

Little bottles and the promise of probiotics

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ADRESSES

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Not for circulation

Little bottles and the promise of probiotics

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ABSTRACT In this paper we explore ‘regimes of hope’ in contemporary bioscience as articulated in spaces of health consumption. We use the case study of probiotic little bottles, highlighting their promissory branding as consumer products, to consider how hope and truth play out across different spaces of healthcare – the supermarket, media and laboratory. Drawing on work within both sociological and geographic literatures to think about hope, truth and probiotics, this paper explores their ambiguous promise through an analysis of their biomedical and popular representation. The seemingly incommensurate promise of probiotics between popular and medical spheres provides the point of departure for an examination of the geographies of hope, truth and selfhood.

KEYWORDS *bioscience innovation, regimes of hope and truth, probiotics, subjectivity*

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Probiotics and functional food: an introduction

It is hard not to notice the little bottles of 'friendly bacteria', or 'probiotics' colonising more and more supermarket shelf space. One lead company in the probiotic little bottle market claims 25 million people across 20 countries as daily users of their products¹. In the UK, from the first introduction of 65ml bottles of sweetened fermented drink containing probiotic bacteria in 1996, other companies and products have entered a growing market for probiotic little bottles, probiotic yoghurts, probiotic smoothies and so on, such that an estimated 3.5 million UK residents consume some form of probiotic product on a daily basis (Senok, Ismaeel and Botta, 2005). The success of probiotic little bottles is generally regarded as a factor of their reputed health benefits and as consistent with a more general shift in supermarkets supply of products that offer *added* health benefits – collectively known as functional foods in industry circles (Heasman and Mellentin, 2001). While the category functional foods currently has no legal status in the UK, it is used within industry to describe foods such as cholesterol lowering margarines with added plant stanols, omega-3 fortified drinks and other products where particular health gains are aligned with

¹ Yakult company brochure, 2006

ingredients deemed to be additional to the food itself (Lehenkari, 2003; Sibbel, 2007).

The continued and rapid growth of these products in supermarkets raises, for us, questions about how to account for consumers' choice of probiotics. The case study provides an opportunity to reflect on the ways in which "raw biological vitality", in this case bacteria as fragments of more complex systems, may be mobilised for new health uses and given a marketable exchange value – what Catherine Waldby terms biovalue (Waldby, 2002: 313). The success of probiotics raises further questions about the new ways in which health-related biovalue is mobilised within markets and mobilizes 'biologies and selves' (Brown, 2006; Waldby, 2002). First, their consumption for supposed health gains appears at odds with the weak scientific evidence supporting the healthy messages such products convey (Tannock, 1999). Whilst advertisements for probiotics promote "vitality", a "healthy digestive system", "wellbeing" and "balance", the evidence that probiotics work to produce such effects, as recent reviews suggest, is far from well accepted (Gibson, Rouzaud and Brostoff, 2005; Senok et al., 2005; Walker and Buckley, 2006). Second, probiotics are the most successful products in the category of functional foods (Sloan, 2004) with estimates that the probiotic sector will continue to grow by as much as 40% (Daniells, 2006). Not all functional foods have met with industry expectations of success, leaving some developers and investors out of pocket (Heasman et al., 2001). While controversies over their effectiveness play out in scientific debates, in the supermarket these concerns appear to have little bearing on their popularity as

consumer products, and moreover, with indications that they are consumed more as an 'article of faith' and less by the ill than by the healthy - thus raising for some the question of why they are consumed at all (Tannock, 1999). Third, the development of probiotics occurs in much more complex and contested terrain of 'facts and myths' about their possible uses and effectiveness (Senok et al., 2005). Interest in probiotics is more widespread than simply the development of new food products. Both scepticism and promise about what they are or what they are claimed to do is evident across fields as diverse as animal nutrition, aquaculture, biotechnology, food technology and medical sciences (Balcazar et al., 2006; Holzapfel, 2005; Vanbelle, Teller and Focant, 1989).

Probiotics describes a new category whose most widely quoted contemporary definition is "live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host" (World Health Organisation, 2001: 5). Like the functional foods category, the link to health is assumed as the primary motivation that underscores their use. However, given controversies over facts and myths about their efficacy, does the linkage with health imply (and perhaps produce) a more prospective hope about them than the 'truth' provides? Alternatively, what might hope and truth reveal about the context of probiotic developments? In this paper we address the latter concern, and rather than addressing, as so many others have done, the question of probiotics efficacy, following the work of Moreira and Pallandino (2005) we trace and consider the significance of hope and truth in relation to them.

