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Yates, Allison

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# WHEN BACTERIA GET GOOD

## Progress, Purity, and the Making of Probiotics

### SURF Conference Panel Session 4A

By: Allison Yates

Mentor: Professor Cori Hayden, Anthropology

The amount of microbial and bacterial cells in the human body—the cells of so-called “nonhuman” organisms—actually outnumber the amount of human cells known to make up our bodies by a ratio of approximately ten-to-one.<sup>1</sup> The past decade has seen a rise in scientific projects that explore the characteristics and significances of these non-human cells and genes.<sup>2,3,4,5</sup> Research that maps out the microscopic environments, or microbiomes, of the human body through genetic sequencing are beginning to have major scientific and philosophical consequences.<sup>6</sup> The idea that a human body, that our skin and insides, are separate and isolated from the environment around us is collapsing. Our bodies are more non-human than human.

My research project focuses on one aspect of science on the human microbiome: the microorganisms that are said to nourish the complex non-human ecosystems inside of us. These microorganisms are called *probiotics*.<sup>7</sup> Typically probiotics are taken in supplement form, or within

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1 Melinda Wenner, “Humans Carry More Bacterial Cells than Human Ones: Scientific American.” *Scientific American*. <http://www.scientificamerican.com/article.cfm?id=strange-but-true-humans-carry-more-bacterial-cells-than-human-ones>, November 21, 2012.

2 Makedonka Mitreva, “Structure, Function and Diversity of the Healthy Human Microbiome.” *Nature* 486 (2012): 207–214.

3 Steven R. Gill et al., “Metagenomic Analysis of the Human Distal Gut Microbiome.” *Science* 312, no. 5778 (2006): 1355–1359.

4 Masahira Hattori and Todd D. Taylor, “The Human Intestinal Microbiome: A New Frontier of Human Biology.” *DNA Research* 16, no. 1 (2009): 1–12.

5 Turnbaugh, Peter J., Ruth E. Ley, Micah Hamady, Claire M. Fraser-Liggett, Rob Knight, and Jeffrey I. Gordon, “The Human Microbiome Project.” *Nature* 449, no. 7164 (2007). This project concluded in 2013.

6 Rosamond Rhodes, *The Human Microbiome: Ethical, Legal and Social Concerns*. Oxford: Oxford University Press, 2013.

7 Kingsley Anukam and Gregor Reid, “Providing Probiotics To Sub-Saharan Africa: Ethical Principles To Consider.” *Journal of Complementary and Integrative Medicine* 2, no. 1 (2005): 10–20.

yogurt, for a variety of purposes,<sup>8</sup> such as aiding digestion,<sup>9</sup> combating complications related to the overuse of antibiotics,<sup>10</sup> helping with yeast infections,<sup>11</sup> or replenishing the stomach after infection.<sup>12</sup> Many bacterial strains are isolated from the milk of certain mammals,<sup>13</sup> including, as I will later mention, humans.<sup>14</sup> My research question investigates how probiotics products, and the narratives about them, are discovered, imagined, and disseminated. Who is involved in the social and scientific politics of probiotics from the moment they are isolated in a laboratory to the day they appear on a shelf? With what authority are probiotics talked about? Who do these narratives serve and whom do they exclude? My methodology involved participant observation at a multidisciplinary probiotics conference, where I examined the intersections of scientific research, public policy, and corporate interests surrounding probiotics and conducted cultural analyses of probiotics advertising campaigns. This is a cursory survey of my data. Because of the preliminary nature of my research data as well for the maintenance of confidentiality, my informants will be kept anonymous.

