice-cream, in particular, or just eating 'anything' at all, that led to effects he reported.⁸

Meanwhile, Jakubowicz et al. (2012) garnered almost as much media attention a few years back with their suggestion that complementing one's regular breakfast with a slice of chocolate cake could help reduce sweet pangs later in the day (e.g., see Telegraph Reporter, 2012, for one such example). The idea in this case was that eating a slice of cake (or rather, a high carbohydrate and protein breakfast) might help those who wanted to lose some weight. The study was conducted on nearly 200 obese participants over a six week period. In this case, at least, there was a peer-reviewed academic publication underpinning the research.

Physiological changes

However, beyond any cultural factors and the latest dieting trends being peddled by the health consultants and nutritionists, one can ask whether there are any more fundamental factors at work, governing what we eat when, during the course of the day. There are certainly a number of important diurnal variations (circadian rhythms; e.g., Aschoff, 1965) that may underpin, at least in part, our food behaviours/preferences. The most important of which may well be the diurnal changes in our ability to detect sweetness. According to research conducted by Nakamura et al. (2008), we are significantly more sensitive to sweetness in the morning, while we find it significantly harder to detect this basic taste toward the end of the day. Intriguingly, however, no such diurnal variation was observed in this study for the other basic tastes (salt, sour, bitter, or umami).⁹ The suggestion here is that the change in sweetness perception may help regulate our food intake.¹⁰

Another important diurnal rhythm is known as the cortisol awakening response (CAR; see Fries et al., 2009). Specifically, in humans, it has been shown that the secretion of cortisol from the adrenal glands follows a diurnal cycle, exhibiting a profound increase after awakening. The suggestion is that the anticipation of the day ahead is of major relevance for the magnitude of this response, which shows up as a 50% increase in cortisol levels on waking. In fact, the CAR is the reason why consuming that caffeinated coffee straight after waking (or at breakfast) might not necessarily be the best idea (see Miller, 2013), since caffeine (e.g., in coffee) also stimulates the release of cortisol (e.g., see Lovallo et al., 2005).

Under normal circumstances, the peak production of cortisol occurs between 8 and 9 am; Meanwhile, survey results suggest that the majority of those who eat breakfast do so somewhere between 6 and 10 am, with the peak occurring at around 8 am.¹¹ As such, if one puts the various research together, the suggestion is that people would do

⁷ It increases alertness and high-frequency Alpha brain wave activity, apparently.

⁸ See Letzter (2016) for critical coverage of the reporting of this industry-funded 'study' in the press.

⁹ Though note that others have reported diurnal variation in our sensitivity to the salt taste of sodium chloride (see Irvin and Goetzl, 1952).

¹⁰ The recognition threshold for detecting sweetness is tied to circulating plasma levels of the hormone leptin.

¹¹ These figures coming from the results of a survey of eating habits over the 2 years 2013–2015 from the NPD group (see Chamlee, 2016).

better saving their consumption of caffeinated coffee beverages for a coffee break somewhere between 9.30 am and 11.30 am (and between 1.30 pm and 5.00 pm) when naturally circulating levels of cortisol will most likely be dipping (see Kosner, 2014).

Our mood varies over the course of the day, and this diurnal variation might also influence the kinds of food choices that we make too (see Gardner et al., 2014). According to Gardner et al., for instance, we tend to make healthier longer-term food choices when in a good mood, while tending to revert to the more immediate gratification offered by less healthy foods when we are in a bad mood. Meanwhile, according to the results of research by Clark et al. (1989), all components of positive affect (including terms such as enthusiasm, energy level, mental alertness, interest, joy, and determination) rise sharply from early morning until noon. They then remain relatively constant until 9 pm, before falling off rapidly thereafter.¹² The fact that, on average, positive affect scores are lower when people normally eat breakfast might, then, be consistent with a tendency to make more indulgent, less healthy food choices at the start of the day than later when their mood is better (cf. Gardner et al., 2014).

Certainly, nutritionists often recommend various foods for breakfast specifically to help improve people's mood (Blake and Hobson, 2016; see also Smith et al., 1988). Though, on this point, it is perhaps worth noting that eating a large breakfast has been shown to be associated with a lower mood later in morning (Benton et al., 2001). Furthermore, and perhaps unsurprisingly, it turns out that the exact composition of one's breakfast meal likely also plays an important role in determining one's ensuing mood (Lloyd et al., 1996).

The rate at which we salivate spontaneously shows significant diurnal variation, and we essentially stop salivating while we sleep (see Spence, 2011, for a review). Such changes over the course of the day might also make certain foods a little more palatable than others at different times of day. However, more research is most definitely needed to probe this suggestion further. Body temperature also varies predictably over the course of the day (see Aschoff, 1965), though, once again, I am not aware of any specific consequences for the patterns of food consumption over the course of the day.

