

# **Yogurt, ‘Dahi’ and Probiotics: The Origins of Nutraceuticals and Biomedical Translations of Indigenous Foods**

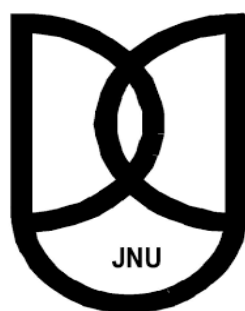
*Dissertation submitted to the Jawaharlal Nehru University*

*in partial fulfilment of the requirements*

*for the award of the degree of*

**MASTER OF PHILOSOPHY**

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**New Delhi 110067**

**2018**



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Date: July 20, 2018

**DECLARATION**

I declare that the dissertation titled “Yogurt, ‘Dahi’ and Probiotics: The origins of Nutraceuticals and biomedical translations of indigenous foods” submitted by me in partial fulfillment of the requirements for the award of degree of **Master of Philosophy** is an original research work and has not been submitted so far, in part or in full, for any other degree or diploma of any University/Institution.

**GURKIRAT KAUR**

**CERTIFICATE**

This dissertation entitled “Yogurt, ‘Dahi’ and Probiotics: The origins of Nutraceuticals and biomedical translations of indigenous foods” submitted by Gurkirat Kaur to the **Centre for Study of Social Systems, School of Social Sciences, Jawaharlal Nehru University, New Delhi** for the award of the degree of **Master of Philosophy**, is an original work and has not been submitted so far, in part or in full, for any other degree or diploma of any University/Institution.

We recommend that the dissertation be placed before the examiners for evaluation.

**(Chairperson)**

**Prof. Harish Naraindas**  
(Supervisor)

*Dedicated in memory of my loving brother,  
Gurmehar.*

*Thank you for always looking out for me.*

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## ***ABBREVIATIONS***

<b>CAM</b>	Complementary and Alternative Medicine
<b>DBT</b>	Department of Biotechnology
<b>DCA</b>	Drugs and Cosmetics Act 1940
<b>FDA</b>	Food And Drug Administration
<b>FICCI</b>	Federation of Indian Chambers of Commerce and Industry
<b>FMCG</b>	Fast Moving Consumer Goods
<b>FSA</b>	Financial Services Authority
<b>GAIN</b>	Global Alliance for Improved Nutrition
<b>GRAS</b>	Generally Recognized as Safe
<b>IJRA</b>	Indian Journal of Research In Ayurveda and Pharmacy
<b>IJT</b>	Indian Journal of Traditional Knowledge
<b>IKS</b>	Indigenous Knowledge Systems
<b>LAB</b>	Lactic Acid Bacteria
<b>NDRI</b>	National Dairy Research Institute
<b>NIHFW</b>	National Institute of Health and Family Welfare
<b>NRC</b>	National Regulatory Commission
<b>PAI</b>	Probiotic Association of India
<b>PFA</b>	Prevention of Food Adulteration Act 1954
<b>WTO</b>	World Trade Organization

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**CHAPTER ONE**  
**INTRODUCTION**



## **1.1**

### **RESEARCH PROBLEM**

*“Scientific expertise is increasingly called upon to alleviate the effects of earlier applications of science.”*

*- Risk Society: Towards a New Modernity, Ulrich Beck (1992)*

The ‘*Nutraceutical Revolution*’ - as referred by Dr. Stephen De Felice, the founder of the term ‘*nutraceutical*’ in 1989, could be a perfect example of what Ulrich Beck was trying to imply by his abovementioned statement. By the 1990s modern society had begun to assess the ‘risks’ and dangers posed by scientific and technological developments. A rise in chronic *lifestyle diseases* was posing severe challenges to biomedical models of healthcare. The efficacy of pharmaceutical drugs was being increasingly questioned on the basis of its side –effects and toxicity. In such a scenario, coining the term nutraceuticals was an intelligent move on part of the bioscientific community. Felice, as cited by Mannion M. (1998) designed the term ‘nutraceuticals’ to harness and organize the scattered potential of alternative forms of medicine such as dietary supplements, herbal and health foods. The agenda was to promote their ‘naturalness’ and ‘safety’ as they were developed through scientific experiments on food/food sources. Attempts were made to position nutraceuticals in opposition to the chemical, biomedical drugs by placing them closer to food. Under the umbrella term ‘nutraceuticals’, these products were promoting ‘prevention’ of disease rather than looking for treatment. Therefore, nutraceuticals were being posed as the magical solution to alleviate the harmful effects of earlier applications of science.

The product categories encompassed under nutraceuticals have been used under varying contexts and forms earlier. For example, in 1907, the Russian immunologist Élie Metchnikoff discovered the health benefits of Bulgarian sour milk (an indigenous fermented milk based food, locally referred as *kiselo mleko*) and scientifically isolated beneficial strains of bacteria from it to promote health and longevity. Although Metchnikoff's discovery faced much criticism to die a slow death, today the entire yogurt industry promotes their product as a health-food, based upon Metchnikoff's discovery. This scientific discovery was carried out more than a century ago, before Werner Kollath, introduced the concept of probiotics in 1953. Probiotics developed in the form of functional foods/beverages and food supplements, build an important nutraceuticals sub-category. Therefore, if we examine genealogically, we observe the existence of a similar concept such as 'nutraceuticals', before it begun to dominate the modern day discourses on food, medicine, healthcare and nutrition. When similar biomedical developments have been proven unsuccessful earlier, the task of their revival under the conceptual category of nutraceuticals poses many questions and invokes critical thinking. I argue that these issues can only be addressed through a comparative historical analysis regarding the development of these products.

The process of developing nutraceuticals involved active participation of the food industry, as Felice (1995) pointed. Food manufacture had to become scientifically research oriented, to discover natural foods as repositories of therapeutic and health promoting properties. This kind of biotechnoscientific activity required turning towards indigenous cultures and dietary systems, in order to locate their research 'objects' and provide scientific evidence for their efficacy. Following the dominant discourse on bio scientific nutrition, experts from the field extract 'beneficial'

micronutrients from traditional foods to obtain isolates for developing a wide range of nutraceutical products.

In regard to these processes, through this dissertation I argue how such kind of biomedical and technoscientific developments are problematic. Firstly, the term ‘nutraceuticals’ is a wide and ambiguous category. Scientific scholars, industrial experts and various State authorities, all across the globe are still trying to define the limits and scope of this concept. Keeping all these varying interpretations in mind, I propose that we also need to critically re-examine ‘nutraceuticals’ a conceptual category under the field of STS studies. In this regard, I emphasize a special focus on India, as the Indian nutraceuticals industry is currently expected to grow at a fast pace of estimated 21 percent growth rate, from USD 4 billion in 2015 to USD 10 billion by 2022 (ASSOCHAM, 21:2017). According to data published by the WHO, the NIHFW noted that 70 percent Indians suffer from micronutrient deficiencies, as they consume less than 50 percent of the recommended dietary allowance (RDA), leading to chronic ailments like diabetes, cancer, obesity, cardiovascular disorders etc. In response to this, FSSAI launched a large scale drive in November 2016, encouraging fortification of certain foods. The list of these foods included milk, edible oil, wheat flour, rice and salt, to be fortified with iron, folic acid, Vitamin B12, A and D, zinc and other micronutrients. This campaign was based on a ‘molecular understanding of food’ (Rose N., 2006), an approach followed in development of nutraceuticals. Efficacy of foods is determined through the ‘functional’ micronutrients it contains. In turn the body is also determined as healthy or dysfunctional in terms of the intake of daily nutrient requirements. I find these ideas problematic, in this way nutraceuticals like these fortified foods would not make the society less dependent on biomedical knowledge, which was the earlier stated objective behind their development.

Throughout this work, I would analyze how nutraceuticals are not the alternative as ‘perceived’ and promoted for getting rid of biotechnoscientific risks. Rather, these are themselves a result of the political nexus between biomedicine and food-pharma industry, which are prime sources of the ‘risks’ in modern society.

I also contend, that the manner in which nutraceuticals promote health and nutrition by stressing upon the micronutrient research on indigenous foods, undermines trust in the traditional expert and non-expert dietary systems of food, health and nutrition. Instead of reducing our dependence on biomedical health and nutritional experts, nutraceuticals are themselves a part of this knowledge system strengthened by the industrial investments. So, in perception an individual might feel that his/her dependency upon biomedicine is getting reduced and now they get to be in charge of their own personal health, in reality this is not the case. The nutraceuticals agenda constructs a ‘*nutritional facade*’ (Sycronis G., 45:2008). Under this process, nutraceutical products are marketed and promoted as ‘natural’, ‘safe’ ‘closer to food’ as binary opposites of pharmaceutical drugs, which are ‘artificial’ and ‘toxic’. The *homogenized toned milk* from Mother Dairy, *fortified with vitamin A* is sold as a functional food (a nutraceuticals sub-category). The product mentions that it promotes ‘*good complexion*’ (sic) and prevents the disease of ‘*night blindness*’. Mother Dairy also sells another probiotic/functional food as ‘*Advanced Dahi*’, which contains *BB-12 (Good bacteria)* to support gut health and assists in the absorption process of nutrients. The dairy company suggests that ‘*good bacteria*’ helps in combating “*bad bacteria*” present in our body and protects us against various infections. Through this example, we clearly see how indigenous foods such as milk and *dahi* are translated into biotechnoscientific products, altering our existing knowledge surrounding these

foods. The company promotes these nutraceutical products as ‘better’ ‘scientific’ versions of food, consumption of which could prevent us from the use of any biomedical drugs (sic). The milk given in the example above is broken down into its component ‘functional’ parts i.e. micronutrients such as vitamin A, which is assigned a specific health function to prevent night blindness. This approach is actually similar to the way biomedical drugs are supposed to operate in the body, targeting a specific disease. The traditional consumer of milk is unequipped with this kind of expert scientific knowledge. In such a scenario, the individual starts to suspect his/her existing base of knowledge on food, which could have been passed to him through the non-expert domain, like old women in the household or also traditional ‘expert’ domains on food and nutrition such as Indian Ayurveda, or it could even be a combination of the two. Newspapers, magazines, social media channels, advertisements are the ‘new experts’ for this confused modern individual, who may also sometimes turn to biomedical doctors or nutritionists in need of scientific advice on food. Dashma Wadhvani, a 38 years old businesswoman says,

“I made slight alterations in my shopping choices after a consultation with my dietitian, who spoke in favor of fortified foods. I always try to get milk and milk products fortified with Vitamin D as veegntarians otherwise miss out on this important nutrition” (Kaul and Sinha: 2017).

This expression clarifies how the ‘new expert’ sources circulate popular scientific knowledge, which might be far from the actual bioscientific logic behind the use of any nutraceutical products. Also, due to lack of sufficient in vivo tests on many nutraceuticals, traditional biomedical experts (doctors, nutritionists) often have a lack of consensus over their promotion in opposition to their business marketing models.

For example, Richa Anand, chief dietician at Mumbai's Hiranandani Hospital says,

“People often think if it's vitamin-fortified juice, they can have as much as they want...also everyone doesn't need every fortified juice out there. If you are not deficient in a certain vitamin, you may as well not pay extra for enriched juice” (Kaul and Sinha: 2017).

This statement obviously does not promote nutraceuticals in the way food-pharma industry would like to, but it still lays emphasis upon the biomedical model of nutrition, evaluating food in terms of its micronutrient components.

Overall, nutraceuticals are increasingly producing overwhelming scientific evidence from indigenous foods based in traditional dietary systems without taking the emic view into account. This biotechnoscientific connection between diet and specific health benefits for chronic diseases is stated as an established condition without any attention to its actual processes of construction (Hasler, 2000). Ironically, more often than not, the 'other' epistemic systems are a site, a knowledge-source for extraction of select information that goes into the formation of these products.

## **1.2**

### **SOCIOLOGICAL RELEVANCE**

As an object of enquiry, the concept of nutraceuticals appears closer to bioscientific jargon. Medical laboratories are commonly viewed as the ideal site to conduct research on nutraceuticals, as the word itself is a compound of nutrition and drugs.

But, Science and technology studies (STS) have been active in demonstrating that there is no obvious line between scientific concepts and social issues. By drawing a binary between the social and the scientific-material realm, we leave many such relevant arenas and critical themes unexplored. “It is by exploring scientists, research materials, knowledge and following processes through which the spatiality of science expands to unexpected realms into the society” (Latour, 1988). Through this approach, we can certainly justify the transfer of a research object like nutraceuticals into the disciple of sociology.

I suggest that the sociological relevance of this research theme can be gauged from numerous concerns it evokes about the relationship between bio-technoscientific developments like nutraceuticals and the changes it brings about in the society on various levels. A few of these include bio-medicalization of everyday life, biotechnoscientific translations of indigenous foods, changing perceptions around traditional knowledge on food, nutrition and healthcare, epistemic mangling, asymmetry and contestations in varying fields of knowledge.

Most research conducted on the theme of nutraceuticals is restricted to their bioscientific development or defining the concept and its various sub categories for regulatory, marketing and business purposes. Very few sociological studies have critically engaged with the concept of nutraceuticals as the title theme, especially in India. Street A. (2014) critically engaged with the process of marketing nutraceuticals to the rural poor in India from a critical public health perspective. This study is conducted from the vantage point of political economy and food industrialization like many others (Holm, 2003; Hess, 2004; Sibbel, 2007).

Many sociologists have engaged with only limited product sub-categories such as functional foods under nutraceuticals, without referring to the term itself. Hyomin K. (2011) examines the connection between rising demand for functional foods and changing consumer behaviors. Through the use of the 'functional food' category, previous sociological works (DuPuis: 2000; Goodman & DuPuis: 2002; Rose: 2003; Hess: 2004; Sibbel: 2007) introduce the themes of perceived health risks in reflexive modernity, food industrialization and the understanding of human bodies in molecular terms. Some sociologists in the West, (Murdoch, Marsden, & Banks: 2000; Goodman & DuPuis: 2002; Holm: 2003) have categorized the use of functional foods as a tendency to move away from traditional wisdom in an industrialized world, focused on isolating a bioactive component from whole foods. A.H. Kimura's (2013) "*Hidden hunger: Gender and the politics of smarter foods*", helps in understanding the popularity of Nutraceuticals in a market dominated political sphere. Kimura argues, "Nutritionism – the reduction of food to its nutritional qualities has shifted authority over food production and consumption from a domestic to scientific domain (Kimura, 2013)." "It is suggested that the introduction of Nutraceuticals is associated with a growing concern with the 'risks' of living and the fostering of individual responsibility for managing the risk of chronic disease (Kim, 2012)." The medicalization<sup>2</sup> of food is problematic in many ways as suggested by Lawrence, M. & Germov, J. (2008). According to Lawrence, M. & Germov, J. (2008), "Genetic and lifestyle differences make it difficult to predict the effect of diet on the health of individuals and thus universal health claims for functional foods are meaningless and exaggerate the diet–disease link. Individual foods do not prevent or cause a disease. This calls for application of the social model of understanding food-nutrition



problems.” Understanding of natural foods is increasingly mediated by bio-scientific knowledge and practices at molecular level or what Rose has termed as the “molecular gaze” (2006, p. 108).

It is partly due to the nebulous nature of the concept of nutraceuticals that many sociologists have yet not dealt with the question of why behind these processes through which social contexts interact with functional-foods-related bioscientific research. Very little research has gone into explaining the process behind the genesis of this concept and critically understand the overlaps with previous similar concepts process influenced by the larger structures of society and institutions of power situated within particular discourses. The creation of any such categories, such as nutraceuticals is to be understood as processes in relation to production of knowledge in asymmetrical social structures.

### **1.3**

#### **RESEARCH OBJECTIVES**

- To sociologically understand the reasons behind the development of the term ‘nutraceuticals’ as a conceptual category.
- To genealogically trace the processes that underwent in the biomedical translation of Bulgarian yogurt into probiotics.

- Critically analyze the ongoing bio-scientific research being carried in India for developing probiotics from indigenous *dahi*. Also note the differences in the biomedical and Ayurvedic conception of dahi.

#### **1.4**

#### **RESEARCH QUESTIONS**

- How are nutraceuticals conceptually different from similar products that have existed previously? If not, what are the various reasons behind introducing this new concept under the biomedical discourse on healthcare and medicine?
- How did indigenous fermented foods, specifically Bulgarian yogurt get translated into a biomedical product for healthcare? How did this biomedical translation aid to the development of the concept of probiotics today?
- What are the current bioscientific processes that are going on for the development of probiotics in India? What is the difference between the biomedical and Ayurvedic conception of dahi?

## 1.5

### **RESEARCH METHODOLOGY**

The task of critically engaging with a concept surrounding a vast range of ambiguity around it like nutraceuticals has been quite daunting. In order to deal with a multilayered category like this, the research approach needed to be cross-disciplinary. This conceptual category is spread across various fields such as medicine, healthcare, nutrition, food, bio scientific-technology and industrial economy. Due to this reason, one can face the challenge of picking among several research approaches that could seem equally exciting and overlapping.

Keeping all these factors in mind, I decided to narrow down my focus to the field of STS studies for writing this dissertation. This particular field of study enabled me to situate the existing industrial-scientific discourse on nutraceuticals within the society, to understand how they were shaping and affecting each other mutually. STS equipped my curiosity with a research lens of reflexivity, through which no established 'absolute' 'objective' truths surrounding nutraceuticals needed to be taken as a given. An established form of biotechnoscientific knowledge projects nutraceuticals as a revolution in the field of healthcare and nutrition, STS studies allows spilling beyond disciplinary boundaries, which is important to deconstruct a concept like such.

I have divided this dissertation into three core chapters, each following a qualitative approach, separately or in combination. In the first chapter, I critically engage with literature and research work ranging from scientific publications, laboratory reports,

marketing reports, policy reports to media articles, business guidelines, legal and regulatory documents. Each unit from this multidisciplinary secondary literature has dealt with the limits and scope of nutraceuticals and its sub-categories. These sources made it very comprehensive for me to engage with nutraceuticals as a conceptual category through the lens of STS studies. In order to understand the socio-economic and political development of nutraceuticals, I conduct an analysis of the current biomedical and nutritional discourse. For this purpose, I engage with academic material available on various theories of nutrition in the field of biomedicine and social sciences. The second core chapter is an attempt to decode the genesis of nutraceuticals, with focus on the category of probiotic foods/functional foods, (a sub-category in nutraceutical products) specifically probiotic yogurt. Therefore, I follow a genealogical approach to conduct a historical analysis for tracing the origin of the biotechnoscientific conception of yogurt, which was historically an indigenous food item. In the last chapter, I explore the differences between two different epistemic domains in their logic on understanding dahi (a traditional fermented food popular in the Indian subcontinent), these are the bioscientific and the Ayurvedic systems of knowledge. In order to study the biotechnoscientific translation of dahi into a probiotic food, I conduct a comparative analysis with the help of ancient text sources of Ayurveda like Charaka Samhita and Sushruta Samhita. I also engage critically with various research articles published in various scientific journals on ancient Indian foods and traditional medicine, Ayurveda, dairy science, online articles on probiotic foods, allied sciences and integrative medicine, official reports from state organizations such as ICMR-DBT.

Finally, I examined not just scientists' narratives and published scientific research materials. I have also observed social media texts/images circulating images and messages relating to health and new health products, current nutraceuticals launched in local markets, and consumers' accounts observed through the Internet for a contemporary take on the topic of nutraceuticals.

## **1.6**

### **OUTLINE OF CHAPTERS**

#### **1.6.1**

##### **CHAPTER ONE**

The first chapter deals with nutraceuticals as an evolving conceptual category, where I attempt to critically analyze its various definitions and meanings provided by biomedical community, regulatory bodies and business organization. The objective in this chapter is to sociologically understand the reasons behind the coining of the term 'nutraceuticals' and situate the development of these products within the shift in the biomedical discourse towards preventative medicine and the growth of micronutrient approach towards food. I also attempt at looking at various similar products that are now referred as nutraceuticals and were scattered categories prior to the advent of the term. I will try to explain how the differences and overlaps among nutraceuticals and its major sub categories including food supplements and functional foods is

problematic and how various social actors along with the capital provided by the food-pharma industry aid to the growth of this concept.

### 1.6.2

## **CHAPTER TWO**

The second chapter focuses upon a genealogical approach to trace the development of what we today understand as 'probiotic yogurt. Numerous publications of clinical studies on the efficacy of probiotics have brought a renewed scientific perspective at traditional food products such as *dahi/yoghurt*. According to Hajela N et al. (2014), "*Probiotics are defined as live microorganisms which, when ingested in adequate amounts, confer health benefits on the host*". Chronic diseases such as diabetes, non-alcoholic fatty liver disease, coronary artery disease, a variety of chronic inflammatory disorders with an immune basis, and some forms of cancer are increasing in incidence around the world and in India, and attributable in part to rapid changes in our lifestyle. Scientific research suggests that usage of probiotic nutraceuticals in the form of supplements, foods or beverages is evident to ameliorate chronic lifestyle diseases.