On hope and truth

We begin by placing our research within recent literature documenting an apparent shift in the epistemological basis of modern bioscience away from rationalistic authority towards a much greater emphasis on investment in less certain but hopeful futures (Brown, 2006; Moreira and Palladino, 2005; Novas, 2006). Various empirical examples may be cited to demonstrate bioscience interest in hopeful technologies and techniques – predictive medicine, nanotechnology, transgenics. However it is not the proliferation of such innovations that provide evidence for a shift to hope, but observations of the conditions for its emergence. These conditions can be seen to involve a shift in what counts, and how it counts, as knowledge in biosciences.

Drawing on poststructuralist methodologies and sociologies of science literatures regimes of power/knowledge enable and produce certain ways of viewing the world (Foucault, 1984, 1989; Petersen and Bunton, 1997). Such methodological approaches share a concern with the “more or less organized or routinized ways of doing things that manifest an immanent logic of reason of their own” (Dean, 1999). Rejecting an absolutist account of knowledge refocuses attention on understanding how knowledge (and power) is dependent on particular regimes, practices and heterogeneous networks. Different regimes of knowledge provide a substrate of intelligibility, in this case rendering investment in the future as a normal state of affairs; and thereby affecting the way the future unfolds.

A regime of truth orients towards fabricating 'proofs' and knowledge robustness, whilst the regime of hope is concerned with the fabrication of expectations and future possibilities (Brown and Michael, 2002; Moreira et al., 2005). Regimes of truth may be said to focus attention on 'what is known, rather than what can be', while investments in a regimes of hope are in future possibilities of truth, deferring truth and rendering the present open to various efforts in securing the uncertainty of the present as an acceptable state of affairs (at least for the moment) (Moreira et al., 2005: 67). A 'parasitic' relationship may be seen to exist between hope and truth, in developing innovative medical technologies and techniques, as 'hope' provides a foundation for (and may be also seen to be performative of) investing efforts in order to secure the 'truth' that something good will come out of the research. The two articulating knowledges/regimes of hope and truth are seen to be in flux in biosciences: but more specifically it is the articulation of the *relationship between them* that is in flux (Moreira et al., 2005).

For Brown (2006) the 'will to the yet not present' also serves as a basis for 'promissory abstractions' that employ values, desires and aesthetics. Brown cites an example in which GM food developers modified their consumer message away from regimes of truth to regimes of hope – from using scientific evidence to promote their products to using the by-line "imagine" as the marketing message to advance the idea that "food, health and hope" underscores their development agenda. Marketing hope ties into what has elsewhere been described as a shift from authority to authenticity (Brown et al., 2002). In regimes of hope not only the messages are different, but also crucially, aspects of subjectivity. Moreira and

Palladino (2005) consider how orienting to a regime of hope also views and constitutes patients as more invested in securing a different and positive future for themselves, whilst appeals to 'truth' leave no space or time for its deferral.

Financing biomedical research; enabling the capital investments in hope creates new spaces for research, new kinds of subjectivities and forms of engagement, but also raises the spectre of hype and the "damaging implications of failed futures" (Brown, 2003: 5). The promise of biotechnology, of genetic engineering, transgenics, bioinformatics, probiotics, synbiotics and so on – if oriented in hope also establish the potential for disillusionment when too much is invested in the expectation of their success. The dynamics of expectation, may as Brown suggests, create a need for more workable expectations in relation to biotechnology:

The problem with the biotechnology sector is that, like many areas of innovation, expectations are sometimes both inflexible and reflect disproportionately exaggerated benefits and risks. This occurs for the very reason that future-abstractions are put into circulation in the first place – to have a 'performative' influence in real time (Brown, 2003: 6).

The double-bind of expectations is *established*: the shift to a more hopeful tense *establishes* the potential for failure, but also enacts a *performative* function in manifesting hopes in practical and material form that may well produce positive future outcomes. Moreover, as Novas (2006) considers, in a political economy of hope subjects who have until now, been left out of a direct priority setting role in

biomedical research may be empowered and enabled to direct research towards the aspirational futures of significance to them.