I am compelled by explorations into the ways science literally and socioculturally produces things, or scientific objects.<sup>15</sup> My argument is that scientific objects such as probiotics do not spring “ready-made” from a Petri dish to the shelf, neutral to political processes.<sup>16</sup> Rather, the making of probiotics is a subjective process that involves specific persons, technologies, capital, and ideology, all embedded in a particular history. Narratives relating to nation, race, and gender have been identified in scientific discourse but are not often openly analyzed or critiqued within scientific venues.<sup>17</sup> In this paper, I will briefly outline some of the specific stories I find to be involved with the making of probiotics. In this paper, I will discuss two narrative findings that I noticed during my conference attendance at the 11<sup>th</sup> Meeting of the International Scientific Association for Probiotics as well as during my analysis of probiotics advertisements. I will discuss narratives of modernity and morality and conclude by considering these tropes in light of the potential for probiotics products that are genetically personalized for consumers.

I will conduct my analysis within the lens of science and technology studies, or STS. STS involves scholarship concerned with situating scientific information in social, cultural, historical, and philosophical contexts.<sup>18,19</sup> Because I am drawing from an STS background, I want to emphasize that I am not setting out to discover if probiotics are good or bad, effective or

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8 Mikki Meadows-Oliver and Vanessa Reid, “Use Of Probiotics In Pediatrics.” *Journal of Pediatric Health Care* 23, no. 3 (2009): 194–197.

9 Martin H. Floch and Walker W. Allan, “Advances In Clinical Use Of Probiotics.” *Journal of Clinical Gastroenterology* 42, Supplement 2 (2008): S45.

10 Shira Idit Doron, Patricia L. Hibberd, and Sherwood L. Gorbach, “Probiotics For Prevention Of Antibiotic-associated Diarrhea.” *Journal of Clinical Gastroenterology* 42, Supplement 2 (2008): S58-S63.

11 Jacqueline A. McGroarty, “Probiotic Use Of Lactobacilli In The Human Female Urogenital Tract.” *FEMS Immunology and Medical Microbiology* 6, no. 4 (1993): 251-264.

12 Meadows-Oliver and Reid, 196.

13 Rocío Martín, et al., “Isolation of Lactobacilli from Sow Milk and Evaluation of Their Probiotic Potential.” *Journal of Dairy Research* 76, no. 04 (2009): 418-425.

14 G. Sinkiewicz and L. Ljunggren, “Occurrence of Lactobacillus reuteri in human breast milk.” *Microbial Ecology in Health and Disease* 20 no. 3 (2008): 122-126.

15 Bruno Latour, “Do Objects Have History? A Meeting Between Pasteur and Whitehead in a Lactic Acid Bath.” *História, Ciências, Saúde-Manguinhos* 2, no. 1 (1995): 07-26.

16 Bruno Latour, *Science in Action*. Cambridge: Harvard University Press, 1987.

17 Donna Jeanne Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York: Routledge, 1991.

18 Sheila Jasanoff, *Handbook of Science and Technology Studies*. Thousand Oaks: Sage Publications, 1995.

19 Sandra G. Harding, *The Postcolonial Science and Technology Studies Reader*. Durham: Duke University Press, 2011.

ineffective. Rather, I want to understand the oftentimes-subtle processes that go into the creation of a seemingly neutral, scientific product.<sup>20</sup>

Anthropologist Charles Briggs explains that scientific researchers and the companies who market their products have a very specific mode of enabling public understandings of products.<sup>21</sup> Briggs describes the communication of these products as a form of storytelling that explains who should consume it and why they should consume it. These science stories typically cast the scientific inquiry in question as neutral, objective, and apolitical. He refers to such messages as “biocommunicable.” For Briggs, biocommunicability allows for subjectivities to be erased, or at least hidden, from view. In the tradition of STS, and Briggs’ work, I approach probiotics science with the assumption that there is no such thing as the objective scientific story. Biocommunicable stories are a simpler *version* of a more complex picture. Briggs argues that there needs to be a methodological accounting for more than the biocommunicable aspects of science: “How we perceive a medical object [...] is closely shaped by forms of authority that have shaped it...and how it has been shaped in such a way as to appeal to particular publics in particular ways.”<sup>22</sup> This critique of biocommunicable stories is the theoretical framework for my paper. My research works to pay closer attention to probiotics science in hopes of accounting for a more complex system of stories.