Finally, it wouldn't surprise me to find that the diurnal variation in the pattern of ambient sensory stimulation also plays some small role in biasing our food behaviours. For instance, natural daylight has a warmer hue at the end of the day than at the beginning, as any photographer knows only too well (see Collins, 1965). Of course, the absolute light level varies too. And here there is a link to the kinds of foods that people order. For instance, just consider research conducted by Gal et al. (2007) showing that those who like strong coffee tend to drink more of the stuff under brighter ambient illumination conditions than dim. The ambient temperature outside also varies (and this presumably also affects food choices that people make). The suggestion from marketing being that, in general, consumers make more cognitive/rational decisions at higher temperatures, and more emotional ones at the temperature drops (Hadi et al., 2013).¹³

In summary, then, while there are a number of salient variations in both the consumer, and in the environment in which that consumer consumes over the course of the day, the consequences for food choice/behaviour remain to be fleshed out.

¹² Though note that while the rise and fall of positive affect were reported to be quite robust across individuals, the precise time at which positive affect peaked varied between individuals.

¹³ My suspicion is that the levels of ambient olfactory and auditory stimulation probably also varies in predictable ways over the course of the day, and that this may be internalized as a slight change in the pattern of sensory dominance. Though, that said, the fact that we spend more time indoors than even before presumably means that the sensory profile of the natural environment has less impact on many of us than would have been the case previously. In fact, according to estimates, we now spend 90% or more of our time indoors (Ott and Roberts, 1998; Wargocki, 2001).

Changing breakfast behaviours

There are undoubtedly robust commercial reasons for trying to understand why people choose to eat what they do, when they do (e.g., in order to try and increase commercial sales of various foods). Rest assured that many of the major food companies out there selling breakfast cereals are eagerly trying to figure out how to make their products more appealing to consumers at other times in the day (e.g., for lunch, dinner, or simply as a snack – e.g., as a cereal bar; Baertlein, 2015). And just think, for example, of the rise of the all-day cereal bar – where customers go to be served a normally-overpriced bowl of cereal – as a niche example of this trend (Mahdawi, 2016). In recent years, McDonald's have certainly been very successful with their all-day breakfast offerings (they were launched in 2015; Chen, 2017; <https://www.nestleprofessional.us/trends/get-top-10-breakfast-trends>). Indeed, according to Baertlein (2015): “A 2014 survey by the National Restaurant Association showed 72% of U.S. adults wished restaurants would offer breakfast items all day.”

There are many other food companies out there too, of course, who would dearly love to break into the breakfast market and so increase their sales. Note that breakfast and morning snack sales, especially of fast food, are predicted to grow faster than the population over the next couple of years (Chamlee, 2016). At the same time: “sales of breakfast cereals have tumbled by almost 30% over the past 15 years, and their future remains uncertain” (quote from Ferdman, 2016) to see why there is such urgency to find a solution amongst some of the major players in this sector.¹⁴ Thinking more carefully about the naming and multisensory packaging of one's products is likely to become increasingly important in the coming years (Spence, 2016; Spence and Piqueras-Fiszman, 2014; cf. Blumenthal, 2003), as companies seek to reposition their products in the mind of the consumer.

Breakfast cereals currently seem to hold a somewhat uneasy position in the minds of many consumers, teetering somewhere between sugary snack and healthy alternative. There is definitely a link to the growing consumer interest in healthy foods, especially given that people are willing to pay more for healthier options (e.g., Beck and Schatz, 2014; Gagliardi, 2015). In terms of the changing face of breakfast cereals, for instance, and making them seem a little healthier, this change is evidencing itself in the introduction of gluten-free breakfast cereals, organic grain options, as well as the reduced use of artificial food colourings (e.g., Bonar, 2015; Kennell, 2015; Severson, 2016b).

The reasons for these changing trends around breakfast are largely those that one might expect, namely that more people than ever before are eating breakfast away from home, and one is seeing a switch from cereals to breakfast sandwiches and (drinkable) yogurt (Ferdman, 2016). However, it is not just sales of breakfast cereals that have been struggling in recent years.

Sales of another one-time breakfast-table staple (at least it was a staple in North America), orange juice (OJ) have been in serious decline too (e.g., Wexler, 2013). As Tuttle (2014) notes: “By some measure, orange juice sales have fallen 40% since the 1990s. Clearly, sales have suffered partially for the same reasons that cereal and milk sales have declined: Our fast-paced, on-the-go culture means that fewer people are eating a sit-down breakfast at home, or eating breakfast at all.” Bachman (2013) notes that: “Orange juice has fallen on hard times. In the past decade, global consumption of OJ has dropped 12%, led by a 29% fall in the U.S. and a 34% decline in Germany, markets No. 1 and 2, respectively.” The decrease in sales has, in part, been put down to the fact that consumers are increasingly-questioning just how healthy it really is (see Bachmann, 2013; Braun, 2014).