Thus far, our discussion has centred on the tensions between regimes of hope and truth in particular relation to biomedicine. The case of probiotics offers a somewhat different vantage point from both the biomedical accounts so far presented, as well as debates about innovative technologies in consumer culture. In consumer culture, research that might be said to be concerned with hope and truth (often cast as hype and truth) have tended to focus on examples where there is a high degree of public scepticism – a prominent example being genetically-modified (GM) foods (Brown, 2006; Cook, Pieri and Robbins, 2004; Cook, Robbins and Pieri, 2006). The GM debate has been typified by the hopeful futures suggested by industry (backed by scientific evidence) and the way in which they are sometimes consumed as unsatisfactory truths for a sceptical public. First, it is not the presence of scepticism in the public sphere but the lack that intrigues in relation to probiotics. Second probiotics biovalue seems more highly regarded in consumer settings than in biomedicine. If the articulation of relationships between hope and truth may be said to vary between biomedicine and consumer markets, it may also be that parasitism can be investigated as spatially constituted. In short, probiotics provide an empirical case study through which to examine how *different spatialities deploy different configurations of hope and truth.*

In what follows we examine three spatial aggregations of actors and their representations of hopes and truth about probiotics. The first takes as its point of departure an extensive review of the status of probiotics in biomedicine. The second occurs in an intermediary space of the media through an examination of an interaction between different publics and scientists in which public actors respond to a scientific review of probiotics. Finally we take the examination into consumer culture and consider how two lead producers of probiotic 'little bottles' market their products to the public.

Probiotic expansions – the future of medicine?

Are probiotics the future of medicine? Theoretically, beneficial micro-organisms could be used to treat a range of clinical conditions that have been linked to pathogens, including gastrointestinal problems like irritable bowel syndrome and inflammatory bowel disease...oral diseases like tooth decay and periodontal disease, and various other infections. Probiotics could also conceivably be put to use in preventing disease or thwarting autoimmune disorders (Walker et al., 2006: 3).

The quote above introduces a report by the American Academy of Microbiology and is based on a colloquium held in 2005 on the topic of probiotics. The colloquium included 38 participants from fields as diverse as microbiology, medicine, animal science, immunology and nutrition amongst others; and from the UK, Canada, Australia, the Netherlands, Finland, Germany as well as the US. The report is titled *Probiotic microbes: the scientific basis*, a title which establishes

the tone of what we expect will follow, a description of the 'truth' about what is known. Indeed the report is premised on the recognition that, an "evaluation of the current state of knowledge about probiotics is required"(3). The report suggests:

The buzz about probiotics has become a roar. But what can beneficial microorganisms really accomplish? Can these products benefit human or animal health? When it comes to probiotics, what is real and what is fiction? (Walker et al., 2006: 5).

Despite the appeal to truth signified by the title and elements of the quotes above, is also oriented towards the potential future benefits that probiotics might provide for a range of clinical conditions and preventive options. The introductory sections of the report are filled with prospective terminologies that align with a regime of hope: "theoretically", "conceivably", "possibilities", "exploration", "could reduce the risk", "potential effect", "could have beneficial outcomes" and so on. The effect is not to discount hope, but rather to establish what is regarded as (yet) untrue or as fiction.

In what follows is a listing of different conditions, the research on probiotics and the limited, but nevertheless promising evidence-base that probiotics might have uses for a series of target disorders: diarrhoea, pouchitis, irritable bowel syndrome, bladder cancer, urogenital infections, clostridium difficile infection, atopic eczema. Based on this evidence the report then lists the potential future applications for therapeutic treatments, the limits of the evidence and inherent

difficulties in measuring and universalizing the results. The complexity of the gut and of microorganisms and their variable effects within it renders any appeals to 'truth' metered by the lack of a similarly complex evidence-base.

In short, the report of the American Microbiological Association attempts to draw a shared truth about probiotics from a diversity of scientific actors engaged in a controversy. Moreira and Pallandino (2005) demonstrate how aggregations of actors occur around regimes of hope and truth. The power of the aggregation appears greater than the sum of its parts, thus it is through the coming-together of different actors that stabilizes further the appeal to a regime of truth.