In the current discourse on nutrition, Dr. Elie Metchnikoff is considered as the founding father of scientific yogurt. He carried out the first scientific application of yogurt in order to develop a cure against ageing and early death. Unlike the probiotic yogurt today, consumption of which is a preventative measure to avoid disease, Metchnikoff's yogurt was regarded as a therapeutic medicine for treatment of disease. Hence, Metchnikoff's yogurt was treated as medicine to cure disease, whereas

probiotic yogurt (nutraceutical) is a medical-food suggested for consumption in order to prevent disease. This chapter urges the reader to not analyze “bio- technoscientific breakthroughs” in isolation from their historical context, nor from the sources where particular scientific knowledge is derived from. By situating biomedical discoveries in a wider social, economic and political framework, we shall be able to locate the growing sense of emergency in demanding products such as probiotic yogurts for healthcare and prevention of disease.

### 1.6.3

#### **CHAPTER THREE**

In this chapter, I shall investigate how the Western bio scientific research practices for developing nutraceuticals are being transferred to India, altering the indigenous knowledge about traditional foods items. For this purpose, I am using the nutraceutical sub-category of probiotics that are most commonly available in the form of functional foods and beverages. Through using the example of *dahi* as a traditional fermented food in India, I explain how bio scientific research is translating traditional meanings associated with this food item into the logic of techno scientific advanced functional foods commonly sold by the name of probiotic dahi/curd/yogurt. This translational activity is being carried out through rapid scientific research on various types of Indian foods items identified for their role in maintaining good health and therapeutic qualities.

Further, I try to map the differences between the Indian Ayurvedic and Western Biomedical conception of dahi to identify how scientific translations of traditional

dietary systems and foods, rip them off their original theories underlying their use. I also address how nutraceutical products like probiotic dahi use the ancient ideas (listed in ancient systems of healthcare like Ayurveda) about therapeutic advantage of foods like *dahi* (, only as a pre-scientific evidence for promoting themselves as ‘safe’ and ‘natural’. I conclude by suggesting that the attempts made by bio scientific research, nutraceutical industry and government agencies for developing an ‘integrative’ approach to healthcare through isolation of nutrients from indigenous food sources not only renders the logic behind their usage as subservient to the West but also creates distrust in traditional dietary practices.



**CHAPTER TWO**

**A SOCIOLOGICAL EXPLORATION OF NUTRACEUTICALS  
AS A CONCEPTUAL CATEGORY**

## 2.1

### **INTRODUCTION**

This chapter is a critical analysis of the nebulous scientific arguments and various biomedical, industrial and regulatory explanations presented to define the term ‘nutraceuticals’ as a conceptual category. I am also going to look at various constituent categories that fall under the umbrella term of nutraceuticals. Globally, these categories can be broadly classified into food/dietary supplements, functional foods and functional beverages. A Comparative analysis among all these categories shall help us map a transition from similar products employed earlier for health purposes. For example, fortified bread (1960s), cod liver oil gel capsules (1970s), which can now be classified under the scope of nutraceuticals. In a brief section, I also attempt to understand nutraceuticals as a conceptual category in India from varying standpoints.

Further I try to locate the origin of the term, in context with the significant changes taking place in the biomedical discourse over healthcare and nutrition. For example, shifting biomedical orientations from curative to ‘preventative’ healthcare<sup>1</sup> and increasing focus on dietary therapy for healthcare. The rise of nutraceuticals as a biotechnoscientific category is assessed in terms of the various bioscientific and

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<sup>1</sup> Preventative healthcare (alternately as preventive medicine, preventative healthcare or prophylaxis) consists of measures taken for disease prevention, as opposed to disease treatment. The biomedical shift from ‘curative’ to ‘preventative’ healthcare is in conjunction with the origin of ‘lifestyle diseases’. For an elaborate definition, refer to Leavell, H. R., & Clark, E. G. (1979). Preventive Medicine for the Doctor in his Community (3rd ed.). Huntington, NY: Robert E. Krieger Publishing Company.

industrial developments taking place in the society, during that time. Finally, I explore how the ‘nutritionism’ ideology has shaped the way in which research and development of nutraceuticals takes place. Concepts of ‘lifestyle diseases’ and ‘micro-nutrient’ approach to health shall be discussed in the same light.

## 2.2

### **CRITICAL ANALYSIS OF NUTRACEUTICALS AS A CONCEPTUAL CATEGORY**

In the year 1989, Stephen De Felice was the founder and acting chairman at the *Foundation for Innovation in Medicine- New York, U.S.A.* In the same year Felice’s dedication towards discovering a ‘new era of medicine’ (Felice, 1995) led him to introduce a new nomenclature as ‘nutraceuticals’. He wanted to dramatically change the existing course of biomedicine’s dependence over pharmaceutical drugs. The etymology of the term nutraceuticals could be derived from the Latin term *nutrire* (nourish) + *pharmaceuticus* (of drugs). According to Dr. Felice (1995), he coined the term ‘nutraceuticals’ in order to provide organization and systematic development for an amorphous range of natural health products being developed from ‘natural’ sources. According to one of the earliest definitions of the term provided by De Felice (1992), “A nutraceutical can be defined as any substance that may be considered as food or part of a food and provides medical or health benefits including the prevention and treatment of disease.” In 1995, Felice published an article titled, *The nutraceutical revolution: its impact on food industry R&D*. He suggested that by the year 2000, these ‘scientific products’ will alter the nature of food industry

dramatically through making it research oriented. This process was aimed at food manufacturers to demonstrate clinical benefits of their products and claim patents for it similar to the pharmaceutical industry. The research was assumed to be a difficult process, as it had to involve ‘clinical evaluation’ of food materials and provide scientific evidence for their health benefits. According to Felice, biomedicine had not ventured into this territory before, which required to be explored in order to surpass the ‘common-sense’ knowledge and ‘historical-precedence’ approach towards food and diet.

Even though Felice did not find much support from the State at that time to promote his scientific endeavour by according the term any legal status, he was still very optimistic about the future of nutraceuticals. He clarified, in order to promote the growth of nutraceuticals his faith resided in the ‘mighty energy and creativity of corporate capitalism and the force of the marketplace’ (ibid.). These factors were expected to bring about a ‘renaissance of nutraceutical research’ (ibid.). Clarifying on his earlier definition on nutraceuticals, Felice elaborates,

“Nutraceutical is any substance that is a food or part of a food and provides medical or health benefits, including the prevention and treatment of disease. Such products may range from isolated nutrients, dietary supplements and specific diets to genetically engineered designer foods, herbal products, and processed foods such as cereals, soups and beverages...this definition applies to all categories of foods and parts of food, ranging from dietary supplements such as folic acid, used for the prevention of spine bifida, to chicken soup, taken to lessen the discomfort of the common cold. This definition also

includes a bioengineered designer vegetable food, rich in antioxidant ingredients, and a stimulant functional food or pharma-food” (ibid.).

Clearly the description given by Felice was extremely wide in scope, incorporating almost each and every type of food/parts of food, which are supposed to be healthy or therapeutic. Collecting from Felice’s abovementioned description, Brower (1998) refers to nutraceuticals as a ‘catch-all’ term, which includes foods, or parts of foods that provide medical or health benefits, including the prevention and treatment of disease.

Israel Goldberg (1994) edited a book titled, *Functional Foods: Designer foods, Pharmafoods and Nutraceuticals* that immediately pointed out the difficulty in defining nutraceuticals. His listing of all the synonyms in the book’s title was an indication of the confusion about distinctions between these new bio-technoscientific categories. It will be interesting for the reader to note that most definitions provided for nutraceuticals include the use of previously existing concepts such as food-fortification and the manufacture of dietary supplements. Nutraceuticals are being popularized as another ‘nutritional elixir vitae’ that came after vitamins in the 50s, proteins and amino acids in the 60s, cholesterol lowering dietary supplements in the 70s, and dietary fiber in the 80s (Hulse, 2004). In agreement, Lawrence and Germov call attention to the fact that since selective breeding and food fortification have existed for a long time, so designer foods or nutraceuticals are not new (2004:120). According to most definitions, as a biomedical category of health nutraceuticals get placed closer to food. This helps many food-pharma products to escape strict regulations and tests set for drugs. Mellentin suggests, ‘More and more ingredients

are quietly coming out of the dietary supplement aisle and moving into the dairy chiller' (2003:14). In accordance with these criticisms, Felice's description about nutraceuticals clearly laid prime emphasis upon the role of business industry and food manufacturers in aiding to their development. With concern to such developments, nutraceuticals fall under the risk of turning merely into profit making machinery for the food-pharma manufacturers. As pointed by Katan and Roos (2004), nutraceuticals could be understood as a term designed solely for the capacity to make scientific health claims about certain food products. A good example of this is popular energy/health drinks sold in India, such as Cloud 9, Crunk etc. (see Appendix: 1). These functional beverages taste something similar to generic soft drinks, but on the basis of adding some bioactive isolates, micronutrients or 'natural' herbs like caffeine, vitamin B or Ginseng, they make health claims based on bioscientific reasons. It is intriguing to note that during 1989 when Felice framed nutraceuticals as a biomedical term, the only stated objective was a one-dimensional focus on bringing about a 'paradigm-shift' in healthcare. Instead, what we see today is a growing range of diverse product lines marketing promises of health and wellness by blurring the boundaries between food and drugs. Based on these developments, 'nutraceutical' has become an organizational term, which comprises of various bio-technoscientific product categories derived from natural' foods/food sources and aids in their growth. With minor variations, these categories can be broadly classified into food/dietary supplements, functional foods and functional beverages globally. For example, in the U.S.A. a major nutraceuticals segment is constituted by what is referred by 'dietary supplements'. In Japan, similar products are mentioned as, 'foods for special use' (Pandey M. M. et al., 2013). Despite the wide circulation of the term and its inclusion in the Oxford English Dictionary, we notice that no consensus has yet been reached

by the scientific community regarding defining clear boundaries for the term. Based on the above discussion, we can infer that the conception of the term was motivated by the need to create a structural unit, which could sustain rapid biomedical developments taking place in the field of healthcare and nutrition. Nutraceuticals as a concept can mainly be defined through its constituent categories, which are widely distributed across various product lines and are yet not standardized globally. Therefore, for a critical understanding of nutraceuticals as a conceptual category, we now must try to locate the differences and similarities among its constituent categories.

## 2.3

### **NUTRACEUTICALS, FOOD SUPPLEMENTS AND FUNCTIONAL**

### **FOODS**

According to Dr. Wele and Kolatkar (2016), food supplements are prescribed to an individual when he/she is not consuming a daily balanced diet, resulting into any disease condition. As a result, these micronutrients such as iron, calcium, vitamins and minerals otherwise available in conventional foods begin to deplete in the body. In order to treat this nutritional deficit, concentrated forms of essential nutrients are administered in the form of common pharmaceutical drugs (for example, gel, capsule, tablet, tonic) only for a specific duration of time. Contrary to this, nutraceuticals are supposed to be added to daily diet for a longer period of time. For example, regular

intake of probiotics under various categories of nutraceuticals, such as functional foods, functional beverages, and food supplements are suggested to maintain a healthy gut. According to the authors, nutraceuticals have partly nutritional (natural?) and partly pharmaceutical (drug-like/artificial?) characteristics to aid in the management of chronic diseases. Santini and Novellino (2017) add to this understanding by clearly stating that nutraceuticals are generally recognized as safe (GRAS), as their production depends on deriving from food or parts of food for providing any kind of health benefits. Their article clarifies that nutraceuticals are “a set of pharmacologically active substances, which have ‘inherent’ therapeutic properties due to the ‘natural’ ‘active’ principles of recognized effectiveness which they contain. In turn, food supplements are administered only when the body is diagnosed with some sort of micronutrient deficiency and are not necessarily made from food or part of a food” (2017:2). These conceptual differences appear to mark a sort of binary distinction between the seemingly inherent ‘naturalness’ of nutraceuticals and the induced ‘artificiality’ of food supplements. Obviously, these factors are being attributed to each category because one is seen as closer to food and the other is seen as drugs. But according to the earlier discussion, food supplements also form a constituent category under the concept of nutraceuticals. This seems problematic. If we go by the definitions listed above, it should be safe to suggest that food supplements that belong to the concept of nutraceuticals, they must only derive from natural food sources. Whereas in the case of falling under pharmaceuticals, food supplements are prepared as chemical compositions, invariably turning them as drugs.

Street A. (2014) is a social anthropologist who studied the phenomenon of marketing nutraceuticals to the rural poor in India. While commenting about the overlap between the terms nutraceuticals and food supplements, she points, “The notion of deficiency



in vitamins or minerals is not new. Governments have been providing vitamin and iron supplements, for example, to pregnant women since the 1970s” (4:2014). However, she adds that it is only through the recent harnessing of science by the food-pharma industry that has emphasized upon the concept of ‘micronutrients’ and ‘hidden hunger’ as a major cause of ill health. Street A. suggests that transformation and isolation of bioactive compounds have been made possible by the industry through promoting food science research like never before. Therefore, it is through such developments that nutraceuticals have emerged as a category, which tends to encompass the earlier ones such as food supplements. Hence, we observe that nutraceuticals are also developed on the logic of identifying a pathologic health condition just like food supplements do as pharmaceuticals. But, due to the emergence of the concept of nutraceuticals in relation to the changing discourse on biomedical healthcare, most of these products have been developed targeting specific categories of lifestyle diseases such as obesity, diabetes, cancer, gastrointestinal problems etc. These are disease categories that were not addressed by food supplements manufactured as pharmaceuticals.

After Food supplements, functional foods and functional beverages together form the second highest popular category under nutraceuticals. Functional foods are claimed to be different from traditionally established health foods, not in terms of their appearance but on the basis of providing scientifically measurable physiological and therapeutic benefits for health. According to Hess (2004), functional foods are expected to reduce health risks with their bioactive components, these are similar in appearance to conventional foods and are intended to be consumed as part of a normal diet” (Hess, 2004). A few examples include, eggs enriched with omega-3 fatty acid or probiotic curd/yogurt with microbial strains of *lactobacillus acidophilus*. The main

difference between functional foods and older philosophical notions of ‘food as medicine’ can be derived from the way in which functional food research focuses on reducing the risk of particular chronic diseases such as heart disease, cancer, osteoporosis, diabetes and strokes (Hasler, 2002). Therefore, functional foods are developed through biomedical research based on assessing conventional foods their micronutrient content. In this process, specific bioactive components within foods are identified via bioscientific techniques and classified/modified into bioactive compounds, consumable in the form of regular food materials. A market research published by the ASSOCHAM (2017:24), mentioned a category of functional ingredients as “ ‘natural’ ingredients that have health-promoting, energy boosting and/or disease preventing benefits”. These include examples of herbs, berries, nuts used for garnishing of foods in traditional kitchens. These are ‘inherently’ functional and do not need to be enhanced through fortification or processing techniques. But, the benefits of these can be harnessed only through their scientific evaluation and food science techniques (sic). These products are mentioned to have better marketing opportunities than functional foods that appear as if they emerged entirely from a laboratory (such as beverages supplemented with glucosamine). The expected success of “(more) natural” over “(more) artificial” functional foods makes the framework of industrialization insufficient for the analysis of functional foods.

Schneider (2005:1) provides us with a definition from *The American Dietetic Association* (1994) that describes functional foods as, food products that deliver health benefits beyond providing nutrients. The American Dietetic Association (1999) further modified the definition of functional foods to include ‘whole foods’ with beneficial health effects, namely, fruits and vegetables as well as low fat cheese and low fat snack foods (Thomson, Block, Hasler, 1999). Schneider (2005:2) also

mentions about Katan and Roos's (2004) critique to this broad description. According to them, such definitions do not provide a clear demarcation between functional and other foods, because almost any food can have some beneficial effect on some bodily function. By these definitions, even 'tap water' could be called a functional food. For example, a liberal intake of water prevents cystitis, kidney and bladder stones, and possibly bladder cancer (2004:370). Katan and Roos (2004: 370), consider the aspect of linking health food with marketing to be a central aspect in the discussion of functional foods. They define functional food as "...a branded food which claims explicitly or implicitly to improve health or well-being (ibid.). This definition is similar to Marion Nestlé's (2002) definition that describes functional foods as products created just so that they can be marketed using health claims. Schneider states that however, health claims in relation to food products are not entirely new (2005:2). Advertisers have used the medicinal properties their products possibly contain prior to the emergence of the food category of functional foods. In order to illustrate the historical role played by advertisements in making health claims about food, Fernández Armesto F. used the example of advertisements printed in magazines as early as 1858, which stressed upon the medical evidence of 'purity' of certain foods (2002: 215). Hyomin K. (2011) marks the late 1990s as a time when the food industry in the U.S., almost evangelically embraced the whole new concept of functional foods—foods and beverages that may provide health benefits beyond basic nutrition, and which have been termed 'nutraceuticals'.

These products were highlighted by the changing discourse over nutritional sciences as well as the growing interest of the post-industrial era in developing biomedical understanding about the dietary benefits of various natural foods. Food companies

offering functional foods products (for example, Unilever develops cholesterol-lowering margarine enriched with soybean and rice bran oil) came to have their in-house R&D facilities specializing not just in basic nutritional science or food processing but also in clinical studies (Menrad, 2003). Holm points that the novelty of functional foods only lies in their social contextualization, as these are 'versions' of already existing foods (2003: 533). Mellentin (2003) concurs to this point while discussing the potential for innovative products in the dairy industry. Therefore, through the development of functional foods, natural foods are increasingly being mediated by bioscientific knowledge and practices at molecular level or what Rose termed as the 'molecular gaze' (2006:108).

Through this comparative account among various categories of nutraceuticals, it would be safe to suggest that the transition from previous categories included vigorous clinical research and developing 'molecular' evidence on any food/part of food, which is already a part of traditional dietary systems. A combination of the newly produced bio scientific knowledge on foods and enhanced technological processes carried out mostly by the food industry, results into the creation of biotechnoscientific products under the scope of nutraceuticals. Theoretically, the appeal of nutraceuticals was to accomplish treatment goals by developing 'natural' biomedical products, in order to address the growing distrust around biomedical drugs due to issues of toxicity and side-effects. Experts refer to the concept of nutraceuticals as 'scientific foresight', 'powerful toolbox', 'beyond diet and before drugs', as they make a promise of delivering efficacy sans toxicity (Santini & Novellino, 2017).

## 2.4

### **NUTRACEUTICALS AS A CONCEPTUAL CATEGORY IN INDIA**

Nutraceuticals are still evolving as a conceptual category in India. Since ancient times, the Indian society has heavily relied upon various alternative therapies of medicine for the purpose of health and nutrition. This was prior to the advent of nutraceuticals under the biomedical discourse on 'preventative' healthcare. Hence, unlike the West, a lot of confusion persists in the Indian society to introduce any new categories on healthcare, such as nutraceuticals.

Under such situations, special regulations are formulated in India to protect traditional knowledge systems. For example, in India various categories for nutraceuticals can include herbal extracts, spices, fruits and nutritionally improved foods or food products with added functional ingredients, except those based upon Ayurveda, Siddha and Unani systems of medicine<sup>2</sup>. Whereas, In the U.S., Canada and Japan all kinds of herbal products mentioned by traditional systems of food and medicine such as Ayurveda or Chinese medicine are to be considered as nutraceuticals. Traditional and herbal medicines are included in the definition of dietary or nutritional

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<sup>2</sup> According to the guidelines mentioned in a report by the FSSAI (2006), under section 22 the scope of nutraceuticals limits in the Indian context because in the name of dietary supplements (being one of the three categories under the broad term of nutraceuticals, the other two being functional foods and health beverages) it must not include Ayurvedic, Siddha and Unani medicines.

supplements in Canada. Japan does not mention traditional herbal medicines under functional foods for special health use. USA includes herbal and botanical foods under its definition for nutraceuticals. The Indian definition lists down the ingredients that a nutraceutical product can entail, and it also specifies general properties of nutraceuticals. Classified traditional medicines have been excluded from this definition. According to the Indian state regulations, nutraceuticals are meant for oral administration only, for example, in the form of capsule, tablets and drinks. This regulation coincides with those prescribed for both pharmaceutical drugs and food supplements (FSSAI, 2016). Under the regulatory schemes of many countries like India, Japan and Canada, nutraceuticals have to prove clinical efficacy over a health condition even when they fall under a similar regulatory authority devised for conventional foods. Nevertheless, many of the health claims which are currently associated with food supplements, probiotics and prebiotics, herbal products and functional foods are often not properly substantiated through in vivo data on safety, efficacy, effect on health and/or on pathologic conditions. This is mainly due to the lack of in vivo and mechanism of action studies confirming the claimed health beneficial effect.