## I. Probiotics: A Modern Life

My first narrative finding is the notion of the modern. During an interview about the promotion of probiotics products, a prominent figure in world health remarked: “All we need is a narrative that goes with the grain of modern life.”<sup>23</sup> Although the notion of using fermented foods that are understood to possess beneficial organisms inside of them, i.e. probiotics, has appeared in medicinal systems for many centuries, this conference maintained a heavy emphasis on probiotics as a purely *modern* technology.<sup>24</sup> Although such an assumption of modernity can be practically justified—considering the fact that this conference was explicitly concerned with biomedicine—I find there to be symbolic consequences of such categorization. Scholars and activists in postcolonial studies and STS argue that descriptions of modernity often have the consequence of creating juxtaposition.<sup>25,26</sup> If some are modern, others are pre-modern. Moreover, the concept of the modern is often employed as a means to romanticize those who are rendered “pre-modern.”<sup>27</sup> For example, *Lactobacillus reuteri* is a strain of probiotics that, according to BioGaia, its global distributor, “was isolated from the breast milk of a woman living in the

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20 Lorraine Daston, *Biographies of Scientific Objects*. Chicago: University of Chicago Press, 2000.

21 Charles L. Briggs, “Biocommunicability—A Companion to Medical Anthropology,” In *A Companion to Medical Anthropology*, edited by Merrill Singer and Pamela I. Erickson. West Sussex: Wiley-Blackwell (2011), 459–476.

22 Briggs, 462.

23 Interview with public health official, New York City, NY, June 12, 2013.

24 M. E. Hume, “Historic Perspective: Prebiotics, Probiotics, and Other Alternatives to Antibiotics.” *Poultry Science* 90, no. 11 (2011): 2663–2669.

25 Arun P. Mukherjee, “Whose Post-Colonialism and Whose Postmodernism?” *Journal of Postcolonial Writing* 30, no. 2 (1990): 1–9.

26 Edward W. Said, *Orientalism*. New York: Vintage Books, 1979.

27 Tayyab Mahmud, “Colonialism and Modern Constructions of Race: A Preliminary Inquiry.” *U. Miami L. Rev.* 53 (1998): 1219.

Peruvian Andes, someone living in perfect harmony with nature.”<sup>28</sup> I find that such a campaign implies that the bodily resource of a more natural, less modern woman can work to nourish the system of a less natural, more modern consumer.<sup>29</sup> In the case of another probiotics product, one made by DuPont-Danisco, who was represented at the conference, Boston University’s Emily Contois points out that “notably all of [the advertisements’] toned tummies were and continue to be light skinned.”<sup>30</sup> I am compelled to further investigate how probiotics, an object signifying modernity in scientific discourse, gets coded as a product for predominantly white (modern?) bodies in American advertising campaigns. I found that at the conference, when the modern/pre-modern dichotomy was established, one group—the modern—was coded as superior with moral responsibilities to help the other.

## II. Probiotics as Moral Objects

Thus the next narrative that I found to be persistent throughout the conference was the idea that using probiotics (and providing them to those who cannot provide for themselves) is morally correct. After attending a talk entitled “*From Yoghurt to Vaccine for the Developing World*,” one interviewee stated: “Probiotics are morally correct; we are all here for the betterment of our fellow human beings.”<sup>31</sup> Certain probiotics strains have been found to prevent and treat gut and urogenital conditions, which are chronic and rampant in certain regions of Sub-Saharan Africa.<sup>32</sup> The “relative low cost and practical means” by which probiotics can be consumed—in a bowl of yogurt, for example—makes probiotics a feasible form of aid.<sup>33</sup> However, the actual provisioning of probiotics to these areas has not really taken place. One visiting scientist in the audience attempted to explain why probiotics are not being well integrated in Sub-Saharan Africa: “These people, ignorant in a way because of their own beliefs, sadly reject our lifesaving assistance.”<sup>34</sup> Postcolonial theorist Chandra Mohanty warns against the reductionist and dichotomous language used to describe individuals in the “third world” by juxtaposing them to Western subjects. She critiques, for example, the “production of the ‘third world woman’ as a singular monolithic subject.”<sup>35</sup> In such a representation, “third world women” are portrayed as “ignorant, poor, uneducated, tradition-bound...victimized, etc.,” while Western scientists are coded as intelligent, stable, progressive, and, in this case, morally obligated to transmit the lifesaving knowledge and products of Western science—even to those who do not want it.