¹⁴ The decline is serious given that North Americans, spend an estimated \$10 billion annually, down from nearly \$14 billion in 2000 (Ferdman, 2016; Severson, 2016b).

So, in terms of the underlying drivers of the changes in consumer behaviour we are seeing around breakfast foods then right up there in terms of importance has to be convenience. Indeed, according to Howard Telford, an industry analyst at market research firm Euromonitor: “Convenience is the one thing that’s really changing trends these days” (quoted in Ferdman, 2016). This certainly fits with the growing focus on hand-held and portable foods for those on-the-go. However, one of the other, rather less prosaic, reasons for the changing face of breakfast relates to the rise of the millennials. Just take the following observation as a sign of what may be to come: “Almost 40% of the millennials surveyed by Mintel for its 2015 report said cereal was an inconvenient breakfast choice because they had to clean up after eating it.” (quote from Severson, 2016b).

Gastronomic breakfasts

For many restaurants, too, it obviously makes sense to try and squeeze as much out of a venue given the costs associated with renting space. One opportunity here is the growth of the business breakfast (Ramsden, 2011). However, it would seem safe to say that no one wants modernist, or haute cuisine, for breakfast. It is a little too early for surprise and playfulness in one’s food (e.g., Mielby and Bom Frøst, 2010; Piqueras-Fizman and Spence, 2012). Instead most people would seem to want consistent, predictable, foods. Who knows, perhaps fuelling-up, enhancing alertness and cognition, and/or nutritional goals (i.e., in terms of the idea of a healthy start to the day; e.g., Anon, 2010) trumps any entertainment value that food may offer at this time of day. Perhaps too, we are mostly not at the peak of our cognitive capacities, and hence not best placed to deal with/interpret such a playful approach to food as represented by much of modernist cuisine.¹⁵ If one were to generalize, it would seem safe to say that breakfast has much more to do with *food science* than with *gastronomy*.

Of course, one might counter this suggestion by arguing that it is not just modernist and haute cuisine meals that people don’t want first thing in the morning. Nor, one might say, do many people like ‘ethnic’ foods for breakfast either (at least not in anything like the same way they do at lunch or dinnertime). However, everything has been changing over the last couple of years, as sales of ethnic-inspired breakfast items have been predicted to rise substantially (see Thorn, 2015; Wallop, 2016; <https://www.nestleprofessional.us/trends/get-top-10-breakfast-trends>).¹⁶

“Even more exciting: The very texture of breakfast is being transformed. Use to be that breakfast was smooth and soothing ... think of soft scrambled eggs, buttered grits, custardy french toast, varieties of benedicts, oatmeal. Today’s textures (and tastes) are turning aggressive ... crunchy fried chicken, sriracha, crispy chorizo, chimichurri, coarse whole-grain 10 cereal. Smaller chains and independents are creating weightier breakfast items that qualify as round-the-clock meals.”¹⁷

And while full-blown modernist cuisine, or molecular gastronomy, is unlikely to make an appearance at breakfast any time soon, it is perhaps worth noting the recent introduction of what are typically taken to be modernist cooking techniques, like *sous vide* (Baldwin, 2012), in Starbucks recently introduced new breakfast offerings. In

¹⁵ There is, of course, also the expense to consider, with people generally seeming happier to spend more on the meals that take place later in the day (cf. Ramsden, 2011).

¹⁶ One also sees the rise of more ‘exotic’ breakfast fayre (see Huen, 2016). Severson (2016c) also notes that Asian-inspired breakfasts are one of the on-trend predictions for 2017, while at the same time questioning how much weight we should really be putting on these food trend predictions.

¹⁷ This from Baum+Whiteman’s (International Food+Restaurant Consultants), 13 HOTTEST FOOD & BEVERAGE TRENDS IN RESTAURANT & HOTEL DINING FOR 2017; Downloaded from <http://www.baumwhiteman.com/2017TRENDS.pdf>

particular the bite-sized breakfast egg snacks in their North American stores launched this year (Chen, 2017).¹⁸ Continuing to develop in this area (of innovative breakfast foods) is undoubtedly important for Starbucks given that they sell 40% of their food at the start of the day. They are also tapping into the health angle with their introduction of organic soup and gluten-free bread.