Numerous nutraceutical combinations have entered the international market through scientific exploration of ethno pharmacological claims made by identifying different traditional dietary practices in India. Currently, a lot of integrative research work is being carried out in these fields, due to which numerous debates and lack of consensus occur among various experts from the bio scientific community including doctors, nutritionists and food microbiologists and other CAMs over accepting nutraceuticals as a homogenous category (discuss over these in detail in chapter 4). In

the context of India, Pandey M. M. et al. (2013) mention that we can understand the concept of nutraceuticals through the various categories the term constitutes. For classification purposes, the authors refer to FICCI, which is an apex business organization in India. It classifies the concept of nutraceuticals into three major categories:

*“Dietary Supplements.* Supplements provide nutrients that are missing or are not consumed in sufficient quantity in a person’s diet, that is, vitamin supplements, mineral supplements, macronutrients, antioxidants, tonics, herbal formulations like *Chyawanprash*, *Muslipak*, *Ashwagandhadi* and non-herbal products like cod liver oil. GlaxoSmithKline, Viva and Abbott are the major multinational players in the field. Major Indian companies include Dabur, Himalaya, Amway, Hamdard Laboratories, Baidyanath and Pantanjali.

*Functional Foods.* Foods that have specific physiological benefits and/or reduce the risk of chronic disease, nutrition fortified foods like fortified flour, fortified oil, fortified malt-based powder and probiotic foods like yogurt. Food companies, such as Nestlé, Danone, Unilever, Kellogg, and Yakult, are active in producing functional foods and beverages.

*Functional Beverages.* Liquids that quench thirst along with replenishing minerals provide energy, prevent ailments, and promote healthy lifestyle, that is, sports and energy drinks, fortified juices, and glucose drinks and powder.”

(Pandey et al, 2015:10-11)

Through this classification, it is clear that the food-pharma nexus is currently

providing direction to promote the nutraceuticals concept. Most of this food science research is aided through a collaborative mechanism operating among business industries, civil societies and various state and international organizations. A very good example of this is the *Global Alliance for Improved Nutrition (GAIN)*, established by the UN in the year 2002 to address micronutrient deficiency challenges worldwide. To obtain a GAIN grant, the organization requires each country to establish a 'National Fortification Alliance', made up of government and corporate membership. This is in order to ensure that appropriate foods are fortified and that they are made available through market mechanisms. For multinational companies like Danone, Coca-Cola and Unilever who joined the GAIN board in 2006, market opportunities get created through collaboration and networking with representatives from government and development agencies. Along with this, such organizations provide access to public and philanthropic funding and political support. All these companies are constantly seeking to expand their fortified foods portfolios in India and have been very successful indeed (For details, refer to ASSOCHAM, 2017:33-34). According to Street A. (2014), a clear sign of the successful establishment of the nutraceutical concept can be marked through the emergence of scientific foundations and institutes by food and FMCG companies in India to generate the scientific evidence needed to market their products as nutraceuticals. For example, Coca-Cola established the Beverage Institute for Health & Wellness in 2004, Britannia established the Britannia Nutritional Foundation in 2009, and GlaxoSmithKline launched the Horlicks Nutrition Academy in 2011. Organizations like these and GAIN promote the techno-scientific research model of nutraceuticals on slippery humanitarian grounds. Lawrence and Germov (2004:127) noted the opportunistic use of the medical paradigm by such organizations for financial and other gains. They



have criticized the rise of a ‘medical-food-industrial complex’ through pointing at “...minimal regulation and limited public debate in pursuit of rapid return on capital investment. Certain government bodies are supporting these developments because of the predicted economic benefits, and medical scientists are captives of the promise of substantial research funding” (ibid). In this context, I shall discuss the role of ICMR-DBT in promoting the probiotics movement in India in chapter 4.

In the case of India, until very recently the State did not accord a specific legal status or regulatory framework to the nutraceutical products. Unlike before, now the State authorities are constantly trying to maintain pace with rapid industrialization of food and new scientific discoveries. It is due to the flooding of the market with various products making health claims, that the state had to frame a regulatory provisions for such conceptual categories including nutraceuticals, food supplements, probiotics-prebiotics and functional foods. In this context, the government of India established the Food Safety and Standards Act (FSSAI) in 2006. Earlier under the FSSAI (2006), functional foods, nutraceuticals, and dietary supplements were together considered as products that were indicated as food for a special dietary application. This act considered products with beneficial health claims to be similar to food proven through clinical trials, without according any special regulatory status to nutraceuticals. Whereas in the U.S.A., FDA (a regulatory body similar to FSSAI) acknowledged the concept of ‘nutraceuticals’ early on and provided a separate set of regulations for the term from those set for conventional foods and drugs.

It was later in 2015, India notified the WTO of a draft regulation for nutraceuticals and foods for special diets and medical purposes The revised regulation was titled as *Food Safety and Standards for Food for Health Supplements, Nutraceuticals, Food*

*for Special Dietary Use, Food for Special Medical Purposes, Functional Food and Normal Food Regulations 2016*. This is based on and framed from Section 22 of the FSSAI<sup>3</sup>. The draft regulation defined the abovementioned health categories based on their ingredients, labeling, additives, contaminants, health and nutritional claims. It also determined the criteria for the manufacture and sale of these categories of foods, and recommended limits to their dosage and consumption levels. However, in the U.S.A., manufacturers and other stakeholders do not have to register their products with the FDA because there is no need to obtain FDA approval and/or authorization before producing or selling food supplements or nutraceuticals. We observe that unlike the U.S., (where the term nutraceuticals originated,) the Indian State is treading the path very cautiously in order to secure various traditional systems of health and medicine. According to Bagdi and Narsana (2016), senior associates of a leading law firm in India- *Khaitan and Co.*, the concept of nutraceuticals is still problematic as a legislative category in India. They suggest that here FSSAI and DCA are two separate regulatory bodies to govern food and drugs respectively. But in the case of nutraceuticals, there is a regulatory overlap on account of the provisions laid in both the organizations.

According to the new Nutraceuticals Regulation (2016), “ A food business operator may extract, isolate and purify nutraceuticals from food or non-food sources, that is preparing amino acids and their derivatives by bacterial fermentation under

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<sup>3</sup> The full text of the Regulation can be accessed from the FSSAI website (<http://www.fssai.gov.in/>), and the Food Safety and Standard Act No. 34 2006 can be accessed from the FSSA web portal (<http://www.fssai.gov.in/portals/0/pdf/food-act.pdf>).

controlled conditions” (2016:77). The lawyers notice the ‘absence of clear benchmarks’ to classify both these categories separately. Giving the example of multi vitamins, the authors point that composition of these (in form of nutraceuticals and medical drugs) is in fact, used for both prevention of diseases as well as providing health benefits. The overlap becomes more confusing in terms of packaging both categories. “While the FSSA clarifies that dietary supplements/nutraceuticals can be orally administered and may be in the form of 'powders, granules, tablets, capsules, liquids, jelly and other dosage forms', the definition of drugs includes even 'empty gelatin capsules” (2016:41). Hence, a health product packaged as a gelatin capsule may fall under both definitions of a 'drug' and a ‘nutraceutical’. In addition to this, they point that such lack of clarity is reflective of a ‘liberal’ regime under the PFA/FSSA. It provides flexibility to the food-pharma industry for fixing the price of their products in accordance to their will, for building profits and escaping strict regulatory regimes set for pharmaceutical drugs.

## 2.5

### **NUTRACEUTICALS AND PROCESSES OF DEVELOPMENT**

As described earlier, the manufacture and marketing of nutraceutical products have become a part of the global development schemes. For example, The World Bank (2006) report describes food fortification, (employed mostly in the manufacture of functional foods like eggs fortified with omega 3 or probiotics added to yogurt) as “a

technology available like no other today, which offers a large opportunity to improve lives and accelerate development at such low cost and in such a short time”. The global nutraceutical market is expected to reach \$278 billion by 2021, as per a report by the Transparency Market Research (2015). With the great lack of consensus around defining these products and lack of scientific data availability on their in vivo clinical efficacy, how did the industry roll out the nutraceuticals agenda successfully around the globe? In order to address this question, I would like to contextualize the growth of nutraceutical products in light of the changes taking in the field of biomedical healthcare and nutrition simultaneously. These changes are directed towards prevention of chronic ‘lifestyle diseases’ and a ‘micronutrient’ dietary approach for achieving health. Due to the developments in the field of biomedical healthcare, the post industrial world has witnessed a demographic transition consisting of almost 800 million people aged over 60 years across the globe (Palombi L, 2016:1). In relation to this we are also experiencing epidemiological transitions with a massive increase in chronic, non-communicable diseases, which are commonly termed as ‘lifestyle diseases’<sup>4</sup>. “In 2001, chronic diseases contributed approximately 59% of the 56.5 million total reported deaths in the world and 46% of the global burden of disease”(WHO, 2003). A few examples of these include cardiovascular diseases, gastrointestinal problems, diabetes mellitus, arthritis, obesity, and cancer.

Therefore now biomedicine is posed with new challenges to solve the problem of the spiraling costs of health care resulting from technological development and

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<sup>4</sup> As the term ‘lifestyle’ was adopted into socio-medical and health disciplines in the early 1970s, it was predominantly used to refer to specific behaviours identified as risk factors (refer to Coreil et al. 1985). According to the biomedical understanding, ‘lifestyle diseases’ are defined as diseases linked with the way people live their life. This is commonly caused by alcohol, drug and smoking abuse as well as lack of physical activity and unhealthy eating. Common examples include cardiovascular and gastrointestinal disorders, cancer, obesity, type II diabetes etc.

addressing these new categories of diseases. Biomedicine has not been able to effectively eliminate health issues of the poor. Lack of economical provisions for easy access to basic healthcare for all is also an issue. It is a phase of increasing uncertainties for biomedical healthcare and the focus is shifting from treatment to prevention of disease. Hyomin K. (2011) rightly points that the growing concern about chronic diseases is a challenging problem for modern biomedicine. It can be understood as a part of a broader social transformation that Beck (1992) noted as 'reflexive modernization', where people become critical of the progressive claims of modernity, including biomedical progress.

Recently, the increasing criticisms offered to side effects of pharmaceutical drugs have forced biomedicine to look for solutions in traditional dietary systems. Under this process after the 1990s, nutritional/dietary therapies underwent considerable transformation. Hess (2005) noted that medical practices in clinical settings came to incorporate many elements of nutritional and dietary therapies. Before the 1990s, dietary/herbal therapy was a marginalized form of medical knowledge-practice. Surgeons, drug-prescribing physicians and pharmaceutical companies with their patented drugs were highly resistant to dietary approaches to diseases. For example, the report *Diet, Nutrition and Cancer* published in 1982 by the *National Research Council*, U.S.A refers to the emergence of 'preventative medicine' as an important event in the mainstream biomedical community since the 1980s. Providing the example of the use of vitamins in cancer therapy, Hess notes the transformation that took place in its use under mainstream medicine. Vitamins were now becoming adjuvants to the conventional therapy for cancer, as opposed to its perception as 'alternative' form of medicine, which needed to be administered in mega doses. Biomedical experts refused to accept the use of vitamins for chemotherapy earlier. In

1984, the *National Cancer Institute* U.S.A. introduced a *Cancer Prevention Awareness Program* focusing on diet and harmful effects of tobacco use (as cited in Hess, 2005). The growing interest in disease prevention through everyday consumption of healthy dietary supplements such as vitamins was becoming promising. Hess also pointed that some of the funding for the studies on cancer prevention came from the functional foods and dietary supplement industry.

Again we can see a link between these processes taking shape simultaneously. Industrial production of nutraceuticals coincides with such developments that took place under the biomedical discourse on ‘preventative healthcare’. Milner (2000) mentioned that among many reasons for the success of nutraceuticals, the legislation on *Nutrition Labeling and Education Act* (1990) in the US, establishing circumstances under which claims about specific disease prevention could be made about nutrients in foods and rapid scientific discoveries could be listed as primary.

Bioscientific research and the food-pharma industry together were a part of the changing *nutriscape*<sup>5</sup>, which followed a ‘micronutrient’<sup>6</sup> approach. This nexus is critiqued by Gyorgy Scrinis (2008), mentioning that focus on micronutrients is a ‘reductive’ approach towards food. This approach is referred to as - nutritionism. As Kimura (2013) argues, ‘nutritionism’ – the reduction of food to its nutritional qualities has shifted authority over food production and consumption from a domestic to

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<sup>5</sup> The term *nutriscape* has been borrowed from John Coveney’s term *nutrition landscape*, which he defines as “the growing expanse of nutrition knowledge, rationales and understandings about food in terms of scientific and medical concerns.” John Coveney, *Food, Morals and Meanings: The Pleasure and Anxiety of Eating*, 2d ed. (London: Routledge, 2006).

<sup>6</sup> According to the WHO (2018) website, *micronutrients* are substances needed only in minuscule amounts. These substances are the “magic wands” that enable the body to produce enzymes, hormones and other substances essential for proper growth and development. The source suggests that the consequences of micronutrient absence are severe. Iodine, vitamin A and iron are most important in global public health terms; their lack represents a major threat to the health and development of populations the world over, particularly children and pregnant women in low-income countries. Refer to, <http://www.who.int/nutrition/topics/micronutrients/en/>.

scientific domain. Scrinis argues that ‘nutritionism’ undermines all other ways of engaging with dietary knowledge and practices associated with health. He also mentions, “Over the past couple of decades nutritionism has been co-opted by the food industry and has become a powerful means of marketing their products”(39:2008). The nutritionism paradigm frames most expert and state endorsed dietary advice. Hence, it provides an opportunity for the industry to push nutraceutical products from the margins to the core through creative marketing strategies to appeal to the health-conscious consumer.

Dimitrios Trichopoulos et al. (2000), confirm that since the late nineteenth century foods and diets are being characterized through their nutrient and biochemical composition. This nutri-biochemical level of engagement with food and the body establishes relationships between nutrients and their effect upon particular health conditions. The bio scientific research on nutraceuticals was also based upon this approach. Through isolating functional nutrients from natural food sources, nutraceuticals also remove these foods from their cultural and ecological ambits. ‘Nutritionism’ promotes the idea that the “perceived problems with contemporary diets can be tackled by the more or less precise quantitative tinkering of the nutrient profile of foods and diets rather than by means of more far-reaching qualitative changes in diets and the types of foods eaten” (Scrinis, 2008:43).

Nutritionism has been used by the food industry over the past three decades not only as a framework to guide the marketing of foods and diets but also for the production, processing, and re-engineering of foods for developing nutraceuticals. In the light of these developments, food scientists and regulators contend that consumers should be provided with more bio scientific information necessary to make informed decisions

on specific foods and their associated components to reduce health risks. Deborah Lupton says, “achieving good health through diet has become a matter of acquiring expertise in the micro- constituents of foodstuffs” (2003: 45). Hence, the ideology of nutritionism has been co-opted, promoted, and exploited by the food industry, with the assistance of compliant governments, regulatory bodies, and health institutions, aiding to the success of nutraceuticals.

## 2.6

### CONCLUSION

As a concept, nutraceuticals are evolving due to the growth in biomedical research and industrial development. The book, *The Functional Foods Revolution: Healthy People, Healthy Profits* by Michael Heasman and Julian Mellentin (2001) indicates that contested political, environmental, economic and social discourses, accompany the invention of any new product to the market. As a critique to the nutraceuticals concept, Jacob Östberg (2003) is disapproving of these products as ‘health simulacrum’, which only produces abstract ideas of health. These products circulate the idea of health and well being through mentioning the scientific rationality behind the health benefits provided by ingredients in a product. At present, due to increasing criticisms biomedicine cannot afford to let the society look for solutions in



alternative/ 'other'<sup>7</sup> systems of medicine and healthcare.

As Henry David Thoreau has said in *Walden Pond*, “more intense than a thousand armed forces is a thought which has come to in time”. In this regard, the term ‘nutraceuticals’ was a timely invention by Dr. Felice, trying to safeguard the position of biomedical authority. This conceptual category attempts at not only organizing a variety of scattered biomedical developments in the field of health products, it also provides a regulatory framework for them, in order to function smoothly. This process is being strengthened by intensive industrial input, combined with bioscientific evidence it becomes very pervasive. Hence, it is quite clear that Dr. Felice was right in predicting the role of the industry in circulating the nutraceutical agenda into the society, “The nutraceutical revolution is in full swing and will dramatically change the nature of the food industry by the year 2000” (1995).

Beck argued that risks of industrialized modernity are “managed politically and economically” (Beck, 1992:19). Looking at the discussion in this chapter, nutraceuticals could be a typical example amongst the risks of industrialized modernity, which Beck points out. In the past century, biomedicine has proven most ‘other’ systems of healthcare as subservient to them on spurious grounds of safety and efficacy. Corporate laboratories backed by bio scientific knowledge are establishing themselves as the most effective and efficient points of transformation from ‘alternative’ systems of healthcare and nutrition. This is clearly made evident through the organizational scheme followed by nutraceuticals. These products creatively combine existing nutritional knowledge derived from ‘other’ traditional systems of

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<sup>7</sup>The term ‘Other’ here points at various traditional systems of knowledge like Ayurveda, Siddha, Unani etc. catering to healthcare and medicine all across the world. The use of the word ‘other’ also denotes the hierarchy that has developed among biomedical knowledge system and these various knowledge systems, where biomedicine refers to most of these ‘others’ as subservient to it.

knowledge with new food technology and marketing. Techno scientific knowledge focusing on specific health claims and clinical trials with foods is produced to intervene in the most wide- spread realm in society i.e. everyday lives of people and building profits. These are arguments that I shall exemplify and elaborate upon in chapter 2 and 3.

**CHAPTER THREE**  
**THE GENEALOGY OF PROBIOTIC YOGURT**

## 3.1

### **INTRODUCTION**

Under the discourse on preventative medicine, probiotic products in the form of functional foods/functional beverages/food supplements (nutraceuticals) have become vital in everyday healthcare regimes. Broadening scientific research and industrial development in the field has led to wide consumer acceptance, despite limited trials carried out for determining their vivo clinical efficacy. Probiotics<sup>8</sup> constitute the new buzzword in human dietary portfolio and currently receive major attention across the world including India and other developing countries due to their enormous health potentials (Grover et al., 2012). In this chapter we are tracing the historical development of ‘Probiotic Yogurt’ (functional food). According to a definition provided by the FSA, “Probiotic yogurts and drinks provide health benefits above and over their ‘existing’ nutritional value, so they are comprised as a kind of functional food” (2004).

In the previous chapter we critically engage with nutraceuticals as a conceptual category. In this chapter we shall elucidate upon similar arguments by exemplifying it

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<sup>8</sup> Probiotics are microorganisms that are claimed to provide health benefits when consumed. The term came into more common use after 1980. The introduction of the concept (but not the term) is generally attributed to Nobel laureate Elie Metchnikoff who postulated that yogurt-consuming Bulgarian peasants lived longer lives because of this practice.

through Elie Metchnikoff's scientific discovery of Bulgarian yogurt as an 'elixir vitae' for longevity. It is important for the reader to note that the prefix probiotic has been attached with yogurt and yogurt based health products in the current nutritional discourse run by biomedicine under preventative healthcare. Otherwise, the usage of yogurt and yogurt-based foods can be commonly observed in dietary systems of many cultures world over, referred by various names. Therefore, probiotic yogurt is a biotechnoscientific product, which derives from a different system of knowledge than the indigenous yogurt. The basic premise of the chapter follows the argument made by Naraindas H. (2006). He suggests that when biomedicine refers to specific technologies from 'other' (traditional/indigenous) systems of knowledge, it strips them off the original theories underlying their usage. Naraindas states, "the fact that specific practices or materials are regarded as biomedically useful because they 'work' (are efficacious) does not mean that the 'traditional' theories underlying them are seen as correct" (Naraindas H., 2006:2658). Here, we shall examine the origins of probiotic yogurt through biomedical translations of Bulgarian *kiselo mleko*<sup>9</sup>.

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<sup>9</sup> Kiselo Mleko is a native term used to refer to fermented milk food, prepared in Bulgaria and parts of the Balkan region. The other common terms used to refer to similar food products is **Yogurt**, **yoghurt**, or **yahourth**. In the case of India, we can make its close comparison with *dahi*, which is an indigenous term used to refer to fermented milk.