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28 Biogaia Global, “BioGaia’s History.” Biogaia, <http://www.biogaia.com/biogas-history>, March 12, 2012.

29 Although there were multiple probiotics distributors present at the conference, I should note that BioGaia was not represented, and its campaign contents cannot be conflated with other discussions of modernity at the conference.

30 Emily Contois, “Toned Tummies & Bloating Bellies: Activia Yogurt & Gendered Digestion.” <http://emilycontois.com/2013/05/06/toned-tummies-bloating-bellies-activia-yogurt-gendered-digestion/> (accessed August 12, 2013).

31 Interview with conference presenter, New York City, NY, June 12, 2013.

32 S. W. Bickler, J. Kyambi, and H. Rode. “Pediatric Surgery in Sub-Saharan Africa.” *Pediatric Surgery International* 17, no. 5–6 (2001): 442–447.

33 Kingsley Anukam and Gregor Reid, “Providing Probiotics To Sub-Saharan Africa: Ethical Principles To Consider.” *Journal of Complementary and Integrative Medicine* 2, no. 1 (2005): 10–20.

34 Commenter during lecture by Gregor Reid, “*From Yoghurt to Vaccine for the Developing World*” (talk presented at the annual meeting for the International Scientific Association for Probiotics and Prebiotics, New York City, NY, June 12, 2013).

35 Helen M. Icken Safa, “Third World Women And The Politics Of Feminism: Chandra Talpade Mohanty, Ann Russo, Lourdes Torres.” *American Anthropologist* 94, no. 3 (1992): 748.

### III. From “bush to burb”<sup>36</sup>—Whose Guts Get to Count?

From my vantage point, probiotics products seemed to involve a different sort of market in the “developed” world. At the conference as well as in recent literature,<sup>37</sup> scientists have discussed the present and near-future possibilities of microbiome data use. Consumers who can afford screening, it is predicted, will have access to detailed, personalized information about their own microbiomes.<sup>38</sup> They will know what kinds of bacteria are growing in them and how to maintain positive bacterial environments by taking micro-genetically specified probiotics or changing diet and behavior. Although one speaker touched on the importance of “global access principles,”<sup>39</sup> I did not find there to be thorough public discussion of the disparities that could be created between those willing to pay more for microbiome data and those who not able to do so or about what “global access” really means and for whom.

### IV. Three Observations:

1. Narratives about “modern” technology at this event often privileged, perhaps unintentionally, the interests of scientists, public officials, and other experts as the knowledge producers. Conference lectures and panels did not account for other persons involved in the knowledge or product formation process itself, while BioGaiia’s ad campaign (troublingly) claims that other-than-modern persons were indeed involved in the original extraction of at least one probiotics strain. BioGaiia’s romanticizing of indigenous culture can be seen as an ethically dubious marketing strategy. None of my informants at the conference commented on this topic. While such a lack of commentary may be understandable given the parameters of this specific event—one interviewee said “such issues are not considered pressing topics to discuss”—other discussions of the “developing” world as recipients of aid did not appear to be irrelevant.<sup>40</sup>

2. Although multiple conference topics engaged with the possibility of using probiotics as health treatments or supplements in the “developing world,” at times I found there to be a lack of consideration to the power dynamics involved between “developed” researchers and “developing” aid recipients and the moralizing or dismissive rhetoric used to describe such relationships.