However, although the report is directed to settle the controversy over effectiveness through appeals to truth, it also appeals to a hope of something good coming out of the research that is necessary to move beyond this. Fiction becomes a metaphor for hype, but also discounts the performative function of futurity in stabilizing the future research agenda. Securing resources, demonstrating the need for research is necessarily premised on hope, but there is no authoritative space for such fantasizing in a regime of truth. The parasitic relationship that is established justifies the need for research (on the hopeful predictions about what might be possible) precisely because the 'truth' is not known. By the end of the report it is the lack of truth that provides the key rationale for financing future research, the final recommendations list areas of uncertainty, suitability of testing procedures and the need for robust evidence:

There is a pronounced need for large, carefully designed (randomized, placebo controlled) clinical trials of probiotics that undertake broad sampling of host microbiota, have clear end points, and have well informed participants who consent to treatment. Investigations like these are needed to overcome the placebo effect and other barriers to the thorough investigation of probiotic products (Walker et al., 2006: 19).

The parasitic relationship between hope and truth is in effect, a masterful bait and switch. The bait is an appeal to truth, but the switch is that hope about their potential is the underlying trope that the report eventually succumbs to. It is apparent however that the authors themselves do not align with a regime of hope even as they employ it, but rather see themselves as the truth seekers.

We now turn to a different aggregation of actors in which science is challenged by those 'outside' the biomedical realm.

Hope in the supermarket – truth in the lab?

A commentary piece on probiotics that appeared in the British Medical Journal(BMJ) demonstrates how different actors deploy hope and truth in ways that do not augur well for agreement. Here we compare a science commentary on probiotics with a series of rapid responses published in the BMJ over the following year and a half.

Science editor of the BMJ, Abi Berger, wrote a short commentary on probiotics that provoked a flurry of critical responses from readers (Butler, 2002; Hayden, 2003; Leger, 2002; McClain, 2002). Berger described probiotics as microbes that could in some cases prevent disease in the host and commented on their promising results in preventing diarrhoea and atopy (allergic reactions where there is no direct contact between the allergen and effect; such as eczema) in children. He suggested that while it was known that antibiotics modify the composition of the flora of the gut, and diarrhoea was one consequence of that, it was still not clear that probiotic supplements could act to substitute for such losses. Although promising, Berger suggested that there was still much to be learned about probiotics because of the complexity of the gut and related uncertainties about how they worked, and the lack of studies providing sufficient evidence of efficacy. Berger's truth about probiotics was far from unhelpful, but rather emphasised 'that which is known' over the more prospective, but nevertheless hopeful truth that there was more to be learned. Nevertheless, four responses critical of the commentary were aired that signalled dissatisfaction with the 'truth' as presented.

A journalist responded with a critique arguing that:

...for years, I have watched the medical profession floundering around on the issue of probiotics. There seems to be a philosophy that anything is only 'useful', if it is clinically proven to be useful. Even more so, if 'we' say so (Butler, 2002).

The position is one of fault finding, not with probiotics per se, but with the authority of science and the modes through which scientists engage with the world. The author defers truth about probiotics by emphasising uncertainty and using it as a justification for far greater investment in hope.

A natural health consultant expresses “delight” at the new scientific interest in probiotics, “even if it seems moot to the cultured kefir-eaters among us” (Leger, 2002). Kefir is a fermented milk product that is linked with a long history of use in the Caucasus and is highly regarded amongst Complementary and Alternative Medical communities (CAM). Tradition, experience and history provides a truth about an example of a product containing various bacteria that slot nicely into the probiotic category, but the example of kefir is used to demonstrate the truth about the category as a whole. Truth is not linked directly to probiotics, but to a more complex set of associations in which demonstration of efficacy is not clinically proven, but is made evident through the association of a diverse set of people united as, ergo healthy, kefir-eaters.

A specialist lactation consultant questions the profiteering of companies patenting bacterium found in fecal samples of babies for eventual use in formula feeds, and suggest that the properties have been “appropriated” by researchers who are paid by commercial interests to be used in products that may even “sabotage” breastfeeding. She asks:

Is the interest in probiotics the end result of scientific enquiry or the result of the patenting of these organisms by corporations seeking to turn a profit? (McClain, 2002).

The author deploys a regime of truth to question the role of capital in investing too heavily in hope, but moreover seeks 'truth' through alignments of nature, and particularly mother nature with health. That tendency to represent women and children, particularly babies as aligned to, or as a metaphor for, nature and health is far from a new observation (Stratford, 1998).

Finally, a mother responds to the discussion with a personal story detailing her success with a probiotic treatment of her 5 month old baby's eczema. She admits, "I ignored my GP and health visitor when they suggested various creams and steroids" (Hayden, 2003). She seeks information from internet searches. Finding 'truth' in internet information and grateful for the scientific articles already out there defending the value of probiotics, in this instance she does not defer truth so much as pre-empt it.

