

Review

The Medicinal Use of Chocolate in Early North America

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The medicinal use of chocolate has a long history in North America dating back to the 16th century. From Mesoamerican Codices and European Treatises scholars have determined that for hundreds of years the beverage called chocolate was administered to the sick and prescribed homeopathically to prevent illness. Yet, little scholarship exists that focuses on medicinal chocolate usage in early North America (18th–19th century). This paper examines medical practices during this era and associated medicinal norms with special attention given to chocolate/cocoa usage. Given the current scientific attention on the relationship between dark chocolate consumption and heart disease attenuation it is timely to investigate and chronicle America's medical forebears' understanding of, and practices related to, the medicinal use of chocolate. Indeed, there is a significant amount of literature to suggest that chocolate was used for wellness and to treat illness.

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1 Introduction

I felt my Self [sic.] very unwell and dierected [sic.] a little Chocolate which Mr. McClellen gave us, prepared of which I drank about a pint and found great relief at 11 A.M. we proceeded on about 1 mile and come up with the hunters who had killed 4 deer; here we delayed until 5 P.M. when the hunters all joined us (Second Lieutenant William Clark, Diary Entry, September 13th, 1806) [1].

Interest in the relationships between foods for health, medicine and science dates back thousands of years [2–5]. Modern historical scholarship on the medicinal use of chocolate/cocoa (hereafter chocolate) has primarily focused on both Mesoamerican and European practices [6, 7], while little attention has been given to early North American traditions. Evidence that use of medicinal chocolate existed in Colonial America is substantiated by early documents, including a pamphlet published for a hospital in Salem, Massachusetts that lists chocolate under “patients diet [8].” Continued medicinal use of chocolate through the 19th century in the United States is demonstrated in the opening quote from the *Journals of the Lewis and Clark Expedition*.

Yet, for the better part of the 20th century, and certainly after the 1930s, the consumption of chocolate shifted in the United States from medicinal to confectionary. Over the past decade laboratory research has indicated positive relationships between consumption of dark chocolate and cardiovascular health [9–15]. As a result chocolate consumption has returned full circle, that is, to its medicinal origins.

If we accept that Pre-Columbian Mesoamericans and subsequently Europeans incorporated chocolate into their respective medical practices [6], it is plausible that early Anglo-Americans residing in Colonial America would have transferred that knowledge and tradition of medicinal chocolate use to their newly founded homeland. Indeed, recently discovered documents indicate that the medicinal use of chocolate was practiced both homeopathically in addition to being prescribed to patients by physicians for a variety of diseases during 18th and 19th century America.

Prominent diseases during the Colonial and early Federal eras included but were not limited to cholera [16], consumption (tuberculosis) [17], scarlet fever [18], smallpox [19], typhus [20], and yellow fever [21]. Prescribing chocolate to treat these diseases, however, was problematic for both the physician and homeopathic practitioner. Proportionally, chocolate is high in fat, has a significant amount of tannins, and often was mixed with spices or simmered with milk. There also was delineation between drinking chocolate and cocoa – the former used for gustatory pleasure and

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the latter for treating the infirm. John Tarbell published his book *The Sources of Health and the Prevention of Disease* in 1850 and wrote:

The [chocolate] kernels of the nut, after being heated upon an iron plate, and afterwards ground, form with the addition of water, a paste, which is sweetened, flavored, dried in moulds and sold in shops as chocolate. Cocoa is a preparation of the same substance ... if the oil of the nut is extracted, the indigestibility is of course diminished; and the “prepared cocoa,” which contains but little oil, is the least objectionable for invalids [22].

Exceptions to this rule, however, existed and are illustrated in the following section on the treatment for cholera. The variability in pharmacological recipes for chocolate (consumed only as a beverage) can be traced to Spanish physicians in Mexico [23]. An influential 19th century American cookbook by an anonymous author (unfortunately, the name of this interesting woman author has remained unknown), *A Manual of Homeopathic Cookery ... by the wife of a homeopathic physician*, contained a section titled “Cookery for Convalesces [sic.] where she directed caregivers how to prepare cocoa for the infirm:

Take two ounces of cocoa nibs and put them in a coffee boiler (but which has never been used for making coffee,) with two pints of water; allow it to simmer for eight hours by the side of the fire, and then pour it gently off for use, leaving the nibs in the boiler, to which, if another ounce is added, it will make other [sic.] two pints, but it should not be used oftener than twice [24].