## 3.2

### **THE CONCEPT OF PROBIOTICS**

Probiotics form a significant category under the classification of various kinds of nutraceuticals today. They are classified as nutraceuticals because of their ambiguous status between food and medicine with claims of ‘preventative’ effects from disease. This ambiguity extends to the category between ‘natural’ and ‘engineered’ foods, with a growing evidence base for scientific efficacy (McFarland and Elmer 2006). Primarily, probiotics are sold as functional foods, functional beverages and dietary supplements in the form of probiotic yogurt, probiotic drinks/ probiotic yogurt drinks and pills respectively. In most cases, probiotics are marketed either as a dietary supplement (ex. products in pill form) or as a food item (ex. yogurt). Most probiotics include *Lactobacillus acidophilus*, *Streptococcus thermophilus*, and *Bifidobacterium lactis*. These microorganism species have been “generally recognized as safe strains” (GRAS), meaning that they are permissible additives in food substances.

Werner Kollath (1953), a German scientist introduced the term ‘probiotic’ (etymology- the Latin ‘*pro*’ and the Greek ‘*bios*’ literally meaning, ‘for life’), describing them as “active substances that are essential for a healthy development of life” (Gasbarrani et al., 2016:S116). In 1954, the German researcher Ferdinand Vergin proposed the term *probiotika* to describe “active substances that are essential for a healthy development of life” (Gogineni et al., 2013:2). Lilley and Stillwell (1965) first used the term- probiotic to describe, “Substances secreted by one microbe that stimulated the growth of another”(Mc Farland, 2015:S88). This definition of the term could not persist for long. Sperti (1971) employed this term to describe, “Extracts of

tissues, which could stimulate the growth of microbes”. Parker (1974) described probiotics as “organisms and substances, which contribute to intestinal microbial balance” (Gogineni et al. 2013:2). This definition related probiotic use to the intestinal microflora but the inclusion of ‘substances’ gave it a wide connotation that would include antibiotics. Therefore, we see a lack of clarity on the status of probiotics both as drug and food. This overlap makes it difficult for regulatory bodies to control its circulation and provides the pharma-food industry an opportunity to place their probiotic products closer to food and escape strict regulatory procedures laid out for pharmaceutical drugs. Fuller (1989) suggested that probiotics were “live microbial supplements, beneficially affecting the host animal by improving its microbial balance” (ibid.). Furthermore, Salminen et al., (1998) defined probiotics as ‘foods containing live bacteria which are beneficial to health’ (ibid.). The formal definition of the term came much later in 2001, by the *Food and Agriculture Organization* (FAO) of the United Nations. According to this new definition probiotics are “live microorganisms which, when administered in adequate amounts, confer a health benefit on the host”. This definition does not clarify on the form (food/drug) of administering these microorganisms, which again passes the control in the hands of the industry to develop products that are closely associated to food for making large profits unlike the restricted sale of pharmaceutical drugs. With reference to this argument, I quote K. Hyomin’s (65:2011), example of a probiotic yogurt produced by the Danone Company – Activia. He suggests that “although consumers perceive Activia as a ‘traditional food’ ‘natural’ and different from ‘pills/drugs’, it has never been disclosed whether Danone used plasmid transformation (which is considered to be genetic engineering) or classic bacterial mutagenesis (usually using ultraviolet ray irradiation) combined with generational screening to develop their

special bacteria strain. On the other hand, the company emphasized that *Bifidobacterium animalis* DN 173 010 (a microbial strain) passed the efficacy and safety study to be qualified as a probiotic functional food". Activia has made \$100 million in sales in the US in its first year with its scientifically proven health benefits (Powell, 2007). Subsequently in 2013, the *World Gastroenterology Organization* established strict boundaries for what products could be clinically determined as probiotics? Global guidelines on probiotics and prebiotics were published and circulated by this organization to dispel any unsubstantiated claims made to consider just 'any yogurt' as a probiotic. Still, without any clarification on the status of probiotics as either food or drugs, this report established that the efficacy of probiotics can only be determined if it is 'strain-specific' and 'dose-specific'.

Therefore, we understand that the coinage of the term ' probiotics' is fairly new and its association with specific types of yogurt and yogurt based products is also recent. But, it does not mean that before the origin of the term, yogurt was not perceived as a food with medical benefits, which we shall discover later on in this chapter. A probiotic product must be characterized through clinical evidence for a specific health benefit, which is what makes it a nutraceutical according to definition. Scientifically proven measures of 'efficacy' are mandatory to classify a food/ food product as a probiotic and any 'other' evidence of pro-health functions is not counted as legitimate. Therefore, 'regular' yogurt or indigenous fermented foods cannot be considered as probiotics according to most medical scientists and clinical nutritionists. This also provides the businesses an opportunity to price their 'probiotic' yogurt products higher than the 'regular' yogurt. For example, Mother Dairy, a dairy based



industry in India has priced its new range of ‘advanced’ probiotic *dahi*<sup>10</sup> (*dahi* is an indigenous name for yogurt in India) at INR50 for 400gms, INR10 higher as compared to ‘Classic’ *dahi* at INR40. Through these processes it becomes evident that the evolution of the probiotic concept is in tandem with promotion of the nutraceutical agenda, which is primarily run with the help of industrial input and scientific evaluation.

### 3.3

#### **A DISCUSSION ON FERMENTATION**

From the above discussion it becomes clear that the origin of the ‘probiotics’ concept was dependent upon scientifically isolating beneficial microorganisms from indigenous foods/food sources, which were naturally fermented. Foods that predate written historical records were invented centuries ago, which can be prepared by the household or cottage industry using relatively simple techniques and equipment. These were called indigenous foods. The term ‘fermentation’ is derived from the Latin word *fermentare*, used to refer to the process of leavening. It is hypothesized that as farming started to replace hunting and gathering around 10,000 years ago, man began to produce fermented food and beverages. In the ancient Indian Ayurvedic texts, fermented foods (For example, *Dadhi/dahi*) are associated with a long and healthy life. It is stated in ancient Indian history that *dahi* (curd/yogurt), *chaas*

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<sup>10</sup> Dahi is an indigenous term used to refer to fermented milk food in the Indian subcontinent, which can be prepared and consumed in a wide variety of ways depending upon the location and culture. It is referred to as dadhi in Ayurvedic texts and it can be prepared from milk obtained from various animals including cow, sheep, goat, buffalo, yak, camel etc. This food is a significant part of the dietary, therapeutic and ritual systems in the country.

(buttermilk) and *ghee* (butter) were widely consumed milk products during about 3000 BC (Prajapati & Nair, 2003). Tamang et al., mention that milk and fermented milk products constitute the important items in Indian diets and have been consumed for more than 5000 years (2010:64). The authors mention that Himalayan fermented foods comprise all types of available base materials ranging from milk to alcohol, soybeans to cereals, vegetables to bamboo, meat to fish. The Himalayan people are consuming these ethnic foods for more than 2500 years.

It is interesting to note that despite deriving the concept of probiotics from scientific research on indigenous fermented foods and referring to their ancient dietary and therapeutic uses, scientists use detracting phrases to denote this system of knowledge as cultural practices. Most modern scientific literature refers to the practice of fermentation as a part of cultural folklore instead of acknowledging it as a part of their traditional knowledge systems. For example, the ancient fermentation techniques are referred as a ‘discovery by chance’ (sic) or a process, which traditional societies just ‘stumbled upon’ (sic) (see V.K. Joshi, 2016). In the paper titled *Probiotics History*, Giovanni et al. (2016) mention, “during the neolithic period, domestication of animals occurred and man began to get fermented food. Probably ‘serendipitous contaminations’ (sic) in favorable environments played a major role”. Scientific writings like this passionately advocate that earlier societies did not have any ‘scientific apparatus’ for recognizing the beneficial effects of fermented foods. Therefore, the traditional societies are assumed to have used fermented foods because of the ‘perceived’ benefits and taste. Another scientific research follows a similar reductionist approach while referring to ancient techniques of fermentation, “While ‘serendipity’ probably played a major role in the genesis of fermentation, the process

became popular not only because it preserved food, but also because it provided a variety of tastes and may have improved digestion or had other perceived beneficial effects” (Gogineni et. al, 2013). Contrary to this, research under the current nutritional discourse suggests that scientific evidence based on, ‘systematic investigations’ carried out under the field of probiotic studies is responsible for identifying health properties of fermented milk and yogurts (Giovanni et. al, 2016).

Gogineni et. al define fermentation scientifically as “a metabolic process by which an organism converts a carbohydrate, typically starch or a sugar, into an alcohol or an acid. These metabolic byproducts lower pH and have a host of other effects that prevent spoilage of fermented foodstuffs” (2013:1). Huxley (1871) states that Van Leeuwenhoek drew the first bio scientific connection between fermented foods, bacteria and health in 1680 with the foundation of the discipline of microbiology. Leeuwenhoek used a microscope to observe yeast cells fermenting beer, but he never established an association between these yeast cells and the process of fermentation. It was in *Mémoire sur la fermentation alcoolique* (1860), when noble laureate Louis Pasteur published a definite conclusion about the role of bacteria in initiating the process of lactic acid fermentation (Gogineni et. al, 2013:2). Although, Pasteur did not apply his theory to observe the benefits these bacteria provided when employed in the human gut micro flora. It was Pasteur’s successor Elie Metchnikoff who took his work forward to discover the relation between microbacteria (obtained from fermentation) and health, which today has become the concept of ‘probiotics’, a nutraceutical sub-category sold in the form of food supplements, functional foods /beverages.

### 3.4

#### **ELIE METCHNIKOFF AND THE SCIENTIFIC DISCOVERY OF BULGARIAN YOGURT**

Elie Metchnikoff, a Russia born zoologist is regarded as the undisputable founding father of probiotics even before the term originated. Even though, his scientific hypothesis on yogurt dates back to more than a century ago in the 1900s, Metchnikoff's reference is widely available in most works on probiotic nutrition and health today. He was a Noble prize awardee in 1908 for his discovery of *phagocytes*<sup>11</sup>, contributing to the field of immunity studies. Preoccupied with the idea of ageing as a disease, the credit for the coinage of the term 'gerontology' also goes to Metchnikoff. In a detailed investigation on Metchnikoff's work and life, Luba Vikhanski (2016), suggests that he was a 'revolutionary figure' who changed the course of modern medicine. She mentions, "It is rare to be able to trace a global dietary trend to single event but the birth of the modern yogurt industry was arguably born the day Metchnikoff delivered a public lecture in Paris, 1904" (2016:152). In addition to this, she also acknowledges that while defending his theory of ageing, Metchnikoff excluded all contradictory evidence with a 'monomaniacal focus'.

He was a celebrated figure at the renowned *Pasteur Institute of Paris*. After Louis Pasteur identified the microorganisms responsible for the process of fermentation, Metchnikoff was interested in finding out the possible effect of these microbes on

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<sup>11</sup> Elie Metchnikoff was awarded the Noble Price for his discovery of Phagocytes in 1882. These were defined as cells that protect the body by ingesting harmful foreign particles, bacteria, and dead or dying cells. Their name comes from the Greek *phagein*, "to eat" or "devour", and "-cyte", the suffix in biology denoting "cell", from the Greek *kutos*, "hollow vessel". According to Metchnikoff's theory, they are essential for fighting infections and for subsequent immunity.

human health. According to Vikhanski, Louis Pasteur also encouraged Metchnikoff's interest in studying the struggle between various microscopic creatures. During that period, Pasteur's support to Metchnikoff was of interest to the French society's struggle against bacterial diseases such as cholera, TB, smallpox. Pasteur had assigned Metchnikoff as his torchbearer for the 'immunity war' against microbes. Metchnikoff hypothesized that animals and plants have 'innate immunity'<sup>12</sup> to fight against the onslaught of ubiquitous bacteria. Vikhanski mentions that, this was due to Metchnikoff's belief in the therapeutic powers of nature that he later translated into existing properties of curative digestion in humans. His interests in this research sprung from his understanding of death and old age as a disease and he was looking for solutions to ameliorate it. Metchnikoff's sole focus was to enhance longevity, as during this period average age for French population was very low at 47 years. Metchnikoff held wide interest in people's dietary patterns world over for drawing their relation to health. He was familiar with the technique of preserving meat by storing it in 'sour milk'<sup>13</sup> or whey in some countries. "Back in Russia, in his twenties he had indeed bought koumiss from Tatar merchants for his first wife, to cure her tuberculosis" (Vikhanski, 2016:165). Owing to his own ascetic style of living he was a firm believer in the 'right diet'<sup>14</sup>, as according to him it played a very important role in mitigating infectious diseases. Metchnikoff wrote an unpublished article titled *A Bacteriological Excursion Through Paris*, as an extension his obsession over

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<sup>12</sup> Elie Metchnikoff's discovery of phagocytes turned out to be the major defense mechanism in innate immunity. Innate immunity is naturally present in organisms and is not due to prior sensitization to an antigen from, for example, an infection or vaccination.. It is in contrast to acquired immunity. Also called natural immunity. This concept aided Metchnikoff to draw a correlation between microbes and immunity.

<sup>13</sup> Although the term 'sour milk' is applied to a fermented milk product, which turns sour due to the process of bacterial fermentation. But, in this context it is specifically in reference with E. Metchnikoff's discovery of "pure" microbial cultures isolated from fermented milk samples in his laboratory where he started to develop sour milk strains for enhancing longevity and immunity.

<sup>14</sup> "Right Diet" according to Elie Metchnikoff consisted of food which has been least exposed to bacterial contamination.

sanitized and boiled food. He appalled the French public and was often ridiculed because of his seemingly obnoxious suggestions about health, such as avoiding traditional favorites including wine and cheese. One of the main reasons for this was Metchnikoff's 'scientific' perception about these foods, which assessed them in terms of their exposure to harmful bacteria. Whereas for the French society the scientific explanation did not set well with their traditional dietary knowledge, as any such concept as harmful microbes was alien to them. Yet, all of this did not prevent Metchnikoff's consistent efforts to identify germs in his lab that penetrated the body despite taking all preventative measures.

As mentioned above, Pasteur noted that microbes<sup>15</sup> were indispensable for digestion in the human gut. Metchnikoff's research extended Pasteur's hypothesis to suggest that certain bacteria could also cause a detrimental process called intestinal putrefaction where body undergoes 'auto-intoxication'<sup>16</sup> leading to death and ageing. With firm belief around the connection between food and health, by the year 1898 Metchnikoff had launched sour milk experiments and he himself began consuming sour milk regularly. His hypothesis was that sour milk aided stimulated digestion and held body-cleansing properties. During this time, Prof. Leon Massol presented Metchnikoff with a sample of Bulgarian sour milk, regionally known as *kiselo mleko* (f). Stamen Grigoroff, a Bulgarian student in Massol's lab had identified 'rod-like' organisms in *kiselo mleko*, which he termed as *Bacillus bulgaricus*. According to

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<sup>15</sup> A microbe is a microscopic organism. Microbes can be multi-cellular or single-celled organisms and include bacteria, protozoa, and some fungi and algae. Under the concept of probiotics or as per Metchnikoff E., these can be categorized as 'good' and 'bad' microbes. 'Good' microbes are those which aid in keeping the gut healthy and replacing 'bad' microbes in our digestive tracts. According to the bioscientific community, these are considered to be the most vital for formulating probiotic products and can be found in natural fermented foods.

<sup>16</sup> The biomedical theory of 'auto-intoxication' was central to Metchnikoff's search for 'pure' microbial cultures isolated from indigenous fermented foods like Bulgarian yogurt. According to him, intestinal 'auto-intoxication' took place was that food that is not absorbed in the upper intestinal tract passes to your colon, where bacteria ferment it to form poisons that are absorbed into your bloodstream to shorten your life and even cause cancer.

Grigoroff, these microbacteria caused milk to curdle and turn it into what he called, yogurt<sup>17</sup>. In 1905, after a year of experiments Grigoroff discovered three different microorganisms and named them *Bacille A*, *Microcoque B*, and *Streptobacille C*. The other crucial bacterium was categorized as *Streptococcus*, later named by the scientific community as *Streptococcus thermophilus*. Metchnikoff's student, Henry Tissier was instructed to study this chemical transformation of food i.e. the process of fermentation, which causes milk to turn sour. The bioscientific explanation of this study was presented in *The Nature of Man* (1906) by Elie Metchnikoff, suggesting that after the fermentation sour milk owes its stability to lactic acid that microbes produce from milk sugar in the course of fermentation. The acid kills the putrefaction bacteria and prevents decomposition of milk. According to Metchnikoff, this could explain why sour milk prevented instances of diarrhea in various regions. He reasoned, if lactic acid blocked rotting of milk it could also perhaps block toxins in the gut. This was Metchnikoff's first description of what we could today refer to as the probiotic concept, where 'good' bacteria in fermented foods are the leading cause for prevention of disease. These microorganisms were tested to generate around 25gms/lt. of lactic acid, which was significantly high. Grigoroff also speculated that yogurt was a part of the staple diet in Bulgaria, which is why the region consisted of a large number of centenarians.

These were rather simplistic hypotheses for a groundbreaking scientific study at that point. Surprisingly, this was done without actually taking empirical data on Bulgarian dietary culture into account. Ironically, this is the way most scientific research on developing probiotics still approach indigenous cultures, the 'emic' point of view is

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<sup>17</sup> An indigenous food made from the natural process of fermentation of milk, also known as *yahourth* in Turkey. After Metchnikoff's discovery of its biomedical therapeutic qualities, this food has been highly commercialized and yogurt available in the market includes variants that are not similar to the traditional homemade yogurt.

rather considered as ‘cultural folklore’ or ‘ritual anomalies’. In *Essais optimistes*, (1907:238), Metchnikoff referred to a study conducted by German scientist Bernhard Ornstein and demographer M. Chemin (Stoilova, E. R. (2014)). Their study identified existence of numerous old age populations in the entire Balkan region including Serbia, Romania, Bulgaria and Greece. Chemin’s figures included more than five thousand centenarians (5,345) in the year 1896. Ornstein and Chemin’s research focused on the entire Balkan region but Metchnikoff selectively restricted his focus to Bulgaria excluding other regions, without explaining any reason for doing this. Vihanski reaffirms, “Metchnikoff’s idea of elderly Bulgarians consuming extraordinary amounts of sour milk was not based on any scientific investigation” (2016:167). Without empirically examining the Balkan region, his conclusions established some sort of mythical correlation between Bulgarian’s ripe old age and their consumption of *kiselo mleko*. Metchnikoff supported the link between longevity, *kiselo mleko*, and Bulgaria despite considering the fact that the earlier mentioned figures of more than 5000 centenarians living in the Balkan Peninsula (Serbia, Bulgaria, and Romania) were not entirely reliable. In fact, neither of the two scientists proved the connection between Bulgarian *kiselo mleko* consumption and longevity. Metchnikoff’s fascination with the bacillus Grigoroff had identified led him to ignore the fact that longevity was typical for the entire Balkan region, not just Bulgaria. It is evident that Metchnikoff’s reductionist translation of Bulgarian dietary practices into scientific hypothesis was motivated by his personal beliefs. In modern medicine, we attribute objectivity to science, ignoring the scientist’s personal ambitions and politics of the lab. Therefore, it would not be misleading to suggest that Metchnikoff’s scientific hypothesis could be based upon ‘chance encounters’, which Metchnikoff



too ‘stumbled upon’ (as mentioned above, such phrase are commonly attributed to traditional systems of knowledge in bio-scientific studies).

The role of media:

Unlike most systems of traditional knowledge disregarded as folklore, Metchnikoff's scientific discovery had created a revolutionary impact that spread throughout Europe. It is important to discuss the role played by media in this context. On June 1904, Metchnikoff delivered a public lecture ‘*La Viellesse*’ (Old Age), in the lecture hall of the *Society of French Agriculturists in Paris*. He suggested that introducing Bulgarian ‘sour milk’ in the diet could reduce the harmful effect of intestinal flora, urging people to consume it. In his article ‘*Le Temps*’ (Eliminating Old Age), he quoted, “Those of you, pretty ladies and brilliant gentlemen, who don’t want to age or die, here’s the precious recipe: eat yogurt!” (Vikhanski L., 2016). Newspaper articles and advertisement are aimed at addressing non-scientific audiences and thus produce most ‘popular’ images of science for the lay public. Similarly, the Press cleared any caveats off from Metchnikoff's statements and fanned people's desire to eliminate old age. It was common for the press to haunt Metchnikoff's residence to collect any new information about his experiments on enhancing longevity. Metchnikoff was also eager to share his experiments with the press, but what reached the masses were controversial and half-baked truths about his work. Media's involvement created an ambiguity between ‘scientific’ and ‘simplified’ knowledge, which misconstrued many of Metchnikoff's ideas. In regard to this, Hilgartner S. draws our attention towards the process of the production and circulation of simplified scientific information. He criticizes the journalists and not simply the scientists who participate in the production of this information. The author suggests that when scientific knowledge is

popularized, it gets distorted. Simplified media accounts about scientific experiments and discoveries strengthen the epistemic hierarchy of popularized scientific knowledge over ‘genuine’ and ‘other’ sciences (1990:519-539). Fleck L. (1979) is of the view that interactions among ‘core experts’ like scientists and ‘educated amateurs’ belonging to exoteric circles (in this case the press) comprise a ‘though collective’ that is constructed as ‘popularized’ scientific knowledge. These vivid images of thought begin to prevail over scientific evidence and often return to the experts to influence their original thought style. In light of these views, it could also be suggested that popularized misinformation in the public domain about Metchnikoff’s theories led him to be uncritical about his neglect of empirical evidence in constructing any scientific hypothesis.