Some modernist chefs and molecular mixologists have also started to take cereals out of their traditional breakfast context and use them in some of their culinary creations – both savoury dishes and in cocktails (e.g., Severson, 2016b; <http://www.molecularrecipes.com/molecular-mixology/white-russian-krispies/>). As Severson (2016b) notes: “A decade ago, the chef Ferran Adrià of the innovative *El Bulli* restaurant in Spain poured a rich reduced seafood broth over Rice Krispies for a dish called *Kellogg’s paella*.” Heston Blumenthal of The Fat Duck fame used porridge oats in his much publicised snail porridge dish (Blumenthal, 2003, 2008).¹⁹ Meanwhile, Christina Tosi, the pastry chef who made a name for herself by turning the milk left in the bottom of a bowl of cereals into ice-cream has also been playing in this space recently.²⁰

My guess is that given the changing demographic, breakfast cereals are going to take on more of a nostalgia role. Indeed, according to a 2015 report from the global market research company Mintel: “Almost half of all American baby boomers and nearly 40% of the generation born before them say the cereals they loved as children remain their favorites” (quote from Severson, 2016b). And as Ferdman (2016) notes: “Ultimately, cereal makers will settle on a strategy for reversing the industry’s downward trend. Among the likeliest routes are embracing the fact that many people are eating the food at times other than breakfast, often as a snack, channeling the food’s nostalgic quality, which helped buoy the industry for years, and shifting to portable containers, which nearly half of millennials prefer, according to Mintel.” Interesting in this regard are the breakfast cereals that are brought to the table mid-way through the meal at The Fat Duck restaurant in Bray. By trying to match the cereal boxes to those that would likely have been available when the diner was a child, it allows the culinary team to play on that emotional, nostalgia, and personalized angles that are so important in high-end dining these days (see Spence, 2017).

Conclusions

In conclusion, there really are a number of reasons as to why breakfast should be considered the most important meal of the day. The decision about if and what to eat and drink at the start of the day has been shown to have some profound effects on our health, well-being, and cognitive performance. There are undoubtedly significant cultural differences in the kinds of foods that people in different parts of the world want, or think it appropriate, to eat at different times of day. However, beyond these cultural factors, not to mention the latest recommendations from the dietitian’s (and the suggestions of the future forecasters), there are also a number of more fundamental psycho-physiological reasons as to why consumers may be drawn to different foods at different times of day.

¹⁸ Though note that while *sous vide* (literally cooking under vacuum) is commonly used in modernist cuisine, the techniques actually has its roots in the domain of hospital service (see Spence and Piqueras-Fizman, 2014).

¹⁹ As Blumenthal (2003) notes: “Part of our expectation of food is conditioned by language - we eat porridge for breakfast, often with something sweet, such as sugar, honey or jam, yet porridge itself is not sweet. It is a grain, just as rice is, and the idea with this dish is simply to use oats as you would rice. This is best served as a starter.”

²⁰ As Severson (2016b) goes on to note: “Cereal manufacturers are starting to catch on. Recently, Kellogg paid a young, culturally diverse group of chefs to create dishes using its cereals. Among them was Danny Bowien, the man behind *Mission Chinese Food* in New York and San Francisco, and a lifelong Corn Flakes fan. For a special breakfast menu he served in December, Mr. Bowien matched Frosted Flakes with matcha milk and green tea powder, and poured bacon-infused soy milk over Corn Pops, topping the dish with a fried egg.”

As we have seen in this review, the consumer landscape around breakfast food and drink items is changing rapidly in the west, with sales of more traditional items like breakfast cereals and orange juice in steady and continued decline over the last 15 years or so. At the same time, we are seeing the rise of convenience foods, breakfast sandwiches and drinkable yoghurts, for instance, that are good for those on the go, and for the millennials who can't be bothered to wash up! And while breakfast has always been more related to food science than to gastronomy, there are some signs that this distinction is starting to change, with top modernist chefs and molecular mixologists incorporating more breakfast cereals into their savoury dishes and cocktails, often with the aim of triggering nostalgia and emotion. The rise of the 'Breakfastarian' – the consumer who wants to have the opportunity to eat breakfast items all-day long (see Baertlein, 2015; Leading Article, 2016), is also helping blur to traditional boundary between what we think it appropriate to eat at different times of day. The idea of the breakfast salad (Poulter, 2017), is also doing much the same. Though, it has to be said, not all attempts in this direction have necessarily met with success (e.g., see Cloake, 2017; Gurkan, 2017).

List of abbreviations

CAR - Cortical Awakening Response.

Ethics approval and consent to participate

As a review paper, no participants were tested in this paper.

Consent for publication

Approval to publish has been given where required.

Availability of data and material

There is no data or material to make available.

Funding

CS would like to acknowledge the AHRC Rethinking the Senses grant (AH/L007053/1).

Authors' contributions

CS wrote all parts of this review.

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Acknowledgements

None.

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