Her recipe contained a footnote with an advertisement that illustrated the distinction between recreational chocolate use and medicinal:

Always on hand pure cocoa and Homoeopathic Chocolate, without any admixture of spices, are to be had, by the single cake or by the box of 25 pounds each [24].

This phrase – *without the admixture of spices* – reflected the view prevalent at the time that “mixed” chocolate was thought to be injurious to invalids. This view also was reinforced by the physician, Dr. Joseph Laurie in his book on child-rearing where he offered dietary advice to mothers:

[T]ea, coffee, greasy or spiced chocolate, are anything but desirable articles of food [25].

The greasiness of chocolate Laurie referred to was full-fat chocolate in contrast to cocoa, which was defatted.

2 Medicinal uses of chocolate

Mesoamerican and European practices of medicine were based on the concept of balance, specifically developed from humoral theory where foodstuffs were defined as hot or cold and wet or dry [26]. In humoral medical practices, health was defined as “balance” whereas illnesses and diseases were classified as hot–cold/wet–dry. Foods also were classified using the same dichotomy: hot–neutral–cold

and dry–neutral–wet. Once illnesses had been diagnosed they were treated using diets based upon prescribing foods of the opposite factor, examples being: cold foods for hot diseases, wet foods for dry diseases. By matching disease states with their opposite food-related classifications, practitioners of humoral theory believed that patients would be brought back into balance and thus good health restored [27]. While historical documents indicate a lack of consensus among 17th–19th century health practitioners whether or not medicinal use of chocolate should be advocated, still, there remains a significant body of literature that documents chocolate used medicinally, specifically for a well-defined range of diseases.

2.1 Cholera

Cholera is a severe disease characterized by profuse diarrhea leading to rapid dehydration. Transmission to humans is *via* feces-contaminated food or water containing the bacterium, *Vibrio cholerae*. Commonly, untreated sewage enters waterways or reaches groundwater tables affecting the water supply. In the early 19th century several cholera pandemics ravaged Europe and ultimately reached New York City and other major North American urban centers during the 1830s [28]. The physician, Dan Drake, asserted on May 24th, 1849, in *The National Era*, that: “there is no preventive of cholera; but all constitutions are not liable to it, any more than all are liable to ague and fever, influenza, or any other disease [16].” Moreover, Drake, drawing on humoral theory, advised his readership to refrain from becoming cold and recommended wearing flannel clothing and keeping their homes well heated. He also suggested (erroneously from the viewpoint of the 21st century) that: “loading the stomach with any kind of food, especially at night, may bring on the disease; and omitting to eat at the usual time may do the same thing [16].” Drake then instructed his readers to follow a prescribed diet of “plain” and “digestible” foods, with chocolate listed among the proper drinks to consume and to be taken as usual [16]. An article published in *Scientific American* in 1849 also addressed a positive relationship between chocolate consumption and cholera attenuation:

During last summer, those individuals who were habitually using chocolate or broma, neither had attacks of cholera or dysenteric affections, while others in the same families, taking their daily potations of tea, coffee, or simple cold water, were suffers [29]. (Broma was a type of hot chocolate beverage served to the infirmed. See Table 1 for a recipe.)

Three years later, a letter to the editor of the *New York Daily News* revealed that cholera remained a major health problem in 19th century American cities. The author, identified merely by the initials J. S. S., implored the government to clean up the filth in the city, and like his predecessor, Dr. Drake, instructed people to avoid “irregularity of

meals, sleep and general habits of life [30].” Interestingly, the author lambasted the use of “medicines, to prevent disease,” and argued that “none should be taken to prevent cholera, as medicines of this description are among the most effectual means of inducing an attack [30].” The author J. S. S., then, incongruently, followed these comments with his views on cholera treatment and recommended patients acquire specific types of pills from apothecary shops that contained: “1 grain opium, 5 grains calomel, 2 grains camphor, 1 grain cayenne” and that cholera sufferers should then follow a “digestible diet” that included “gruel, rice, light soup or chocolate [30].” Such remedies like the types identified here continued to be used to offset the ills and deaths caused by cholera and were prescribed into the next decade. It was not until 1854, however, that John Snow discovered the lethal link between cholera and contaminated drinking water [31]. While public officials responded to the emerging knowledge that followed Snow’s famous map of the Soho water pump and its relationship to cholera transmission, the general population continued nonetheless to engage in allopathic remedies to treat this debilitating disease.