### 3.5

#### ***‘Let food by thy Medicine’: SCIENTIFIC MISINTERPRETATIONS OF HIPPOCRATIC GUIDELINES***

“And as he had done in Messina, he was about to infuse modern meaning into yet another health concept formulated by Hippocrates...There was no proof, only an idea. Neither Metchnikoff nor anyone else could have imagined the revolutionary impact it was to have on the diets of the future generations worldwide” (Vikhanski L., 2016: 167).

Metchnikoff added to the pool of Hippocrates’s most widely misquoted health

concept of “Let food be thy medicine”. The nutraceutical network exploits this misquotation even after 100 years of Metchnikoff’s scientific discovery. Diana Cardenas (2013) provides a review of reputed biomedical journals, which have at least for the last 30 years misquoted the Hippocratic phrase. She suggests that it has mistakenly helped scientists to confirm the importance of food to health, in a manner that it has become a misconception of Hippocrates’s implied meaning. Metchnikoff considered the *lactobacilli* as the cause behind for enhanced immunity longevity of the Bulgarians, a principle followed by modern concept of probiotics (pro- bios, i.e. conducive to life of the host as opposed to antibiotics). Probiotics could have a positive influence on health and prevent aging. But the research on probiotics widely reduces ancient concepts of food and medicine into scientific misquotations.

In her paper Cardenas D. (2013), mentions the confusion modern medicine has created around the famous quote by Hippocrates “Let food be thy medicine.” According to her, for Hippocrates even if food was closely linked to health and disease, the concept of food was not to be confused with that of medicine/drugs. Dietary interventions to maintain health were significant in that era. But it was based on a complex regimen of diet and exercise, suited to each person’s age, nature, activity, season etc. as mentioned in Hippocrates’ treatise on *Regimen*. For Hippocrates, food when ingested gets converted into a substance of the body (like muscles, nerves etc.). This understanding is unlike the biomedical approach, where the body is itself seen as the site of disease. Under modern medicine scientists like Metchnikoff reduced properties of food to its microbiological components to act like drugs, targeted at specific types of disease. In the case of developing yogurt as a health food, it has been reduced to its functional components i.e. health promoting microbacteria such as *lactobacillus bulgaricus*. This is not the Hippocratic

quotation's logic. Cardenas, D. suggests that such misquotations lead to persistent misconceptions. "In reference or quotation, is that mistaken information may become "a truth" or an "accepted fact". This is the case of the Hippocratic misquoted phrase (Cardenas D. 2013)".

### 3.6

#### **YOGURT: TRADITIONAL TECHNIQUES OF PRODUCTION**

While studying Himalayan food culture Tamang P. (2011) mentions, that the process used for the production of indigenous fermented foods is artisanal in nature. Mostly women use their traditional knowledge to prepare these foods. In Bulgaria, a farmer's wife or a shepherd provided the basic technology for producing *kiselo mleko*. Popdimitrov K. (1941) as cited in Stoilova E.R. (2014), explains the traditional way of producing *kiselo mleko*. He suggests the first step was to obtain the *maya*, which is a small portion of the previously produced yoghurt that producers preserved and used as a leaven for the new product. Milk obtained from sheep, goats, cows, or water buffalos was boiled and then cooled to a set temperature. The locals tested the temperature for inoculation of the *maya* manually by dipping their pinkie into the boiled milk. If the temperature was not too hot to bear, the *maya* was mixed in the milk and it was left to set. The women often applied different indigenous techniques that would be considered as 'magic rituals' by modern science, such as, drawing a cross over the milk or producing special sounds such as whistling, to guarantee a

positive outcome. In order to prevent any drastic drop in temperature, farmwomen would use woolen material to cover the containers like unglazed earthenware pans and wooden containers of about twelve kilograms filled with the leavened milk. In this way, it took several hours to transform the milk into *kiselo mleko*. Popdimitrov K. was a Bulgarian veterinary surgeon. He published the first handbook on manufacture of Bulgarian yogurt in 1938 (as cited in Stoilova E.R., 2014). In the book, he describes how prior to mass production, the soured milk (*kiselo mleko*) was, preferably made from ewe's (female sheep) milk instead of cow or buffalo's milk. Bulgarian women produced fresh batches daily, depending on the season and recommendation according to the religious calendar, if it allowed the consumption of dairy products on a certain day. The health, absence of disease and proper nutrition of the livestock were also factors that were considered before obtaining milk for preparing *kiselo mleko*. Bulgarians produced yogurt by extracting milk from different animals: ewes, buffaloes, goats, cow, or even by mixing those milk types (Johnston J. and Baumann S., 2010:68). Despite the potential variation in raw material, Popdimitrov K. emphasized Bulgarians' preference for ewe's milk. Popdimitrov suggested that "from pure ewe's milk you can get the most delicious and nutritious Bulgarian soured milk" (Stoilova, 2014:96). These specifications regarding the use of what type of milk, animal, season etc. were not taken into account by Metchnikoff and his colleagues while suggesting the health promoting properties of Bulgarian milk, which might have been able to produce a differential analysis. Katrandzhiev (1961:50) as cited in Stoilova E.R. (2014), explained the popularity of ewe's milk by Bulgarians' preference for fat products as 'nutritive'. He pointed out that yogurt made of cow's milk was not as thick, as the proportion of fat in it was half as that of in ewe's milk, hence, certainly 'less' nutritive. The characteristics of cow's milk

affected the traditional technique of making yogurt. “Because of its liquid consistency, cow’s milk was boiled until three quarters of the quantity was left, to thicken the milk”. The biochemical composition of this type of milk was important to give the specific taste of Bulgarian yoghurt, a major determinant for its quality (Parasecoli, 2008:134). As proof of quality, consumers looked for the presence of *kaymak* i.e. the fatty portion of cream on top of the yogurt.

Here, the reader must observe the making of Bulgarian *kiselo mleko* is extremely nuanced and specific in terms of its employed materials and techniques of production. I argue that it is extremely an unscientific approach to let go off these details in the name of unnecessary cultural practices, as these play a significant part in determining *kiselo mleko* as nutritive or not under the IKS<sup>18</sup>. If we assume that Metchnikoff’s hypothesis on correlating Bulgarians’ health to consumption of *kiselo mleko* held any scientific credibility, then we must take notice that the hypothesis was based on testing a sample from *kiselo mleko* prepared using indigenous techniques. Therefore, Bulgarians’ ways must be accounted some credibility on grounds of their production techniques and years of practice. Or least, the traditional knowledge must be empirically studied to account for these many variations. These indigenous techniques comprise an entire system of knowledge whose evidence can be found in its daily practice, which is not isolated from the larger system of dietary, social and cultural practices unlike the biomedical realm of nutrition and health.

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<sup>18</sup> IKS refers to indigenous knowledge systems comprising of both expert and non-expert domains of knowledge.

### 3.7

#### **YOGURT: SCIENTIFIC TECHNIQUES OF PRODUCTION**

As mentioned by the *Stamen Grigoroff Foundation* (2005), Dr. Stamen Grigoroff published a full description of his ‘discovery’ of yogurt in the scientific journal *Revue Medical de la Suisse Romande* (1905). The article was the first publication on instructions for preparing traditional/homemade Bulgarian yogurt. In his publication, Grigoroff gave details about the local use and homemade preparation of fermented milk in Bulgaria. He explained, in some parts of Bulgaria *kiselo mleko* (sour milk) was consumed almost daily by peasants and by others mostly in summer months. Grigoroff provided the scientific world with a partial description of the native technique. He ignored ‘other’ specifications (as mentioned in the section on traditional techniques of producing *kiselo mleko*) and stressed upon boiling of the milk and then chilling it to 40-50C°, these being the ‘scientific’ elements of yogurt making. We notice that temperature was a prime element in Grigoroff’s description. “After the introduction of yogurt making bacteria, the container should be kept as long as possible at a constant temperature” (2005:714). I translate Grigoroff’s description of the process as given by Stoilova, E.R. (2014) from French to English,

“At the end of eight to ten hours, according to the season, the milk is taken and forms at the bottom of the vase a rather compact white cake which, when intact, allows only a very small quantity to be exuded. The ferment which is kept to prepare the *kisselo-mleko* and which always comes from an earlier operation is designated in Bulgarian under the name *Podkvassa*”(2014:40).

Here, we notice that Grigoroff's description of preparing yogurt was similar but not identical to the traditional technique of producing Bulgarian *kiselo mleko*. Even though, his description is referred to as the 'traditional way' of production but his approach towards it has been altered according to 'scientific' suitability. This description was reductionist as it misses the specifications given under the traditional technique of Bulgarians. Metchnikoff took Grigoroff's description to a next level, in order to suit his scientific requirements. Stoilova E.R. mentions about Metchnikoff's technique, he suggested that the "customary *maya* introduced to milk is a drawback of the traditional technology of homemade yoghurt" and termed it as 'merely rennet' (2014:43). Metchnikoff proposed on introducing a new scientific, modern and universal manufacturing method that would do away with the geographical limitations posed by traditional yogurt. He was convinced that micro-flora of all varieties of soured milks (*yahourth, leben, prostokwacha, kephir, and koumis*)<sup>19</sup> contained both 'beneficial' and 'malicious' microbes (ibid.). The microbiologist believed that *maya*-the 'natural ferment', along with the presence of useful *lacto bacilli* it contained other microbes as well, which might be harmful. In order to support this, he offered an example of the *red torula*-a microbe predisposed to cholera and typhoid fever, which he had found after investigating yogurt leavening in a Parisian dairy. To solve such problems, he asserted, "The selection of pure cultures of the lactic microbes was the only way to avoid yoghurt with undesirable micro-flora"(ibid).

The probiotic foods like yogurt need to be 'strain' specific according to the current WHO regulations. This was Metchnikoff's logic too. He felt the need to develop 'organized' ferments/ 'pure' cultures/ 'prepared' ferments now referred as 'specific' strains as opposed to the 'non-sanitized, 'wild', 'contaminated' *maya* (ibid. 2014:43-

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<sup>19</sup> All these are types of indigenous foods derived by fermentation of milk.



48). This was necessary to get rid off the risk of contamination in traditionally prepared yogurt, as its starter culture-*maya* contained undesirable microbes too, according to him. By doing this Metchnikoff was transferring yogurt from home to the laboratory, translating food into medicine, which is similar to the process of developing nutraceuticals/probiotics today. Herschell G. mentions that during this time, most microbiologists and physicians rejected the preparation of sour milk using *maya* as they considered this method as risky and unhygienic (Stoilova, 2014:51). The bio scientific community including microbiologists, doctors, and chemists promoted the scientific method for yogurt production as superior to traditional preparation. In 1909, Adolphe Combe stated in an article in *The British Medical Journal*, “curdled milk obtained by the use of lactobacilli is superior to yoghurt as ordinarily prepared, being a constant product, completely harmless, and having a similar but more powerful, action on proteolytic microbes” (ibid.48). Adding to the growing pool of scientific knowledge on the preparation of yogurt, British bacteriologist Richard Tanner Hewlett (1910) offered a description in scientific measurements, “For the preparation of soured milk, the milk should be well sterilized by actual boiling for at least half an hour, preferably for an hour. It is then cooled to 40°C (105°F), inoculated with the lactic culture, and incubated at this temperature for twelve to twenty hours (ibid.47). Alongside this, doubts regarding the use of ‘sour milk’ had started to advance within the scientific community but they were often overlooked for advancing public health by sciences as minor deviations For example, Scientists like British surgeon Thomas Davey Luke in 1910 described the relevance of geographical location in preparing yogurt. Luke stressed that “in Bulgaria and Turkey, soured milk has been prepared for centuries without any such special precautions as now suggested, and with eminently satisfactory results from the clinical standpoint” (ibid.).

He suggested that sour milk was an indigenous food item native to Turkey and Bulgaria and it was impossible to obtain the same product in Britain or France.

The association of yogurt as a part of the Bulgarian dietary culture got laden with scientific translations, as the food item steadily was being placed closer to medical drugs packed in tiny bottles. Cautionary statements were being made regarding the use of bacterial isolates derived from yogurt, similar to how they were made regarding the use of pharmaceutical drugs. The traditional food item had reached the final stage of being identified as a scientific product. Metchnikoff's cautionary statement came out in the fall of 1905, with a chapter titled as, *Quelques Remarques sur le Lait Aigri* (A few remarks on sour milk). He included a small brochure containing instructions on preparing healthful sour milk. "Since raw milk could contain dangerous germs, yet lengthy boiling ruined its taste, Metchnikoff proposed a compromise:

"Boiling the milk, 'preferably skimmed', for just a few minutes. After cooling, it had to be seeded with a 'pure dose' of beneficial microbes, covered, and left for a few hours in warm temperature. The resultant sour milk could be eaten at any time of the day, with meals or separately", Metchnikoff advised. As per him, its use at 500-700mltrs/ day regulates the bowel movements and improves the secretion of urine" (Vikhanski L. 170:2016).

This statement is identical to a doctor's prescription on taking a drug. If we look at the development of probiotic yogurt today, it is interesting to note the attempts are made to place the biotechnoscientific product closer to its perception as an indigenous food item. Whereas, when we look at Metchnikoff's development of a similar product by the name of 'sour milk', the attempt was to place the product closer to drugs. This

opposite movement of similar products, developed almost a century away from each other can only be understood by situating them in their respective discourses on health, society, economy and politics. For example, in the early 1900s, scientific developments were seen as revolutionary because they were could control deadly epidemics such as TB, cholera etc. In this case laboratory prepared bacterial strains appeared as ‘specialized’ and ‘scientific’ products, which could work as effectively like a drug. Today, we see growing mistrust in drugs due to their toxicity and side effects. Due to the rising cost of medical treatments and drugs, people have started to seek refuge in ‘alternative’ therapies Therefore, in such a scenario the concept of nutraceuticals including probiotic foods is an attempt to make these products appear natural and as similar as possible to conventional food.

### 3.8

#### **ROLE OF THE INDUSTRY: EARLY NUTRACEUTICALS?**

From 1900 onwards, scientists had initiated a new transformation in yogurt manufacturing and adopted a strictly codified language to describe the technology. The laboratory-selected cultures of yogurt were of advantage to its industrial production as they helped developing industrial milk processing methods. They also required ‘standardized strains of bacteria’, to maintain a homogenous taste and consistency of the product, unlike traditional *kiselo mleko*. The product was characterized by its chemical and microbiological composition. The control of the microbiological composition of the product became one of the basic characteristics of yogurt science. Ferments were no longer controlled by the traditional producer

(women and shepherds), as was the case with *maya*. The laboratory became the new place to cultivate sour milk *cultures* of microbes. The Westernization of the technology was a break with the home-based, traditional models of production (Porter C., 1993:17). ‘Artificial’ ferments were the modern, hygienic, and scientific way of producing yogurt that promised to eliminate the dangers of the traditional methods. The scientific discourse was legitimized through laboratory tests proving the superiority of the pure cultures but also through campaigns criticizing the use of the previously produced yoghurt as starter. The scientific and rational description of yogurt production and the introduction of new practices to the dairies gradually transformed the traditions of yogurt production into something different – a Western scientific product characterized by the industry.

While Metchnikoff’s research on the prolongation of human life had made Bulgarian yogurt fashionable, the discovery of the ‘exact agent’ i.e. microbial strains of bacteria for milk fermentation was a bane for the industry. Metchnikoff’s scientific hypothesis triggered the creation and development of the dairy industry in France, the first in Europe with the use of fermented milk obtained from *Bacillus Bulgaricus*. Metchnikoff’s wife, Olga wrote in her memoirs, “After her husband’s experiments on lactic bacillus, the notion of the therapeutic power of pure sour milk began to spread among the public.” This attracted dairy producers, who “had the idea to prepare it on a large scale according to the new scientific principles” and contacted her husband for help. (Metchnikoff O.,1921:226). She was referring to Metchnikoff’s sponsoring of the commercial enterprise named *La Ferment*. Vikhanski L. (178:2016) informs that in the French Society, obtaining profit from research was a risk of reputation.

Metchnikoff's desire to secure his goddaughter Lili's future pushed him to risk his position and sponsor a commercial enterprise, *La Ferment* (ibid.).

*La Ferment* proudly advertised everywhere as being the sole provider of Prof. Metchnikoff's, 'sour milk' and pills called *Lactobacilline*. Their package stated that *Lactobacilline* offered a method for replacing harmful intestinal flora with one that is beneficial, which is, composed of different rigorously selected lactic ferments. The transition from indigenous yogurt in the Balkans to commercial yoghurt in France and Great Britain's markets required the already industrialized dairy production to appropriate and adjust traditional technologies for manufacturing. Many subsidiaries of *La Ferment* expanded overseas. In U.K., it sold a type of yogurt named *Lactobacilline Milk*. In America, it marketed *Lactobacilline* pills, *Bacillac*- a yogurt powder supplement; and *Lactofermentine*- a suspension of Bulgarian bacilli in broth for use against abscesses and wound infections. (Vikhanski L.178: 2016). All these examples could easily be classified as early nutraceuticals.

After Metchnikoff's green signal to this commercial venture, bio-medicalization of yogurt and similar fermented foods through techniques of cultural expropriation of indigenous foods began rapidly. Microbiologists and chemists started to experiment with a variety of dry lactic ferments obtained from such experiments to produce 'sour milk'. From food, yogurt had been translated as a biomedical drug sold as tablets, powders and dry cultures, which helped expand the market and promote certain characteristics of *Bulgarian bacillus*. Pharmacies and laboratories sold scientifically designated pure cultures in dried form as tablets or in sealed bottles as liquid form that had to be consumed within a few days of manufacture (Fournier, Combe and States, 2011:221). According to Hertz (1910), William Oppenheimer prepared his own

liquid cultures for patients under the name *Lactigen* recommended one wineglass of *Lactigen* three times a day (Stoilova, 2114:50). Pharmacists were an important part of the distribution network. They delivered and even produced yogurt that physicians prescribed to their patients. A discussion published in the Therapeutic and Pharmacological Section of the *British Journal of the Royal Society of Medicine* (1910) included the reactions of the bacteriologist William Bulloch and medical doctors Vaughan Harley, Arthur Hertz, and Gordon Lane on the therapeutic nature of the lactic-acid *bacillus*. These specialists also mentioned pharmacies as outlets where a variety of yoghurt tablets were sold. In 1910, the British newspaper *Hastings and St Leonards' Observer* ran an advertisement on sour milk, also referred to as Bulgarian fermented milk, which was prepared and distributed by pharmaceutical chemists. From an ordinary daily food accessible to everyone, as was the case in the Balkans, yoghurt became a medicine, a tool in the polemics of nutritionists, doctors and pharmacists propagating healthy food and lifestyle. This invokes Bruno Latour's analysis of occurrence of scientific events in his famous work *The Pasteurization of France* (1993). Latour's Actor-network theory (ANT)<sup>20</sup> suggests that in the 19<sup>th</sup> century French society, each actor in the network was playing a unique role depending on the power relation in the revolutionary scientific event i.e. 'Pasteurization'. Therefore, development of Metchnikoff's scientific hypothesis must not be analyzed in isolation from its network, numerous agents who were aiding to the success of this scientific venture. Here, I am extending this argument to the development of scientific yogurt. Following Latour's analysis, I argue that agents who form a network to support the scientific agenda, do not solely rest upon the principle of scientific objectivity. Any scientific progression is governed through various actors

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in the network, making it a ‘scientific revolution’. The whole chain of production to distribution of scientific yogurt products is similar to the processes run by nutraceutical industry today (refer to chapter 2). The abovementioned products fit in the definitional boundaries of nutraceuticals. Therefore, according to the current definition these can be understood as early nutraceuticals. Just as the case with most nutraceuticals today, dried cultures of yogurt in 1900s were a new method of ferment production that was not thoroughly researched.