The commentary and responses demonstrate different spatial configurations of truth and hope that play out in the development (or reconstitution) of biotechnologies. The 'truth' about probiotics in the biomedical sphere is also nested within regimes of hope about what they may achieve in treatment based outcomes. In the views of those responding negatively to the commentary, the truth may be constituted differently, or even through the same means, but with different effects. The tendency is for fault finding (deferring truth), but not

necessarily in relation to probiotics themselves – but other concerns – about scientific methods, other systems of belief like CAM, and personal experience. Thus it is not just how hope and truth may be associated with different actors in the controversy over effectiveness, but also what hope and truth relate to.

The observation that innovation is *situated* ties to work in studies of science and technology, not about hope and truth, but concerning the ways in which interest in new biotechnological development often fails to take account of the context into which they are placed. It is all too easy in studies of biotechnology, suggests Bingham (2005) to focus on the novel innovation itself rather than exploring the surroundings in which such technologies necessarily emerge within and around. In this view, and drawing on the work of Mol (1993), Bingham argues that biotechnologies do not materialize in a void, but into a world already complex and full. ‘Things’ in the neighbourhood of biotechnologies, he suggests, can be investigated to give insights into where technologies, for example probiotic little bottles, fit. This seems appropriate for two reasons. First, as has been demonstrated thus far, the promise of probiotics is not simply different between actors but appears to have a spatial quality; it appears differently in biomedical and popular consumption sites. Second, what hope and truth refer to in the controversy about probiotics, is not necessarily probiotics themselves. Extending our theoretical approach in the following section, in which we look specifically at the case of little bottles, we consider actors, aggregations and hope and truth around probiotics in the supermarket, but also ask *where (in the world) hope and truth emerge*.

Between hope and truth and next to

In this section we present key findings of a content analysis of advertisements from the two leading probiotic manufactures in the UK (Yakult and Danone Actimel) over a two year period (January 2005-January 2007); this includes advertisements from a range of different media including television, newspaper and the internet. Our interest was in exposing different articulations of hope and truth between science and popular consumption. We therefore focused our investigation on how the leading probiotic companies might frame messages for popular consumption, and the coherence of such framings across a random sample of their advertisements (Krippendorff, 2004). A selection of from each company and genre (newspaper, internet video, internet text, television advertisements) were sampled at six monthly intervals. While we utilised a content analysis method to ensure a consistent approach to the selections, our aim was not to prove assertions to be true or generalisable. Following Peirce (1958) and Eco's (1976) account of abductive analysis where examination occurs not through simple deduction or induction but rather through a process of inference, insight, empirical observation (in this case of adverts) and logical reasoning to generate new understandings we present an argument for a particular explanation (cf. Iedema, 2007). We detail two fairly typical examples of these advertisements and refer to a few others to consider where hope emerges, next to what and associated with what promissory abstractions.

Close up of a woman holding three videos she looks at the camera and says:

“Well in order to maintain my er wellbeing I've become completely dependent

on these er yoga videos". As the camera pans out we see her placing the video's on a pile of others and moving backwards into a relaxed seated position in a lounge chair drinking a bottle of Actimel; the camera gives a close up of the little bottle as the narrator in the background states "*Only Actimel has the L.casei immuitas culture*". The camera returns to the woman lazing in the chair, she leans forward to place the little bottle on the pile of yoga videos and as she does so says "stretch", the narrator states: *the Actimel habit, keep it up*" the woman leans back in the chair and says "relax", the advertisement ends with the narration *mm Danone*²

Box 1: Description of Yoga advertisement for Actimel (Danone, 2002)

The advertisements about probiotics vary considerably in content, form and delivery, however common representations are, like the Actimel advertisement above, of individual consumers who need do very little to secure a desirable health state (Box 1). The appeal to regimes of truth lies in the authenticity of the particular bacterial culture that is used by the company Danone and, other than the appeal to make this a habitual activity, the company says nothing directly about the evidence of effectiveness or even what health states the person may seek to address by using the product. Rather, the woman herself embodies the

² Viewed on a one off basis at <http://www.uk.actimel.com/>

health state that is desired – one in which knowledge of yoga demonstrates her appreciation of the need for physical exercise, but where the placement of the now empty little bottle on top of the pile of videos signifies its effective replacement through consumption.