2.2 Consumption (tuberculosis)

Tuberculosis has plagued humans since remote antiquity. Fragments of spinal columns from Egyptian mummies dated to 2400 BCE show definite pathological signs of tubercular decay [32, 33]. Ancient Egyptian papyri list the words *seryt* (cough) and *wefa* and *sema* (lungs) in reference to pulmonary tuberculosis [34]. Etymologically, tuberculosis or consumption is derived from the word *phthisis* meaning to waste away. Hippocrates c. 460 BCE wrote that *phthisis* was the most widespread disease of his era, and noted that it was almost always fatal [35].

During the middle of the 19th century Thomas McKeown, a British citizen, produced a treatise on tuberculosis that hypothesized that improved sanitation conditions and increase in quality and level of nutritional intake were the major determinants to declining mortality associated with the disease [36]. More common, however, was reference to the digestion of food and how this affected “tuberculosis blood:”

It is probably that tuberculosis is a disease of the primary digestion, causing, 1st, impoverishment of the blood; 2d, local exudations from the bloodvessels [sic.] presenting the characters of tuberculous [sic.] exudation; and third the consequent softening, ulcerations and destructive results which distinguish [37].

One popular theory of the time was that the imbalance of the constituents of the blood could be remedied by consuming a diet that resulted in humoral restoration. In the case of consumptive patients, it was common to prescribe chocolate and cocoa. The rationale was that “fat is deficient in the tuberculous [sic.] dyscrasia [sic.] [37].” (Dyscrasia: Ety-

mology: New Latin, from Medieval Latin, bad mixture of humors, from Greek *dyskrasia*, from *dys-* + *krasis* mixture, from *kerannynai* to mix. Used in the 18th–19th centuries to describe an abnormal condition of the body, especially the blood.) In other words, the consumptive patient was viewed as physically wasting away and by adding high fat foods to the diet – such as chocolate – would aid in the patient’s recovery. Chocolate was also used to make medicines more palatable.

Dr. De Pascale also recognized that consumptives lost weight whereas chocolate-consumers gained weight. De Pascale described a “blood cure” for tuberculosis and noted that since fresh, warm ox blood had “gone out of vogue,” he suggested a mixture of dried blood with chocolate added to improve the taste [38]. During this same period, however, physicians recognized the advantages of consuming beverages that required water to be boiled in addition to cocoa’s nutritive qualities. In 1867, Dr. Albert J. Bellows suggested that there were medical benefits to treating tuberculosis patients without using water, and recommended wine as a water substitute, even if the patient was a “teetotaller [sic.].” Bellows wrote that “[I]mpure waters, contain materials a thousand times more deleterious than a little alcohol” and argued that water should be avoided since “in our present ignorance [we have not] the means of correcting the evil [39].” An additional benefit to the purity of boiled water, cocoa differed from other similarly prepared beverages in that it was recognized as a nutritious food. Bellows asserted:

Cocoa differs from tea and coffee in that it is rich in nutritious food, and having in it no tannin or other deleterious elements, its theobromine, or characteristic property, being connected with albumen – a muscle-making element [39].

Further evidence in the support of cocoa’s medicinal use in the treatment of tuberculosis and other illnesses is found in a Boston City Hospital ward’s daily bill of fare where cocoa was listed along with a subtext that stated “the foregoing diet list and bill of fare may be considered the best dietetic arrangement in this country” (Fig. 1) [39]. Cocoa shells [for brewing like tea] also were listed. The difference between medicinal use of cocoa and cocoa shells was that the former was derived from the beans while the later is analogous to 21st century tea, where cocoa bean shells were steeped in boiling water, the shells discarded, and the brew consumed. (Contemporary consumption of steeped cocoa shells has received recent attention and can be purchased on-line under the manufacturing label: Yogi Tea (http://www.iherb.com/productdetails.aspx?c=1&pid=5505&utm_source=shc&utm_medium=c&ppnshpng; accessed: 5/21/2007). This product incorporates organic cocoa shells with spices into a blend that is packaged and sold in tea bags. Within the past decade chemists have identified cocoa shells as a good source of phytosterols, a nutrient found in plant oils associated with improved vascular health, and a major chocolate manufacturer has patented

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Bread always in abundance; potatoes always; other vegetables in their season. In addition, broth, either of mutton or chicken, is made each day, that it may be in readiness for patients, if prescribed by the physicians.

The above is what is called the House Diet, which takes the place of the "Full Diet," "Ordinary Diet," or "Common Diet," of the London hospitals. But there are no tables of "Middle Diet," "First Diet," "Milk Diet," "Low Diet," "Fever Diet," or "Broth Diet," as in the London hospitals. But in every ward is a bill of fare, which is filled up every morning and evening by the nurse, under the direction of the physician, and generally according to the wishes of each patient, thus:—

Orders for Food for Patients. Ward —.