3. Conference speakers discussed findings on the human microbiome, hypothesizing that microgenetically personalized products will be seen in American and European markets

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36 This is the title of the American Gut Project’s (AGP) blog found at <http://humanfoodproject.com/ancestral-microbiome>. The project describes itself open sourced alternative to the NIH’s Human Microbiome Project. The blog is entitled “From Bush to Burbs: Ancestral Microbiome.” In it, the AGP often refers to “the guts of our ancestors” as well as the guts of one of its sample populations, Hadzabe hunter-gatherers around Lake Eyasi in Tanzania, all who are said to live in closer proximity to nature, dirt, and bacteria – and have healthier guts because of it. In a forthcoming paper I will examine the merits of the AGP while troubling its romanticizing (as well as supporter and gut-sample contributor Michael Pollan’s romanticizing) of indigenous, non-Western diet and behavior.

37 Maneesh Dave et al., “The Human Gut Microbiome: Current Knowledge, Challenges, and Future directions.” *Translational Research* 160, no. 4 (2012): 246–257.

38 James M. Kinross et al., “The Human Gut Microbiome: Implications for Future Health Care.” *Current Gastroenterology Reports* 10, no. 4 (2008): 396–403.

39 Conversation with conference presenter, New York City, NY, June 12, 2013.

40 Interview with conference presenter, New York City, NY, June 12, 2013.

within the next few years.<sup>41</sup> There was not a thorough consideration of how economically contingent access could reinforce disparity. It is quite possible that such topics were outside of the scope of this event.

## V. Making Microbiomes

Information about human microbiome maintenance is becoming a hot topic. Michael Pollan recently published a piece about human microbiomes,<sup>42</sup> the Human Microbiome Project concluded this year and posted its results online, and a new open source alternative to the NIH project called the American Gut Project aims to democratize access and understandings of microbiome science.<sup>43</sup> The \$30 billion probiotics industry is predicted to expand in response to new consumer demand for probiotics products that are person-specific down to the genetic microbiotic level.<sup>44</sup> My concern is that as these realms of scholarship and consumerism take root and expand, biocommunicable stories that appear to objectively convey all aspects of probiotics will actually convey only a very *particular* picture of the world, one that invokes Western narratives of modernity and morality, and one that may only benefit a select group of people. Biocommunicable stories about probiotics travel through researchers eventually to consumers—and issues of race, nationalism, and class are not a part of these stories—or, at least, they are not carefully considered. I argue for a close analysis of what Bruno Latour calls “science in the making.”<sup>45</sup> When we look at scientific research before it is has become widely-accepted, unquestioned knowledge, we get to see something in process. We get to become attuned to a more complex picture of the world, and we can allow for interventions in order to deeply trouble biocommunicable notions. This paper strives to highlight narratives that I detected during my time at the conference as well as aspects of probiotics marketing that, as far as I have understood, are not widely discussed. I present my argument that probiotics are socially and politically produced not to diminish the pioneering and powerful findings of microbiome science at large. Rather, I want to find a way to embrace these radically reorienting scientific findings *without* losing hold of complex notions of social justice. As microbiome research expands the very boundaries of what it means to be human, we cannot cease to trouble the subjectivities and systems that make the notion of the human—especially the modern, moral human—in the first place.

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41 Jeremy K. Nicholson, Elaine Holmes, and Ian D. Wilson, “Gut Microorganisms, Mammalian Metabolism and Personalized Health Care.” *Nature Reviews Microbiology* 3, no. 5 (2005): 431–438. See also Rizkallah, Saad, and Aziz (2010).

42 Michael Pollan, “Some of My Best Friends Are Germs.” *New York Times*, May 15, 2013.

43 “American Gut.” Human Food Project RSS, <http://humanfoodproject.com/americangut/> (accessed May 14, 2013).

44 PRWeb, “Global Probiotics Market is Expected to Reach USD 44.9 Billion in 2018: Transparency Market Research.” <http://www.prweb.com/releases/2013/8/prweb11034618.htm> (accessed October 4, 2013).

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