The marketers aestheticize probiotics (Brown, 2006) deploying a vision of health and well-being. But such an aesthetic may also be seen to be nested within particular discourses of health. The sociological literature on 'healthism' (Crawford, 1980) is now more than two decades old, and yet observations about the shift from treatment oriented regimes of health to lifestyle interventions and ideas about healthy living still resonate in contemporary settings. Bunton, Nettle and Burrows (1995) contribution to the sociology of health promotion sets out this transition. But it is worth returning to one of their key observations: with the shift in biomedical interest, there is a cultural shift to healthism. Healthism is seen to have a value beyond medicine that articulates with consumer culture in particular ways, most notably in the present through ideas of "youth, vitality, energy and so on" (Henderson and Petersen, 2002).

Certainly youth, vitality and energy are routinely employed in many advertisements for probiotics. Indeed one probiotic 'little bottle' company markets their goods directly as 'Vitality' (Müller Company). Yet the aesthetic of one-slurp-well-being is not the only kind of engagement with the public – regimes of truth underscore much of the advertising for the Yakult company, albeit less for public consumption than for those publics that make the extra

effort to learn more about the product by visiting the more detailed literatures available through the company websites.

The index page for the Yakult company website in the UK provides the following text:

Do you do something you believe in? Us too. Our little bottle. Full of good bacteria. To help your digestive system. Which can lead to better natural defences. Simple. Our founder Dr. Shirota certainly thought so; he dedicated his life to isolating a strain of bacteria beneficial to human health. He succeeded in 1935 and placed his unique bacteria into a milk drink so its benefits were accessible to all. Have a wander around our website to find out what Yakult can do for you
(www.yakult.co.uk, accessed 14 January 2007)

The content of the introductory statement about Yakult contains a series of declarative statements: our little bottle, full of good bacteria etc. Each of which can be examined individually in order to raise questions about what else in the world such concerns relate to. The following is a prospective analysis, and not one that necessarily can be verified without further examination – rather the discussion demonstrates probiotics little bottles emerge in a world that may be seen to be already complex and full (Bingham, 2006).

The little bottle: both Yakult and Danone, as the biggest players in the probiotic drinks market in the UK, have used the unique packaging as a key element of their marketing strategies and the use of ‘daily-dose’ formulas has been cited as

key element of the success of probiotics; as well as other goods packaged in little bottles (Mattila-Sandholm et al., 2002). The appeal of a little bottle may lie in convenience of a single serve, but it also accords with a language more common in the medical sphere in advocating particular dosage levels, taken regularly, as a means to achieve a health outcome. The little bottle may in fact, appeal to both a regime of truth in its medical guise, and exist within a regime of hope in aligning with a contemporary concern for convenience. Put another way, the little bottle is not the same thing if entangled in regimes of hope or of truth. The qualities of the little bottle are different in an ontological sense, changing in different regimes and settings.

Good bacteria: 'good' and its obvious opposite 'bad' create an all-too simplistic image of right and wrong that belies any question of complexity that is so much a feature of the biomedical investigation of probiotics and their variable effects. Though all too black and white, the appeal in marketing may not be about probiotics per se, but rather lie for example, in a new awareness that not all bacteria have negative health effects. Such a shift in thinking may in turn have been precipitated by concerns about anti-microbial resistance and the over-use of antibiotics and public health campaigns to raise awareness of the issue (Department of Health, 2000). Though we do not wish to make the claim that probiotics are successful because of public awareness of anti-microbial resistance, awareness of both has certainly risen in the same time frame – perhaps warranting further investigation of a link.

Help digestive system, better natural defences: There is strong association between probiotics and securing the body against that which is outside using individuals'

seemingly innate immunity. The contemporary concern with personal security has resonances with the threats not only to individuals, but to nations as a whole. The global threat of terrorism, biological warfare and so on, provide as Brian Massumi suggests, a 'background hum of anxiety' that pervades every aspect of human activity (Massumi, 1993). The notion of 'balance' is another element commonly invoked in the advertisements for probiotic little bottles: 'restoring balance', 'maintaining balance' and in general, reordering relations between humans and their internal flora. Balance, like immunity, functions as a metaphorical device associated with inside and outside, self and society. However consider the following statement from one probiotic company: "As we all try to juggle increasingly hectic lifestyles, it's often difficult to maintain a healthy diet": here balance refers to lifestyle factors and their influence on diet. In this view, consuming probiotics may be part of the solution to imbalances in lifestyle – and ones that can be remedied not by changing lifestyle practices, but by adding new elements to the diet.