Date.	No. of Patients.	Date.	No. of Patients.
House Diet.		Baked potatoes.	
Beefsteak.		Eggs.	
Mutton chop.		Milk.	
Chicken.		Boiled rice.	
Oysters.		Toast.	
Broth.		Coffee.	
Mush.		Tea.	
Gruel.		Shells.	
Farina.		Cocoa.	

The foregoing diet list and bill of fare may be considered the best dietetic arrangement in this country,

Figure 1. Boston City Hospital Bill of Fare, 1867. Adapted from *The Philosophy of Eating*, Bellows, A. J. Courtesy of University of Michigan Making of America.

an extraction process whereby cocoa oil rich in phytosterols are removed and utilized in granola-type, health bars [40]. Moreover, "the cocoa oil also contains tocols, both tocopherols, which have antioxidant properties, and tocotrienols, which may have cholesterol lowering activity [40]. Although 19th century physicians would not have had access to this knowledge, perhaps the cocoa-shell tea had a positive influence on patient health.

Late 19th century physicians based their diagnoses and subsequent recommendations from laboratory research findings. Moving away from humoral medicine and toward germ theory and scientific chemical analysis, doctors published recommendations that reflected the period's cultural value toward quantitative research based medicine. Dr. John King published in his 1867 book: *The Causes, Symp-*

toms, Diagnosis, Pathology, and Treatment of Chronic Disease the positive aspects of chocolate in managing tuberculosis:

In this disease the blood must be enriched, and the body be sustained and nourished by [a] proper nutritious diet, which will materially aid in the removal from the system of those elements which favor tuberculous [sic.] deposits, as well as in effecting a change in the condition of the blood unfavorable to their existence ... Nitrogenous food is required for the true transformation of the hydrocarbons, and for the supply of material to be fixed in the nitrogenous tissues. As drinks, water, milk, milk and water, cocoa, chocolate, tea, or coffee, may be used [41].

In 1870, 3 years after publication of King's book, the Chicago Medical Examiner listed his *November Mortality Report* that identified the causes of 489 deaths: 48 were consumption-related. Only still-births (at 51) outnumbered deaths attributed to consumption [42]. This disease continued to kill at high rates well into the 20th century. At the same time, as late as 1910 physicians continued to recognize, value and recommend cocoa to consumptive patients. Julius Friedenwald and John Ruhrah, two Philadelphia doctors listed cocoa, and chocolate (60% sugar by weight) under "Rapid Reference Diet-lists/Tuberculosis" and assert: "in chronic tuberculosis cocoa may be taken night and morning with good effect" in their *Diet in Health and Disease* medical reference text [43].

An unusual preparation of seaweed mixed with chocolate was recommended by a Professor Dalton while instructing his class at Clinique [sic.] of the College of Physicians and Surgeons in the greater Boston area. His views were published in an article that appeared in the *Pittsfield Sun* where noted:

Dr. John Davy and Professor Abjohn, of Trinity College, Dublin has proved the great value of many varieties of Algae as articles of nutriment ... they abound in the phosphate of lime, and the fixed alkalies [sic.]: and that they contain such quantities of Iodine as should render them very valuable articles of food for persons laboring under scrofulous and tuberculous [sic.] diseases each biscuit [after grinding the seaweed into powder] weighing half an ounce, containing about one thirtieth of a grain of Iodine; and that a similar amount was present in the quantity of chocolate required for each cup of the liquid beverage. After some remarks upon the composition of cocoa and the peculiar advantages of the combination of it with natural Iodine-bearing substance to produce an agreeable substitute for the cod-liver oil ... Dr. Dalton concluded by observing that, although these preparations had not as yet been tried as to their medicinal efficacy, the principal involved in them was one which deserved the serious attention of the profession, and he hoped their merits would be fairly and fully tested [44].

Chocolate and cocoa continued to be used in many pharmacological recipes, however, their inclusion may have been more to mask unwanted flavors, or make the medicine

more palatable. A Dr. Chase, for example, added cocoa to his “Santonin [sic.] Lozenges,” but offered an alternative recipe that omitted the cocoa if “white” lozenges were desired [45].