### 3.9

#### **CRITICISMS ON ‘SOUR MILK’**

By the early 1910s, criticisms started to pour in from within the scientific community. At the *British Royal Society of Medicine in 1910*, Dr. Vaughan Harley disclosed how the popular ‘sour milk’ treatment also had negative effects. Based on his experience with the treatment and physical and psychological reactions of his patients, he concluded: “no doubt the public were being instructed very wrongly about it, and they thought that all their diseases were curable by the method” (Stoilova, 2014:49). Advertisements suggested that patients could be their own doctors, but Harley thought this undermined medical authority. Supporters of the new remedy like Harley realized the negative effects of the treatment’s popularity. As cited in Stoilova (2014), they warned against the inappropriate prescription of soured milk and soured milk tablets (Herschell, 1910:53). Herschell admitted that Oppenheimer had obtained good results in certain cases of colitis, but only where the Gram-positive organisms were in excess in stools. He explained why other researchers were less successful as they had not

made a proper bacteriological examination of the stools, and prescribed haphazardly in unsuitable cases. Most commercial products failed to live up to that standard of natural yogurt. In dried form, the bacilli lost their activity and livability.

Thus, several years after Metchnikoff promoted the medication based on sour milk research in 1907-1908, problems arose around the effectiveness and microbiological composition of 'sour milk' tablets. The sales boom of the tablets from 1908 till 1914 gradually declined. Infact, post Metchnikoff's death at 71 years of age in 1916 due to heart failure, criticisms were so staunch that they swept away all his hopes to prove his hypothesis correct. After few years of using a medicine, the scientific world began to refer to Metchnikoff's theory of immunity as 'an oriental fairytale'. Instead of now focusing on the indigenous techniques of sour milk (kiseló mleko) production, the industry began to repackage Metchnikoff's scientific logic into what we today but in the market at a health food – yogurt. This industrially manufactured yogurt with the support of biomedical scientific evidence is now being translated as probiotic yogurt.

### 3.10

#### **DANONE: INDUSTRIAL AND PROBIOTIC YOGURT**

After Metchnikoff's death, his theories about beneficial effects of yogurt had created a therapeutic demand. This paved the way for the industrialized production of indigenous yogurt. Isaac Carasso, was a young industrial company owner from Thessaloniki (Greece). He soon realized the market potential of Metchnikoff's



discovery. In 1919, going by the name of his son Danone he began to sell his first yogurt fermented with lactic bacteria prescribed by Metchnikoff. *Danone* yogurt was scientifically produced by pasteurizing milk, enriching it with powder milk to boost its protein and calcium content, then heating it to 43°C and adding two types of bacteria: *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. Here we again notice how this production technique was scientifically motivated with no inputs taken from the indigenous knowledge system of the source food. The food industry was certainly wanted to exploit the idea of ‘scientific evidence’ in selling their yogurt.

In 1942, the Carraso’s son named Daniel Carasso started a company called *Dannon Milk Products in New York, U.S.A.* In the early days, Greek, Arab and Turkish immigrants mainly consumed Dannon yogurt. Yogurt’s acidic flavor was not palatable to Americans. Therefore, local fruits like strawberry and blueberry were introduced into plain yogurt in 1947 for the company’s expansion. Addition of fruits was purely motivated by profits and had nothing to do with the production techniques of neither ‘scientific’ nor ‘indigenous’ yogurt. It was dyed, sweetened, lightened, liquidized, mixed with fruit, honey, and candy, and even squeezed into portable plastic tubes. By then, indigenous yogurt had been expropriated from its source system of knowledge, now biomedically translated and industrially manufactured as a ‘health-food’, an idea later classified by the nutraceuticals industry as probiotic food.

In 1977, after many failed ad campaigns Dannon president Juan Metzger got Americans to try yogurt in the first place. Although indigenous logic of the Bulgarians behind the production and use of yogurt was never taken into account, the cultural association of yogurt with Bulgaria was used as a selling point by Dannon to establish the idea of ‘naturalness’ about their product. Dannon used the face of a

Bagrat Tabaghua, a resident of a small village in the Soviet Caucasus in a thirty-second television commercial. The commercial was carefully conceptualized in order to provide a close to nature kind of perception about Dannon's yogurt. "In Soviet Georgia, there are two curious things about the people," intoned the narrator over the footage of extremely old people vigorously tilling fields and chopping wood. "A large part of their diet is yogurt, and a large number of them live past 100." The commercial closed with Tabaghua, a smiling 89-year-old wearing a *papakha* (a Turkish hat), enthusiastically digging into a cup of Dannon yogurt while his mother (age 114) smiled approvingly<sup>21</sup>. Industrial yogurt has become a part of the diet of most Western societies due to its perceived biomedical ideas about healthcare and naturalness.

### 3.11

#### **CONCLUSION**

Various historical processes that led to the biomedical translation of indigenous yogurt into industrially manufactured probiotic yogurt provide an analytical framework for development of modern day concepts such as nutraceuticals and probiotics. Naraindas (2006) argues about notions of biomedical 'evidence'. He suggests that notions of biomedical 'evidence' such as objective tests and measures are accepted as the only legitimate cannon to determine 'efficacy' of a cure for other medical traditions too. "But these do not necessarily accord either with the premises of these other traditions or with patients' subjective perceptions of well-being" (ibid: 2658). Extending this argument to the biomedical notions developed for determining

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<sup>21</sup> See: <https://www.youtube.com/watch?v=R9RJBgNB1ZI>

the therapeutic efficacy of indigenous foods like *kiselo mleko*, helps us understand the asymmetry and contestation among both the systems of knowledge i.e. biomedicine and IKS. Throughout the chapter, we see the use of bio-scientific terminology and measurements imbued to indigenous yogurt. The scientific hypothesis derives from the fact that consumption of *kiselo mleko* produces longevity and good health in Bulgaria. During this process, biomedical explanations reduce the traditional food only to its microbiological components. The hypothesis is reductionist as it isolates a dietary practice from its source. The new technique did not rely on the tacit knowledge of natives nor was Metchnikoff's opinion based on empirical knowledge.

For Bulgarians, *kiselo mleko* was a part of their larger dietary system, which was much more nuanced than its scientifically isolated microbiological components. It was no longer yogurt but a biomedical translation into a modern Western health product. In the current discourse it is translated into a probiotic food, a quiddity with no bearings on its origin. The sloppy translation of Bulgarian sour milk into medicine by the pharma-industry has abridged its entire endogenous logic.

Metchnikoff's yogurt-eating regimen for health, immunity and longevity attracted numerous adherents in the early 20<sup>th</sup> century. This new discovery eventually fell out of favor due to many factors including lack of consensus among various biomedical experts due to lack of scientific evidence, allegations laid on Metchnikoff for commercializing yogurt in the form of capsules, unsatisfactory scientific verification and the onset of WWI. After Metchnikoff's death in 1916, the premises on which health-promoting properties of yogurt were laid could never be satisfactorily verified. Nonetheless, in 1930 Dr. Minoru Shirota from Japan scientifically proved the colonization of the human intestines by a probiotic strain (*Lactobacillus casei* and

*Bifidobacterium breve*) obtained from fermented milk. This was the first probiotic drink named Yakult from Japan, launched in Japan in 1935 and claimed treat to treat specific health conditions, including pediatric antibiotic-associated diarrhea, acute infectious diarrhea, and persistent diarrhea in children. By 1977, the Danone Company had successfully emerged as a popular health brand by selling yogurt. Danone was circulating the idea of achieving health and longevity by consumption of yogurt through its commercials (footnote). The abovementioned developments fit correctly with the strategy devised to promote the concept of nutraceuticals post 1990s. This was done through developing industrial products produced through claims of scientific efficacy and marketed in the name of prevention of diseases. Within this context, Metchnikoff's discovery became a precursor to the development of what we today know as probiotic concept and his theory's revival was set in motion. Today Probiotic products are being developed under all the three sub categories of nutraceuticals, including food supplements, functional foods and functional beverages. But, the medium of food like in the form of probiotic yogurt is still considered the best way to administer their health benefits to humans.

Therefore, with the help of the nutraceutical concept, scientific evidence, right marketing approach and industrial input, Metchnikoff's hypothesis on the correlation between Bulgarian sour milk and immunity in the form of yogurt has now been translated as probiotic yogurt. Metchnikoff's theories supplement the popular discourse on preventative healthcare and micronutrient approach to food helping the development of nutraceuticals. I infer that this is one big reason why the initial shortcomings of Metchnikoff's theory (as mentioned in the previous sections of this chapter) have been left unexamined.

## **CHAPTER FOUR**

### **'DAHI' IN AYURVEDA VS. BIOMEDICINE: DEVELOPING PROBIOTICS IN INDIA**

## 4.1

### **AN INTRODUCTION AND BACKGROUND TO THE PROBLEM**

Under the first section of this chapter we shall critically analyze the intensive research being conducted on various varieties of *dahi*<sup>22</sup> in India for determining their biomedical efficacy and develop a variety of indigenous probiotic<sup>23</sup> strains. The Western logic of developing nutraceuticals through biomedical evaluations of indigenous foods and food sources can be seen moving to India. A good example of this is the rapid research carried out in the field of developing probiotics in the country. The probiotics were launched in India in 2007 and at present the Indian probiotic industry is valued at more than \$10 million (S Bisen, 2015:5). The ICMR (2011) suggests that the probiotic concept gained momentum recently with considerable and significant advances in functional and health food market across the world. In support of this, ICMR-DBT has formulated guidelines for probiotics being

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<sup>22</sup> Dahi is an indigenous term used to refer to fermented milk food in the Indian subcontinent, which can be prepared and consumed in a wide variety of ways depending upon the location and culture. It is referred to as dadhi in Ayurvedic texts and it can be prepared from milk obtained from various animals including cow, sheep, goat, buffalo, yak, camel etc. This food is a significant part of the dietary, therapeutic and ritual systems in the country.

<sup>23</sup> Probiotics are live microbial organisms thought to be healthy for the host organism. Food scientists generally include a probiotic-enriched yogurt as an example of functional foods. See, for example, Jones and Jew (2007) and Powell (2007).

marketed as foods. Currently, probiotic foods available in India are predominantly *dahi* (indigenous name for Indian yogurt) and a few probiotic beverages such as flavored milk, fermented and unfermented milk and buttermilk. Industrial production of dairy products has encouraged food manufacturers to diversify their product range and develop functional foods such as probiotic dahi/curd/yogurt (used interchangeably). S Bisen suggests that at present 80% of the total packaged *dahi* is manufactured by the dairy companies Amul, Mother Dairy, Nestlé and Britannia due to their strong distribution networks and market penetration (2015:4).

Looking at rising prospects in growth of probiotics in the country, the dairy industry and various State organizations are facilitating microbiological research on discovering indigenous strains of probiotics. Various government, scientific and business organizations in India, such as the NDRI, NIHFWS, ICMR and PaI, are promoting extensive research, standardization, product development and marketing of probiotics. For example, the ICMR (2011) report suggests a connection between the use of probiotics (especially made with microbial strains of *Lactobacillus* and *Bifidobacterium*) and alleviation of various health issues such as, lactose intolerance, prevention of bacterial, antibiotic or radiotherapy induced diarrhea etc. We can note the support of science and state to the dairy industry stakeholders like Nestle, Amul, Yakult, Mother Dairy and Danone for promoting probiotic foods through various examples in India. For example, scientists at the NDRI in Karnal are among the pioneers of research on the Indian probiotic bacteria. They are active members of the PaI, which is massively constituted by the dairy industry in India. Through this support, Emeritus scientist Virender K Batish and his colleague, Sunita Grover at NDRI have been working on a repository of 120 types of bacteria sourced from

indigenous fermented foods. The scientists plan to market two types of bacteria in near future—*Lactobacillus plantarum-91 (Lp-91)* and *Lactobacillus fermentum-1 (Lf-1)*, in collaboration with the Indian dairy industry. According to them, probiotics developed with the help of these two microbial strains can help us deal with burgeoning obesity epidemic (Grover et. al, 2012).

The process for developing probiotics under biomedical research involves use of ‘natural’ fermented foods. These sources are usually derived from ‘other’ systems of knowledge on health, food, medicine and nutrition, which includes both expert and non-expert domains. Varying samples of *dahi/curd* are being tested to determine their scientific efficacy for developing probiotics. In this regard, I would like to extend Elaine Elisabetsky (1986) criticism on ethno pharmacologists to the State, bioscientific community and food industry. These organizations are driven by the need to find ‘novel’ microbial strains, which leads them to conveniently neglect the various contexts of traditional systems of food, healthcare and nutrition. The problem with such processes is the equivalence they draw between disparate systems of knowledge, which are epistemologically different in their understanding of food and nutrition. Most biomedical research papers argue that ethnic/cultural groups have been ‘unknowingly’ using fermented foods rich with probiotic potential. Hence, these food items must be scientifically evaluated to prove their potential as ‘functional foods’. The traditional usage of these foods with reference to Ayurveda or IKS is only a starting point for supporting the biomedical argument. Therefore while conducting bioscientific experiments, the cultural and Ayurvedic understanding of most fermented foods is overwritten by the scientific logic. This is what I shall



demonstrate through critically analyzing scientific research that is being carried out since the last decade in India on *dahi*.

The second section in this chapter attempts at bringing attention to differences between the understandings about *dahi's* dietary/therapeutic effects in Ayurveda and its biomedical translation as 'probiotic' *dahi*. In India, *dahi/dadhi/curd* are the most common terms used to denote a dairy based fermented food item that is similar to yogurt in the West, as both are obtained through the process of milk fermentation. Under the native conception, this particular food item in its various forms, sweet, sour, salty, set or liquefied, is eaten, drunk and applied for dietary and therapeutic purposes. These uses are not only restricted to India but have been a part of the collective subconscious of many other south Asian nations like Sri Lanka, Nepal, Pakistan and Bangladesh since ancient times<sup>24</sup>. *Dahi's* role in India is not restricted to being a culinary item. It also performs as a therapeutic agent according to Ayurvedic system of healthcare, medicine and nutrition. Both indigenous (non-expert) and Ayurvedic (expert) systems of knowledge derive support from each other in practicing the production and use of *dahi* as a therapeutic agent separately into diet and medicine. As opposed to its standardized, homogenized and pasteurized technological variants like *dahi* fortified with vitamin A or probiotics, (example, Nestle probiotic curd fortified with vitamin A) the indigenous homemade *dahi* is consumed in variety of forms and ways and not solely as food with medical health benefits. Probiotic foods made with 'functional' 'isolated' microbes are being promoted as 'better' versions of the 'unscientific' indigenous fermented foods. The Ayurvedic rationale behind the use of indigenous *dahi* is very nuanced than its biomedical

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<sup>24</sup> Pal et al. (2007) mention about the utilization of *dahi* under various forms in many Indian culinary preparations.

translation into as a probiotic food. Like most other nutraceutical products, probiotic foods belong to the biomedical discourse on nutrition, which according to Scrinis G. (2008) has undermined other ways of engaging with and understanding foods, including traditional, cultural, sensual, and ecological approaches. For example, in India *dahi* is also used as an article in temple rituals and as an ingredient in *panchamrut*.<sup>25</sup>

## 4.2

### **CRITICAL ANALYSIS OF BIOMEDICAL EVALUATION OF INDIGENOUS CURD/DAHI**

In this section I would like to exemplify how biomedicine is using the credence of other systems of medicine (Ayurveda) and cultural dietary patterns to identify probiotic strains in India. Here we are focusing on research works that specifically extend the microbiological explanation to the therapeutic benefits of a particular fermented food i.e. *dahi*, in order to secure a variety of microbial strains for developing probiotics. As explained in Chapter 3 about how Metchnikoff's 'sour-milk' strains were sold as dry *cultures*, pills and tablets, similarly probiotics are available today in the market in different forms, as freeze dried capsules or spray dried foods. But it is stated that these provide more beneficial effects when provided in live form such as yogurt or fermented milk (IJTK, 2012:36). Hence, most research

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<sup>25</sup> *Panchamrit* is a sweet concoction used in Hindu worship and in the prayer rituals known as *pujas*. The name comes from the Sanskrit, *pancha*, meaning "five," and *amrit*, meaning "immortal" or "nectar of the gods." Traditional recipes for *panchamrit* consist of five ingredients: raw milk, curd (yogurt), honey, sugar and ghee (clarified butter). Typically, *panchamrit* is offered to the deity or deities and is consumed at the end of worship or after *puja*.

is also conducted on scientifically isolating microflora (LAB, yeast) from indigenous starter cultures used to prepare *dahi*/curd in common households. Chavan et al. (1989) suggest that indigenous fermented foods have emerged not only as a source of nutrition but also as functional and probiotic foods, this has stimulated the production of these foods and beverages at an industrial scale. I argue that reference to traditional systems of knowledge (expert and non expert) is just a prescientific validation point support a biomedical scrutiny of traditional foods, constructing new notions of efficacy, which undermines the logic of the source knowledge system.

In a research published by IJRAP, Ghosh et al (2013) examined the microbiological use of Indian curd as a probiotic suggesting its role in the management of diarrhea as a functional food. After the scientists made a quick reference to the relevance of curd/*dahi* in south Indian diet as a dietary staple since ancient times, it was suggested that the indigenous curd may not be as good as yogurt (implying probiotic yogurt) due to lack of probiotic potential. The authors mention, “It has been reported that chance contamination, favourable environmental and climatic conditions and serendipity, together played a role in the development of many of the cultured dairy products” (ibid: 1). Therefore, it becomes mandatory for the scientists to examine the local curd to prove its biomedical efficacy. Torrance (2000) suggested, rather than using these foods as they are, microbiologists are keener on discovering ‘valuable microbes’, to be used in industrial production of probiotic *dahi* with the use of food science technology, with claims to improve efficacy. This scientific experiment determined that the indigenous variety of curd was safe and contains anti-diarrheal properties due to the presence of LAB in it. But, it was concluded that not every variety of indigenous curd could be tested to verify its probiotic potential. Therefore, probiotic

‘strain-specific’ curd must be developed and probiotic curd must be made available to poor rural populations to manage diarrhea.

This kind of scientific enquiry is problematic because it applies an exogenous logic to an indigenous food item. This is done in order to determine whether it is ‘good’ curd or not, without examining the endogenous logic behind its usage. Etkin N. (1992) states that often the pharmacopeia and culture of the people are ignored in pharmacologic and phytochemical studies. The tendency of these studies is to ignore the use of the plant as originally used in indigenous therapy and to test it for other activities. In congruence with this, I argue that instead of using an emic point of view to determine the efficacy of dahi and the promoting the indigenous techniques for production of *dahi* in rural areas, capital is being invested in collecting biomedical evidence to develop probiotic products. While the scientists are hypothesizing about the inefficacy of the curd due to the lack of ‘good’ microbacteria, they are automatically denouncing the indigenous logic to determine efficacy of *dahi* on the basis of ‘absent material evidence’. Also this evidence is gathered to find cure for health issues such as diarrhea. Diarrhea is a biomedical nosological category of disease and might be foreign to the native’s conception for assessing therapeutic qualities of dahi.

In another study conducted by Kore et al. (2011) for evaluating the probiotic potential of traditionally prepared fermented milk/dahi, the first reference is made to the therapeutic benefits of *dahi* as stated in Ayurveda. But, in order to determine these therapeutic benefits, the study employs biomedical nosological categories of disease, which are alien to the logic of the native episteme of Ayurveda. The paper states, “According to Ayurveda, *dahi*’s antibacterial action and pathogenic microbes

promote health, vitality and improves nutrient digestibility” (Kori et al., 2011:35). Naraindas (2014) would argue against such statements, as they reflect practices that engage in what he calls as “conceptual bilingualism<sup>26</sup>”. Ayurveda certainly mentions about the role of *dahi* in promoting vitality, health and digestibility but nowhere in Ayurvedic texts can one find a mention of ‘microbes’ as the causal explanation to determine the therapeutic qualities of dahi. Naraindas (2014) argued that such kind of “epistemic mangling” eschews the complex therapeutic format and reduces it to ‘specifics’ against a particular syndrome, selected through correlation of symptoms. Thus, the indigenous healing procedure undergoes a biomedical translation whereby the holistic regimen of diet and medicine is abridged.