Simple: A magic bullet? The marketers do not explain why Yakult or probiotics should be regarded as simple and unambiguously good for health, but they do offer a method by which to accept this simple 'truth'. The paragraph tells the story of Dr Shirota, a man who we should believe in because as 'they' suggest, they do. The product is marketed through appeals to authenticity derived from the portrayal of an eminent scientist and founding figure – a man that embodies a regime of truth.

In short probiotics establish a new foundation upon which to measure health and through which to establish hope and truth about them; in particular through the notion of the body in imbalance. The 'truth' that is established is of a new kind of acceptance that however much harmony bodies are capable of, the essential disharmony of modern living renders us unable to live without added health. One question arising from the consumption of probiotics is then what kind of subjectivities does this give rise to? Isin (2004) has argued that such disharmonies are symptomatic of the emergence of a new kind of 'neurotic' subject: "while on the one hand neurotic subjects are incited to manage their anxieties by adjusting their conduct, they are also incited to administer themselves with pharmaceutical interventions without making adjustments to conduct"(226). The neurotic subject of probiotic consumption feeds within regimes of hope that are in turn, fed by appeals to regimes of truth.

Discussion and conclusion: on hope truth and geography

We have not implicitly discussed how geography might be used to think about regimes of hope and truth, however by dividing our discussion into three sections that detail different aggregations of actors we have located them differently and found similarities in each aggregation in the ways that hope and truth play out. Brown(2006: 4) observes that "uncertainties become less visible the further one travels in space and time from the material messiness of the bench" and that for this reason, regimes of hope and truth might be thought of as spatially and temporary patterned. The public acceptance of probiotics does seem to provide an example where distance from the bench erodes the messy

uncertainties about the 'truth' of them: and almost entirely. However in our view it is more than distance from uncertainty that may be considered in this spatial patterning; we observe that the *form* of parasitic relation between regimes of hope and truth are also spatially patterned.

The observation of Tannock, raised in the introduction, that probiotics may be consumed as an 'article of faith' in the supermarket, provides a clue that the subject constituted by and within spatial regimes of hope and truth as the lynchpin of the kinds of parasitism that emerge. The promissory abstractions of simplicity, immunity, self-defence, well-being and so on, are premised on the subject being situated outside biomedicine. In contrast, while the articulation of the relationship between regimes of hope and truth may be shifting within biosciences, the subject still maintains the 'self' through a regime of truth – as suggested, there is no place for promissory abstractions in the laboratory. Put another way, there is no place for a new kind of subject constituted within regimes of hope within the laboratory.

In our examination we have considered how the notion of regimes of hope and truth might be useful for thinking about how different aggregations of actors engage in a controversy about the biovalue of probiotics. We conclude that focusing only on the object of our investigation, probiotics, is not sufficient to explain where the promise of probiotics resides. Using the example of company advertising about them we sought to uncover some plausible, though untested, reasons that regimes of hope and truth apply to much broader concerns than

simply the development of the innovative product itself. For us, the development of probiotics is symptomatic of the new spatial formations common to contemporary public health: the supermarket and home as more than places where food gets bought and prepared, but where ideas about health and illness are increasingly reside. We concur with others that there is a spatial patterning to regimes of hope and truth, but suggest new approaches are required to consider the significance of shifting balance between the articulation of truth and hope and its spatial patterning.

In practical terms, our examination of probiotics provides some further insight into their marketing success, also suggesting there is more to their appeal than particular health gains. Probiotics articulate a range of contemporary discourses about health that include those from within biomedicine, but also in terms of a public health focus on lifestyle and the cultural appeal of healthism; amongst other less easily identified values and aesthetics. Their appeal is multifarious and complex. The category of functional foods appears to conflate health with evidence based medicine and offers a range of new products for consumers in these terms, however the success of probiotics in relation to other functional foods provides some indication that probiotics articulate more than 'simply' biomedical concerns.

Finally, we raised some concerns about the new subjectivities that emerge from these discussions. In our analysis the biomedical subject remains one driven by rational enlightenment thinking, despite the new salience of hope in driving

innovations forward within the laboratory. However the consumer does appear differently - forged through an expectation of disharmony.

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