Dahi is recommended for treating diarrhea and chronic gastrointestinal disorders in Ayurveda, since time immemorial. (Kori et. al 2011:35). While making statements like these, most researchers overlook the logic of the native episteme from which they derive such information and address biomedical categories of disease through twisting of Ayurvedic concepts. “We should beware of attempting to ‘define’ any Ayurvedic concept, particularly in terms of modern scientific terminology”. In this regard, Hankey A. (2010) mentions about Meulenbeld, a Dutch scholar of Ayurveda, who asserts that during the translation of Ayurvedic concepts into scientific terms, we risk loosing the integrity of this knowledge system. By trying to merely equate the features of the Ayurvedic concept to bioscientific terms, we are reducing its whole to parts or worse rather ‘explain them away’. Naraindas’s detailed ethnographic account of the current formulary logic of Ayurvedic drugs can provide a clue as to why such equivalences are problematic. He pointed out that the “Ayurvedic pharmacopeia is

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<sup>26</sup> Refer to Naraindas 2006, p. 2659.

used to address an allopathic nosology and through a kind of symptomatic correlation, the drug is chosen to address a disease category or syndrome not native to Ayurveda”. (Naraindas, 2014:124). While mentioning *dahi* as a cure for diarrhea (translated from *Atisara* in Ayurveda), the researchers do not take account of the various types of diarrhea mentioned under Ayurveda. The causal explanation of this condition is not even similar in both these epistemic systems. I shall explain this in detail.

The 19<sup>th</sup> chapter of Charaka Chikitsa Sthana (as cited by Dr. J.V. Hebbar) mentions the causes, symptoms and treatment for *Atisara*. Charaka suggests that there are various types of *atisara*, namely- *Vataja atisara*, *Pittaja atisara*, *Kaphaja atisara*, *Agantuja Atisara* and *Sannipatik atisara*. Causes and symptoms of these types also differ according to the individual’s *prakriti* (bodily constitution) and hence their treatment is different too. As far as the use of curd/*dahi* is concerned, it is only used under a specific kind of treatment. Curd’s administration is also done in varying forms according to the specificity of the patient.

According to Ayurveda, *Atisara* is caused due to the aggravation of the *doshas* (bodily humors). Diet and treatment are prescribed depending upon whether the *doshas* are highly, moderately or mildly aggravated. If the patient feels hungry, *Takra*<sup>27</sup> (buttermilk) and not curd is given as an accompaniment with light foods like *Yavagu* (thick gruel), to stimulate the *agni* (digestive power) of the patient. In case the patient experiences *pravahika* (gripping pain), he/she is given *Khada* (a type of soup) made using the cream of sour-curd, paste of tender fruits of *Bilva* (Aegle Marmelops), equal quantity of paste of *tila* (Sesame) and profuse quantity of *dahi*. In case the patient experiences *Varcah-kshaya* (Scanty stool), she is recommended to

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<sup>27</sup> *Takra* in Ayurveda refers to the drink obtained after churning of curd/*dahi* with cold water and separating butter from it. This is different from what we generally understand as lassi, which is made by diluting curd in water. Refer to (Van Loon, 2003: 269-70)

have cream of curd sizzled with ghee and mixed with Jaggery and *Sunthi* (Ginger). It is important to note that this is only used as *Vyanjana* (side-dish) to the diet of the patient.

In *Kaphaja Atisara* (type of *atisara*), *takra* along with the sour juice of *changeri* (*Oxalis Corniculata*) and *kola* (a herb) added with ghee and salt is again used as a medium to administer Ayurvedic recipes, like, [*Dhataki* (*Woodfordia fruticosa*)+*Nagara-Bilva* (*Aegle marmelos*)+*Lodhra* (*Symplocos racemosa*) + *Padama Kesara*]. Like Ayurvedic drugs, these Ayurvedic recipes are also *yogams*<sup>28</sup> and cannot be seen as therapeutic for a specific ailment in isolation from each other. Intake of *Pippali* (*piper longum*) with honey, or buttermilk added with *Chitraka* (*Leadword*) powder or powder of *Bilva* fruits is used to cure *atisara* too.

The biomedical regime's testing protocols are foreign to the logic of the Ayurvedic medicine and nutrition. Banerjee M. (2008), points “dismantling Ayurvedic formulas into few active ingredients to fashion them into herbal products and nutraceuticals is one of the adverse impacts of integrative pharmaceutical research and standardization” (V.Sujatha, 2011). These newly ‘innovated’ products become hugely profitable as ‘over the counter’ products, escaping tight and tedious regulatory regimes, unlike pharmaceutical drugs.

In another study by Nanda et al (2013), a particular type of dahi named *chilika dahi* prepared in the state of Orissa has been scientifically evaluated. Following the lines of

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<sup>28</sup> By the term ‘*yogam*’, Naraindas has defined the “the *yogam*, or union of a formulation” (2014a: 24) that is something university-trained Ayurvedic physicians or allopathic system of medicine finds difficult to take a notice of, make mention or address while referring to Ayurvedic recipes on drug formulations.

the current nutritional discourse on preventative medicine, the authors suggest that India has a rich heritage of traditional fermented foods, significantly known for their tremendous nutritional and therapeutic properties, and great economic potentials. This *dahi* was scientifically validated through identifying a total of 64 microbial isolates from curd and milk samples collected in *Chilika*. Phenotypically these microbial isolates were found diverse and characterized as *Lactobacillus*, *Leuconostoc*, *Lactococcus*, *Streptococcus* and Yeast. The presence of 8 *Lactobacillus* isolates were suggested as the cause for preservation of curd from fungal spoilage, and enhancing its shelf life against the test organism *Candida parapsilosis*. We notice here that biomedicine has a very specific way of constructing evidence, which is absolutely alien to the logic of its native corpus. The microbial approach determines the efficacy of a cultural food like *Chilika* curd only through its microflora. Scrinis G. (2008) would term this as nutri-biochemical level reductionism. Under this, individual nutrients are analyzed in isolation from other nutrients and from particular foods just like isolating microbacteria from dahi and its properties. While acknowledging that this reductive nutrient-level focus might be useful within a particular framework, she adds, “it is often translated into fairly meaningless, misleading, and decontextualized dietary advice” (2008:43)

*Chilika* curd is traditionally prepared in a cup shaped bamboo basket using milk of *Chilika* Buffalo by ethnic community of *Chilika* (Orissa, India). These traditional techniques of production are neglected while exploring the unique character of *Chilika* curd in microbiological terms. Naraindas (2016) mentions that even if there is any evidence of cure or well being, the efficacy of the indigenous medical system is disregarded as empirical practices (which have been ‘accidentally’ discovered) or grounded in spurious beliefs. If biomedicine has to advance its explanation of these



food items, it has to reduce the status of the existing knowledge to merely empirical practices whose efficacy can only be determined scientifically. The logic of developing nutraceuticals like probiotics depends upon identifying traditional food materials, which have ‘functional’ potential. These foods are chosen for study because unlike medical drugs, these bioactive compounds are natural without any ‘side effects’, which has been the major cause for tremendous loss of trust in biomedical drugs. Therefore, in order to support bio scientific claims about the functional properties of isolated micronutrients from these foods, the credence of being ‘naturally therapeutic’ from its source tradition is much needed to further the agenda of nutraceutical industry.

In a study of traditional and Ayurvedic foods of Indian origin Sarkar P. et al (2015) state the fact that many traditional health foods in India can also be classified as Ayurvedic foods. The paper suggests, “Indian traditional foods are also recognized as functional foods because of the presence of functional components such as body-healing chemicals, antioxidants, dietary fibers, and probiotics. These functional molecules help in weight management, and blood sugar level balance and support immunity of the body” (2015:97). I would mention Naraindas’s (2014) argument in this context. He points that most of what passes as Ayurvedic research invariably means treating the ayurvedic materia medica as a resource to address biomedical nosological entities. While biomedicine’s nosological categories constitute the superstrate, a dominant language providing its own grammar, Ayurveda constitutes the substrate language. This results into an asymmetrical power struggle, leading to the birth of a *creolized*<sup>29</sup> formulary logic (Naraindas, 2014:42).

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<sup>29</sup> The word ‘creolization’ is derived from the work of Dr. Harish Naraindas, (2014) ‘Nosopolitics. Epistemic Mangling and the Creolisation of Contemporary Ayurveda’, in M. Dinges (ed.), *Medical Pluralism and*

### 4.3

## COMPARATIVE ANALYSIS OF AYURVEDIC AND BIOMEDICAL CONCEPTIONS OF 'DAHI'

In this section we analyze the Ayurvedic conception of Dahi through the study of English translations and interpretations of ancient Ayurvedic texts *Charaka Samhita* and *Sushruta Samhita*, which prescribe *dahi/dadhi's* therapeutic use varying according to season, taste, form, content and more. The mention of dadhi in these two texts covers its properties both as a therapeutic food and as part of Ayurvedic medicine. For example, *Sushruta Samhita vol. 2, chapter XXIV* (1911) contains the rules of hygiene and prophylactic measures using curd. It clearly specifies when and how *dahi* is to be administered for achieving good health. Dahi is an indigenous food item in India, so traditional systems of knowledge like Ayurveda have elaborated upon its properties and uses for humans. As we notice under the first section, biomedicine attempts to extend the idea about the therapeutic use of foods like dahi under Ayurveda to support its own practices. Therefore, when biomedicine identifies these food resources for developing scientific products like probiotics, a translational activity starts to take place. It is for this reason that we must account for the

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*Homeopathy in India and Germany (1810-2010): Practices in a Comparative Perspective*, Stuttgart: Steiner Verlag, 105-36. According to him a creole is formed through political and epistemic encounters between this 'inside' and 'outside'. He uses the concept of 'creole' and 'creolisation' to describe and analyze the transformation being wrought in the making of so-called proprietary medicines. Creole, with its notion of superstate and substrate languages, indexing a particular kind of asymmetrical encounter between dominant and subordinate languages at a particular historical juncture, captures the emergence of a new grammar and new formulary far better than concepts such as 'hybridity', 'domestication', 'bricolage', or '*masala* medicine to name some of the concepts that have been offered in the literature to depict this transformation. These concepts, although useful, rather than inviting analysis and critical scrutiny, often lead to a form of closure and tend to black-box the precise formulary logic of contemporary ayurvedic pharmaceuticals.

differences in conception of dahi under both the epistemic structures. This would lend evidence to the fact that how during these translational processes nuanced details get lost, which are otherwise essential to the logic of the source epistemic system.

As discussed earlier, when bio scientific research works use the example of Ayurvedic properties of indigenous fermented foods like *dahi*, they often turn a blind eye towards the larger context encompassing the usage of a food material. Instead, their focus restricts to identifying micronutrient components to determine efficacy. In this section, we try to analyze Ayurveda's logic of using dahi as a therapeutic food agent and how its gets reduced to its micro nutritional components under the biomedical conception.

Beginning with the idea of production of *dahi*, we note that the Ayurvedic texts rely upon the homemade indigenous *dahi*, usually produced by women of the house. No specific detail can be obtained about a standardized procedure for making dahi in these authoritative texts. When we study indigenous technologies about *dahi*'s production we find variance according to the availability of material according to the local's cultural and geographical context. Dating back to Indian civilizations and Indian old literature, namely Bhagavadgita, Ramayana, and Manusmriti, every community that lived in India had a clear and separate food belief system. (Sarkar P. et al 2015:97). As an example, Tamang points at curd or *curad* as the most auspicious item for any kind of ceremony among the Rajbanshis of Bengal. He suggests, in the traditional way, cow's milk is kept in an earthen pot for several days in a clean dust free, cool-dark room (made of earthen walls and roof built with straws and sticks). After few days, the *curad* is formed and then consumed with salt. No lemon or sour fruit extract is added to it, nor is the milk heated. This is unlike the Western

bioscientific logic of producing yogurt, which needs to be pasteurized and inoculated with a starter culture. These variances must be accounted from the natives' perspective, which are neglected as elucidated in the first section of this chapter. Lorna Rhodes stated, "while indigenous medical systems are perceived as culturally constructed, subjective and symbolic, biomedicine is proposed as universal, acultural and steeped in scientific factuality" (Waldram, 2003:3). These scientific ideals of rationality mentioned by Rhodes, legitimize the existing neglect offered to the indigenous techniques of producing *dahi*.

The milk for preparing dahi is obtained from available livestock, according to the region. These include animals such as cow, buffalo, camel, sheep, goat and yak. Ayurveda mentions different properties of each type of milk and variance in its therapeutic qualities<sup>30</sup>. The vessels employed in the fermentation of milk also vary according to the local topography. For example in the Himalayan region bamboo vessels are used to prepare dahi, whereas in the southern regions of India dahi is usually prepared in earthen pot vessels. Also, depending upon the weather conditions the duration of fermentation varies but the procedure remains more or less the same. These variations apply not just to India but we have noted in the second chapter that for producing yogurt in Bulgaria, similar variances can be found among different regions.

Even though, indigenous systems have their own techniques for determining the quality and efficacy of dahi, microbiologists make it mandatory to scientifically evaluate the quality of local dahi. These Ayurvedic texts clearly mention the characteristics of a dahi, which is not fit for consumption instead of categorizing it

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<sup>30</sup> See table, (Van Loon, 2003:268-9).

into binaries of 'good' and 'bad' on the basis of its microbial content. The technique employed to determine the quality of a dahi is mainly through an assessment of its organoleptic properties (taste, smell and appearance being a primary factor to determine quality here). For example, if the dahi is obtained through a slow fermentation process i.e. when milk undergoes slow alteration than the usual, Charaka referred to it as *Mandaka*- the imperfect curd. According to him, *Mandaka* curd is not well coagulated and the acid taste does not manifest in it. This type of dahi is not considered suitable for consumption as its use vitiates all the three doshas, causing health problems (Van Loon, 2003:269).

In contrast to the indigenous techniques for producing dahi, the production of probiotic dahi is extremely regulated and standardized to maintain its 'efficacy'. According to the guidelines specified for evaluation of probiotics in food by ICMR-DBT (2011), the quality of any probiotic food can only be determined through its particular genus, species, strain and dose of bacteria listed, measured in (cfu/ml/day). Therefore, these factors are the most important during the production of probiotic dahi. In addition to this, because the probiotic dahi is industrially produced, it is first pasteurized and then homogenized (meaning all fat and whey is evenly dissolved in the milk) to provide it with a smooth texture and standardized taste matching to the industrial yogurt. These features of techno scientific products like probiotic dahi are usually marketed as features of 'good quality', which do not comply at all with the Ayurveda's logic for quality determination of dahi.

It is through this difference between the techniques of producing 'indigenous' dahi and 'probiotic' dahi that we understand the subservient position of the indigenous logic and traditional techniques of producing dahi to the bio scientific rationale. Most

industrially produced dahi do away with the Ayurvedic distinction between the uses of milk as a matter of convenience.<sup>31</sup> The local variation in taste, form and appearance are important factors, which determine the use of dahi as a therapeutic agent under Ayurveda. I shall elaborate this point through the use of an example. Charaka (in Van Loon, 2003) suggests that differently tasting types of dahi (sweet, sour-sweet, sour) are prescribed for fulfilling particular therapeutic functions and different parts of dahi [curd water/whey, curd scum, curd cream (*mastu*)] work as therapeutic agents differently in diets as well as are employed as active ingredients for preparing Ayurvedic medicines.

The biomedical conception of probiotic foods lays emphasis upon its active pro-health microbes, offering neglect to the distinction among various traditionally fermented foods that are being solely employed as a ‘natural’ medium to deliver these probiotics. If similar dose and strain of probiotics claiming to act upon similar health issues are delivered through different foods, a consumer will soon forget to distinguish between the uses and therapeutic benefits offered by curd and lassee separately. The consumer will treat both the foods similarly based upon the presence of the ‘functional’ health ingredient in them. This would be very problematic to the traditionalist approach towards consumption of these food items. For example, the intake of dahi is much restricted in Ayurveda than of *Takra* (buttermilk).

“One fond of curd and using it recklessly suffers from fever, internal hemorrhage but regular use of buttermilk is considered to alleviate many

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<sup>31</sup> The dairy industries rather use a mix of cow and buffalo milk due to availability issues. A Nestle customer care representative as a part of telephonic query suggested this. Nestle A+ probiotic dahi is on the top list of probiotic foods available in India. Also refer to: <https://consumeraffairs.nic.in/consumer/WriteReadData/dahi-12.pdf>

health issues such as swelling, piles, obesity and anemia” (Van Loon, 2003:269-70).

Under the biomedical conception, these two foods would be clubbed as replacement of one another, both being probiotics are assumed to have similar effect on health.

The two systems of knowledge do not only vary in terms of their logic of production but also in their logic of consumption. These differences occur because the whole premise upon which disease, health and nutrition is conceptualized is not the same between Ayurveda and Biomedicine. Hence, selectively using the logic of one system of knowledge to validate the existence of another is only beneficial to the market and industry stakeholders, not to the ‘subjects’<sup>32</sup>. Biomedicine suggests that immunity and digestive health of an individual is compromised due to the absence of ‘good’ gut microflora but the Ayurvedic theory about immunity and digestive health is based upon maintaining a balance between the three *doshas* (humors) of the body, vitiation of which causes a loss of ‘*agni*’ (digestive fire) in the body (Charaka, as mentioned in Van Loon: 2003). Therefore, the biomedical approach of nutrition is focused upon the ‘micronutrient’ content in a food. This understanding presents the human body to us as one that needs to be regularly supplemented by nutraceuticals like probiotic dahi. Further, we shall be looking at the difference between logic of consumption of dahi under Ayurveda and probiotic dahi.

In the first section of this chapter we observe that most scientific studies advance the

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<sup>32</sup> For Foucault, “subjects are constructed through relations of knowledge and power” and that he “does not understand power to be oppressive or dominating.” Rather, Coveney (2006) notes, Foucault saw power as “*productive*,” as “produc[ing] ‘subjects’, for example, subjects of food choice; it also produces ‘objects’, for example, bodies that require nutrients; and it produces facts or ‘regimes of truth’, for example, nutritional knowledge.”

regular consumption of products like probiotic dahi by referring to *dahi's* daily use in our 'traditional' dietary systems, but they do not mention the nuanced details or restrictions associated to its consumption. For example, Ayurveda suggests the nature of dahi is *abhishtyandi*<sup>33</sup> and therefore its use must be restricted. Contrary to this logic, I use the example of a newly established Indian yogurt brand in 2015, *Epigamia*. In 2018, this brand launched a probiotic product named *Epigamia artisanal curd*. The web commercial encourages everyday consumption of the product and markets it as 'daily dose'<sup>34</sup> of health. By referring to the use of this probiotic dahi/curd as a 'dose', emphasis is being laid upon its biomedical properties, just like it would apply for pharmaceutical drugs. In opposition to this, *dahi* in Ayurveda is not meant for daily administration as it 'hot' in potency and 'heavy' for digestion (Mallika KJ, 2013:364).

“For instance in the manuscript *Ashvini Samhite*, time taken for digestion of curd is mentioned as 'twenty nights', which symbolizes the extent of heaviness it inherits” (ibid: 367).

The Ayurvedic texts prescribe specific rules for *dahi's* intake, which are lost in the biomedical translation and marketing of probiotic *dahi*. In Ayurveda, according to Charaka,

“Curd has been restricted in several ways viz., with respect to time (day, season, duration of consumption), heating directly, mixing or processing with hot substances etc. along with these, for prevention of ill effects addition of certain adjuvant are also specified” (ibid: 365).

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<sup>33</sup> Meaning of the term is pertaining to the Ayurvedic system of medicine and healthcare. Any food or material is regarded as *abhishtyandi* when on ingestion, it increases secretion and coats the channels carrying dosha (bodily humor), dhatu (tissue) and mala (waste products).

<sup>34</sup> See: <https://www.youtube.com/watch?v=Js9vENe6fs0>



Under the code of everyday good conduct, Charaka suggests that one should not eat full amounts of curd, as it falls under the category of heavy food and it is also not meant to be taken at night time (Van Loon, 2003:222). The use of curd must only be moderate as it can cause considerable derangement of *doshas* in the body if taken up to saturation point. This could be considered as one of the reasons why curd is usually served only as a part of a full diet, consisting of various other food items. As Tamang (2018) mentions, *Bhat-dal-sabji-tarkari-dahi/mohi-achar* combination is a typical everyday meal of people in the Western Himalayas. *Dhenroh* (boiled-maize flour) is a commonly eaten with *mohi* (buttermilk) in rural areas of Sikkim, Darjeeling, Nepal and Bhutan. This is in contrast to the way most probiotic foods including probiotic dahi are marketed, mostly as a small meal or a snack with no specification regarding its intake time. Some of the probiotic yogurts like *Danone-Activia* also contain fruit flavors to enhance their taste and consumer acceptability, which would be considered as *virudhahara* (foods with opposing properties/antagonistic to each other) in Ayurveda. The proper therapeutic benefit of curd could be obtained by consuming it with certain adjuvants.

Charaka (Su7#61) states, “ one should not take curd at night, without ghee and sugar, without soup of green gram, honey or amalaka, and that which is hot” (Van Loon, 2003:289).

Furthermore, the consumption rules for curd/dahi are laid according to the *prakriti*<sup>35</sup> (*vataja, pitta, kapha*) of an individual and also according to season (*ritu*), time (*kaal*) and place.

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<sup>35</sup> Together the three *doshas* determine the physiological balance and constitution of the individual which is called as **Prakriti in Ayurveda**. Every person has all three doshas (physical humors – vata, pitta, kapha) and trigunas (psychological qualities - Satwa, Rajas, Tamas) in different proportions.

Charaka (*Su6#41-48*) suggests that “curd should not be consumed during autumn, summer and spring since *kapha* and *pitta* gets aggravated respectively in these seasons. For example, during autumn one should avoid curd due to aggravation of *pitta* in the body” (Van Loon, 2003:98).

Such nuanced description gets lost in the biomedical translation about the therapeutic value of indigenous foods under Ayurveda and can be problematic too. Wele A. and Kolatkar A. (2016) provide an example in this regard,

“Neem capsules as a nutraceutical taken by a *vata-pitta* predominant person will induce a drying effect on the gut of the person and instead of benefits he would suffer from constipation that leads to variety of complaints. Similarly, *curcuma* supplement for a *pitta*-predominant person may lead to various symptoms like burning of mucosal membrane, epistaxis or others upon long-term usage” (Wele & Kolatkar, 2016)

Elisabetsky (1986) pointed out that drugs derived from indigenous plants, prepared and ingested in different ways can have different effects. This argument could be extended to *dahi's* pharmacological usage as specified in Ayurveda. For example, biomedicine while stating the use of probiotic *dahi* in prevention of diarrhea, neglects the rationale of its preparation and usage of its source knowledge system from which they derive this information. *Prameha* is usually translated as diabetes in the biomedical nosology. While the treatment of diabetes is restricted to the intake of a specific strain and dose of probiotics administered through *dahi* as a potent medium, in Ayurveda

“*Prameha* gets alleviated by the administration of buttermilk with haritaki , triphala and arista -*Su23#19-20* . Kustha, gomedaka (onyx), hingu, bone of

kraunca (a bird), trikatu, vaca, vasa, ela, godsura, yavani and pasanabheda-the powder of these drugs taken along with butter-milk, curd-water, or sour jujube juice alleviates dysuria and prameha. -Su23#17- 18” (as cited in Van Loon, 2003: 326).

The reader must note that the Ayurvedic properties of curd, curd-water and buttermilk are starkly different from each other (table ref), but all these foods are clubbed as probiotics, all addressing a universal disease category-diarrhea. Therefore, under the biomedical conception the medium is not important, it doesn't matter if the “good” bacteria is ingested through the medium of buttermilk or curd. No such medical advice is labeled on the probiotic products, as the logic of *dahi's* biomedical efficacy lies solely in its probiotic ‘dose’ and ‘strain’.

Functional foods such as probiotic curd/yogurt/dahi produced to supplement a natural food with micronutrients, are isolated from these natural foods and artificially preserved as probiotic strains in the laboratories, later purchased and employed into the making of probiotic foods by the food manufacturing industry. Therefore, under this process the ‘natural’ food is being fortified under the discourse of preventative medicine, itself being reduced to a non-active food substance stripped of its existing therapeutic values. It is only when this ‘natural’ ‘traditional’ food will contain an active (probiotic strains) health agent that it will become ‘functional’. In turn, for Ayurveda every food is an active agent of health, with its specified properties, which are employed separately in pharmacology from its dietary use. For example,

“ Psyllium seed husks, when consumed with water or honey may have different properties and if consumed with honey, the substance is often to be licked and not swallowed” (Naraindas, 2014a:17).

These rules are based upon the humoral logic where each food substance incorporated has an ‘active’ role in maintaining health.

Naraindas (2014a) suggests that, “Unlike a biomedical drug, which includes an inactive substance along with an active ingredient, there are no inactive substances in *Shastric* (Ayurvedic) medicines”.

In continuum to this argument, just like Ayurvedic medicines, every food item we consume is stated to have its own ‘active’ properties according to Ayurveda, which act differently on different individuals in different forms, time and season.

The regulatory guidelines provided by the FSSAI 2016 on nutraceuticals, functional foods including probiotics restrict their usage to oral administration only. So, probiotic curd’s therapeutic benefits for health are limited in form for aiding therapy, unlike its Ayurvedic conception. For example, in reference with chapter *XXXI of Vol. 2 Sushruta Samhita (1911)* by Bhishagratna K., the health benefits of *dahi* according to Ayurveda extend to its use a part of an anointment for removing over-obesity. This anointment is made of *takrarishta* (a fermented preparation of butter milk obtained from dahi) combined with various herbs such as *guduci*, *devadaru*, *musta*, *triphal*, *takrarishta* and honey (ibid: 556). The reader must note the specificity of the form in which dahi is being employed in preparing this anointment i.e. *takrarishta*. Similarly,

“A potion composed of powdered *Pippali* and (*Sain- dhava*) salt mixed with ***Mastu (curd-cream)*** and the four kinds of oleaginous substances (*Sneha*) constitute what is known as the *Sadyah-Snehana* {i.e., it produces the effects of the *Sneha* within a very short time). This potent emulsive measure (*Sadyah-snehana*) should be prescribed for the old, the imbecile, to females and to

persons of sluggish appetite, as well as to sensitive persons and in diseases due to a slight aggravation of the bodily *Doshas*” (ibid: 555-6).

Sushruta suggest that application of *Sneha* improves the digestive capacity, and overall vitality of the old, impaired and the weak and enhance longevity (ibid). It is from such sources that biomedicine flinches partial information to be used as pre-scientific evidence and build hypotheses. What remains problematic here is the fact that while establishing the role of dahi in treatment and prevention of diseases as probiotics biomedicine lets go off the minute details that entail the logic of an entire episteme. From this abovementioned example we see how only *mastu* and not *dahi* (curd-cream), which is just the top layer formed in indigenous curd/dahi is used in formulating a particular kind of potion for treatment of digestive issues and promote longevity. Looking at the examples cited earlier in this chapter, it is possible that biomedicine constructs pre-scientific evidence from this formulation given by Ayurveda and correlate the benefits of dahi (which are actually attributable to one part of dahi i.e. the cream layer ) with longevity and later begin to evaluate this formulation as ‘good’ or ‘bad’ based on its probiotic potential, even when that is not the original determinant of the efficacy of this potion

#### 4.4

### **CONCLUSION**

In this chapter I examine the increasing scientific research and development of probiotics in India. I also analyze how such biotechnoscientific processes are systematically dismantling the traditional dietary knowledge and how this is

problematic. Commercial lobbies and global healthcare industry with increasing partnership with food manufacturers and support of microbiological research all around the world is leading to the transformation of cultural knowledge systems of diet and nutrition. In this regard, I concur with Dr. V. Sujatha's critique on developing Integrative medicine and categories such as nutraceuticals,

“Which are going to gradually eliminate the crucial role of non-expert domain of knowledge as an important layer of health security and folk medical knowledge in Ayurveda” (2011:6).

Development of nutraceutical products such as probiotic foods, do not merely inform and complement but instead tends to displace and undermine food-level knowledge. Beyond its probiotic value, curd/dahi symbolizes the culture of various ethnic groups of India. The production techniques, the consumption pattern, preferences and its use in various forms build the substratum of an entire system of knowledge guided by Ayurveda and various other traditional scientific (Siddha, Unani) and non scientific (IKS) systems. Understanding of dahi solely through its microflora, limits the scope of traditional foods. It renders all other types of foods derived from it in homogeneous category.

The “value” of dahi is assessed solely in terms of its microbial content, using measures of biomedical efficacy. All these factors culminate into an epistemological hotchpotch. Traditional dietary and healthcare systems are being exploited to extract pre-scientific evidence for therapeutic qualities of certain foods, establishing notions of ‘naturalness’ for their products. With the involvement of various stakeholders in production of these probiotic functional foods/nutraceuticals, this process undermines the home based production of dahi which has been used since ages and requires due credence. The Indian society is familiar with preparing and consuming a particular

food through the use of their indigenous knowledge settled in their collective subconscious and located in everyday practices (which includes both the cultural knowledge based in everyday practices and rules prescribed by Ayurveda).

The state, scientists and industry stakeholders fail to realize that the indigenous ways of understanding food is not based upon its microbiological units, it is not assessed within the confines of the nutritional value. Their understanding of disease, health, food and nutrition are markedly distinct from the bio scientific approach. The dangers of promoting foods such as probiotic dahi lie in the practice of their usage, the medical field of knowledge it arrives from does not control its circulation of consumption, which makes it appear easily on market and mostly advertisements govern the mentality of the consumer who buys probiotic dahi because of its biomedical properties, clearly dislocating it from the pre-scientific body of knowledge (in this case Ayurveda and IKS). Dahi becomes medicalised and industrialized, the logic of its therapeutic usage is lost and also it is dislocated from its cultural field. However, practices around the usage on dahi in India must be studied under traditional systems of knowledge on food, medicine, and while one may contribute to empirically study their technology from an 'emic' point of view without damaging the dietary knowledge systems.

**CHAPTER 5**

**CONCLUSION AND REFLECTIONS**



## 5.1

### **CONCLUSION**

This dissertation has been an attempt at understanding the various processes that have undergone into the formulation of the concept of ‘nutraceuticals’ under the biomedical regime of healthcare and medicine. There is asymmetry and hierarchy in the way knowledge is produced and circulated around food, healthcare and nutrition. With nutraceuticals as a case in point, I try to address the issues of the many ways in which systems of knowledge play out in the society.

My first research objective was to sociologically address nutraceuticals as a conceptual category. This is a theme that runs parallel with other research objectives throughout the research. In the first chapter, we see how there is no uniformity among varying definitions of the term by the bio-scientific community, regulatory bodies, business and industrial organizations to explain the term ‘nutraceuticals’. The concept is still evolving, yet in the past two decades since the inception of the term we see rapid increase in the production of these products. In this regard, Santini and Novellino (2014) have pointed that the legitimation for determining the efficiency of nutraceuticals in biomedicine is still contradictory. They further add that no one definition of nutraceuticals is accepted worldwide, as the concept overlaps with food, pharmaceuticals and food supplements. From this definition, we also infer that parameters of defining biomedical efficacy of nutraceuticals haven’t also been met satisfactorily. The Lancet, a British Medical Journal published an early report in this context, suggesting that ‘good bacteria’ in probiotic yogurt/curd/dahi can also prove to be fatal for some people suffering from severe pancreatitis. The doctors advised to

not give probiotic foods to patients in intensive care. DNA (2008), an Indian broadsheet newspaper suggested about the rapid influx of probiotic curd in Indian market and published the findings of this scientific study by a team of doctors from University Medical Centre (Utrecht, Netherlands).

Therefore, we notice that no consensus has been built within the medical community regarding the ‘revolutionary’ potential of these products, but biomedical research on nutraceuticals and product development is rising. To address these contradictions, I have tried to situate the growth of nutraceuticals within the current discourse on preventative healthcare and micronutrient approach towards food under the ‘nutritionism’ (Scrinis G., 2008) ideology. It is through understanding nutraceuticals as a part of larger social, economic and biomedical discourse that I could also locate categories of similar products that emerged previous to the origin of the term ‘nutraceuticals’. Most of these categories, for example, food supplements like use of Vitamin C for cancer therapy during the 1970s-80s were being promoted as ‘alternative’ medicine and faced much criticism (Hyomin K., 2011:20-1). It was the coining of the umbrella term ‘nutraceuticals’, which was the first attempt to provide a systematic framework for all scattered health-product categories.

Although regulatory bodies in different countries have tried to classify the differences between nutraceuticals and various sub categories such as functional foods, probiotics, dietary supplements but the nomenclature is yet not standardized. For example, in Japan the terms functional foods and probiotics are referred to as what is legally classified as nutraceuticals in the U.S.A, therefore the nomenclature is overlapping. Similarly, I also mention that we can find a regulatory overlap among

food supplements which are pharmaceuticals by definition and food supplements that are classified as nutraceuticals in India (Bagdi & Narsana, 2016). This provides an opportunity for the food-pharma industry to club all these categories together and advance them under the nutraceuticals agenda, which is supported by sections of biomedical communities and public health programs of many nations like India (see Street A., 2014). In view of these differences and overlaps among several such similar product categories, I find that most of the biomedical research works and business reports classify three major sub categories under nutraceuticals for purpose of study, development and marketing. These include 1) Dietary supplements, 2) Functional foods, 3) Functional beverages (see Radhika et.al, 2011; ASSOCHAM, 2017; Pandey et.al, 2013; Frost & Sullivan:FICCI, 2009; Ernst&Young, 2009 etc.).

The second objective of this study was to trace the process of development of nutraceuticals. For this purpose, I chose a specific category of probiotic yogurt, which is also classified as a functional food under nutraceuticals (see Sharma & Garg, 2013, ASSOCHAM, 2017). It is through this genealogical investigation that we can locate the emergence of a similar concept like nutraceuticals and also its failure. I begin by addressing the present concept of probiotics and the association of Dr. Elie Metchnikoff as the founding father with this development. Further, I discuss how without any empirical evidence, Dr. Metchnikoff developed a 'scientific' hypothesis based upon correlating the longevity of Bulgarian population with their consumption of an indigenous fermented food item, known as kiselo mleko. Metchnikoff carried out Biomedical translations of kiselo mleko through scientific evaluations and clinical measurements into 'sour milk', to make claims about its therapeutic qualities of promoting immunity and health. Although, widely popular in the early years sold as

pharmaceuticals in the form of dry culture and pills, 'sour milk' faced tremendous criticism within the biomedical community for making commercial profits upon spurious grounds of efficacy of this and similar products. The 'scientific discovery' resurfaced after Danone- a dairy company started selling Metchnikoff's 'sour-milk' strains in the form of yogurt in parts of Europe and later in the U.S.A. Yogurt was popularized as a health food in the year 1977 all over the U.S.A. by launching a commercial that projected Bulgarian centenarians eating yogurt for good health. Simultaneously, the concept of 'probiotics' was being built through carrying out rigorous scientific research in order to ward away any criticism, unlike Metchnikoff's time. These processes have today led to the development of products such as probiotic yogurt for maintaining health, under the present biomedical regime of healthcare and medicine. I argue that increasing scientific evidence and clinical tests do not solve the problem of a reductionist approach followed by the bio-scientific community. Since the therapeutic logic behind such indigenous foods are disembodied from their source system of knowledge, a lot gets lost under such biomedical translations, as discussed in detail in Chapter 3. Ironically, more than a hundred years later the 'other' epistemic systems are merely a site for developing hypothesis, pre-scientific evidence used for extraction of select information, offering neglect to the endogenous logic behind the practice of employing specific foods as a part of their dietary and healthcare systems.

Keeping the abovementioned concerns in view, I finally turn towards exploring the transfer of this Western biomedical logic to the development of probiotics through bioscientific evaluation of indigenous foods. Hence, I critically analyze a few research works carried out in India for developing probiotics from indigenous samples of dahi. I have briefly mentioned the role of bioscientific community, the State and dairy

industry manufacturers aiding to the growth and popularity of probiotics. I do this in order to find out how such works use the idea of therapeutic value of dahi as listed in Ayurveda to draw the idea of ‘traditional wisdom’, ‘naturalness’ and ‘safety’ about their probiotic formulations. I observe that biomedical evaluations of dahi isolate its ‘microbial strains’ and translate it as a “good” or “bad” sample on the basis of its probiotic potential. This kind of bioscientific research is laden with notions of clinical trials, scientific evaluation, techno-scientific development, isolation of (nutrients, microbes, bioactive compounds), biomedical efficacy etc. All these phrases are aligned with categorically distinguishing nutraceuticals from ‘other’ forms of health foods, which might have been associated with therapeutic benefits by other systems of knowledge. Without biomedical assessment, the efficacy of indigenous dahi cannot be determined. Such processes turn ‘other’ systems of knowledge as subservient to biomedicine.

Finally, in order to understand how this biomedical reductionism can be problematic, I have a dedicated section to note the differences among biomedical and Ayurvedic conception of dahi in India. Most indigenous foods have been incorporated by the Ayurvedic system of healthcare and medicine. Ancient texts like Charaka Samhita and Sushruta Samhita discuss the therapeutic role of dahi in the Indian dietary system, its prophylactic properties and its role in formulation of Ayurvedic medicines. By drawing this comparison, I am in no way attempting to undermine the biomedical discovery of probiotics, rather only trying to highlight the lacunae in the bio scientific approach that overlooks the logics behind the use of dahi listed in their sources of reference, in this case Ayurveda. This as Naraindas H. (2014) would suggest entails “problematic consequences for practitioners and patients of both source and recipient

traditions” (2014:2658). In this section I argue that biomedical identification of the therapeutic properties of indigenous foods listed by other systems of healthcare such as Ayurveda is not to be seen as a promotion of the practices of these other systems. Rather this approach promotes the biomedical interpretation of these foods and practices surrounding them, which leads to the formation of creolized categories<sup>36</sup> (Naraindas H., 2014) such as nutraceuticals.

## 5.2

### **FINAL THOUGHTS AND REFLECTIONS**

The concept of nutraceuticals attempts to stand away from other biomedical methods of healthcare and medicine. This is done through making claims about being ‘natural’ and hence devoid of any toxicity, unlike pharmaceutical drugs. I argue that this turn towards ‘natural’ is not to be seen as going ‘back’ or being provided with unadulterated forms of healthcare resources that existed prior to the developments in the modern day society. Rather the idea of ‘natural’, ‘traditional dietary systems’,

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<sup>36</sup> The word ‘creolization’ is derived from the work of Dr. Harish Naraindas, (2014) ‘Nosopolitics. Epistemic Mangling and the Creolisation of Contemporary Ayurveda’, in M. Dinges (ed.), *Medical Pluralism and Homeopathy in India and Germany (1810-2010): Practices in a Comparative Perspective*, Stuttgart: Steiner Verlag, 105-36. According to him a creole is formed through political and epistemic encounters between this ‘inside’ and ‘outside’. He uses the concept of ‘creole’ and ‘creolisation’ to describe and analyze the transformation being wrought in the making of so-called proprietary medicines. Creole, with its notion of superstate and substrate languages, indexing a particular kind of asymmetrical encounter between dominant and subordinate languages at a particular historical juncture, captures the emergence of a new grammar and new formulary far better than concepts such as ‘hybridity’, ‘domestication’, ‘bricolage’, or ‘masala medicine to name some of the concepts that have been offered in the literature to depict this transformation. These concepts, although useful, rather than inviting analysis and critical scrutiny, often lead to a form of closure and tend to black-box the precise formulary logic of contemporary ayurvedic pharmaceuticals.

‘indigenous food/food sources’ are used as tools to construct a conceptual category under the biomedical regime to deal with the risks it has generated and sustain it. Dislocating traditional dietary practices from their sources of origin for developing nutraceuticals is bound to translate the logic behind their ‘original’ therapeutic action. As Dr. V. Sujatha would suggest in this context, the risks of such processes also remain in the constant reclassification of Ayurvedic disease terminologies into biomedical disease terminology. In turn, altering the overall meanings and practices behind the usage of a particular food source.

Through this study, I infer that ‘nutraceuticals’ promoted as a ‘revolutionary’ step forward in human healthcare, are just repackaging old bioscientific logic into industrial profits in a cyclical pattern. Traditional yogurt has resurfaced as nutraceutical in the form of probiotic, aiding industrial profit through product diversification. At the beginnings, when De Felice faced hardships in promoting nutraceuticals, he foresightedly quoted, “Nutraceutical research will begin to flourish mightily owing to the energy and creativity of corporate capitalism”. The rise of Probiotic yogurt is an evidence of the same statement. The indigenous food sources being repackaged and translated into biotechnoscientific products, suitable to the larger narrative of biomedical discourse and industrial growth. In this regard, I would concur with Dr. V. Sujatha’s (2011) suggestion regarding “integration of the knowledge, skills, and techniques within ISMs in different regions of the Indian subcontinent, instead of integration with biomedicine.” Accepting that traditional system of medical and dietary knowledge must be strengthened by new approaches, this paper advocates a pluralistic approach to these ‘other’ systems of knowledge through their own perspective rather than adding to the pool of biomedical knowledge through an integrative approach, which leads only to reductionism.

Lastly, the crucial argument is that practices like normalizing everyday consumption of nutraceuticals is not to be looked at as an inevitable and the only next logical step. Rather the attempt is to question such ideas created by larger institutions and understand that these are practices embedded in creation and sustenance of particular systems of knowledge. I must add that the purpose of this research is not to criticize or condemn any system of knowledge. Rather, the purpose it is to understand the processes, conditions, epistemic contestations, asymmetries and hierarchies that go into the production of a particular kind of knowledge. Also, through this research I would urge the reader to re-examine some of our fundamental beliefs regarding the approach to healthcare, food and nutrition in the light of the arguments presented here and question why nutraceuticals and not food as we knew it before?



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