2.3 Asthma

A condition with clinical outcomes similar to pulmonary tuberculosis, albeit not an infectious disease, is asthma. The 19th century has been coined the *age of chemistry* and food composition tables were prolific within books that addressed food related topics. Cocoa and chocolate were differentiated into two categories in chemical composition tables. During this era cocoa, through processing, was defatted, and typically prepared and consumed with only water whereas chocolate was boiled with milk and sugar resulting in different nutrient profiles [46]. The cocoa/chocolate products were considered “well-known [as] valuable foods, since they [act] as *respiratory excitants*” in addition to possessing “a large quantity of fat and other food materials [47].” Medicinal use of chocolate for asthma just prior to the 20th century is evidenced by advertisements placed in the *Los Angeles Times* by a Dr. Gordin who sold “Chocolate Emulsion[s]” that he claimed beneficial for patients with “asthma, bronchial, and lung trouble [48, 49].”

London physicians as well recommended chocolate for asthma. Dr. Thomas Hayes wrote a book on pulmonary diseases that included a chapter on asthma where he recommended:

Milk chocolate, or milk coffee, which is not too strong of the coffee, or too thick with chocolate, may be taken [by asthma patients] in common in breakfast or supper [50].

By 1796 his book had become so popular as a medical reference in northeastern America that publishing it domestically began in Boston. Continued regard for the nutritive value inherent in chocolate prescribed for asthmatics and other conditions was maintained well into the beginning of the 20th century and was substantiated by respected scientific journals, including *Lancet* [51].

2.4 Smallpox

Of the major epidemics in the United States only yellow fever matched smallpox in severity and outbreak occurrences. Over a span of 230 years (1628–1865) there were 23 major, city-wide smallpox epidemics – a 10% outbreak rate that resulted in catastrophic smallpox, related deaths (Epidemics in US 1628–1918, 1998, <http://bjhughes.org/epidemic.html>; accessed 5/21/2007). The Northeast American seaboard suffered terrible smallpox-related losses throughout the 18th century. One particularly horrific and well-documented outbreak occurred in Boston in the spring of 1764. By reviewing historic Boston newspaper articles and advertisements, the 1764 smallpox outbreak and its spread through the city can be traced [52].

A sampling of articles and advertisements printed in the *Boston Evening Post* between January and April, 1764, illustrates the fear the public had toward catching smallpox. Grocery merchants responded by relocating their stores away from known infected areas and allocated advertising monies toward assuring the public that their goods were not tainted with the disease. Proprietors such as Herman Brimmer advertised: “[I have now] opened shop at the [s]ame place (the house of Mr. Samuel Woodburn, the Sign of the Lion, in Waltham) to keep [my goods] free from infection [53].” Listed among his goods for sale was chocolate. Likewise Rebecca Walker a grocery store merchant whose shop sold chocolate relocated “opposite the Blue-Ball, near the Mill-Bridge” ... she moved “out of Boston, on account of the smallpox [53].” A week later, Ezekiel Lewis placed the following advertisement: “informs his country customers and others, that the small pox being in Boston, he has opened a shop at the upper end of Roxbury (commonly called Spring-Street) in the House of Mr. Ebenezer Whiting; where he has to sell, a large assortment of English Goods ... brown sugar, tea, coffee, chocolate [53].” The smallpox epidemic continued to ravage the city of Boston and merchants increasingly advertised their relocation out of the inner city:

William and James Jackson inform their country customers and others, that upon account of the spreading of the small pox in Boston, they have removed their goods to Waltham, at the sign of the White Horse, where they have to sell, a handsome assortment of English, India, and hardware goods. Likewise to be sold at said store, choice Bohea tea, coffee, chocolate [53].

Nearly 100 years prior to Robert Koch and Louis Pasteur's scientific experiments and resulting germ theory postulates, physicians recognized that smallpox was contagious, although they did not relate the etiology of the disease to microorganisms. Not surprisingly with fatalities so high, physicians during the Colonial and early Federal Periods concentrated their efforts on finding a cure for smallpox. Early on, Dr. Benjamin Rush, a signer of the Declaration of Independence and a professor at the Institutes of Medicine and of Clinical Practice in the University of Pennsylvania, published recommendations on the treatment and prevention for smallpox. Rush was among the physicians who favored blood-letting and purging for disease treatments. When inoculation first was practiced in Europe and later in post Colonial-America proved successful to smallpox prevention and treatment, Rush hypothesized on the mode of disease transmittance. He acknowledged, however, that further experimentation was needed:

I suspect the matter that produces the disease is of the same nature with certain poisons, which require to be brought in contact with the wound or sore in the body before they produce their effects. I deliver this opinion with diffidence. The subject stands in need of more experiments and investigations [54].

Inoculation differs from vaccination in that the prior involves a small incision of the skin. In 18th century North America the incision commonly was performed on the hand between the thumb and forefinger and a sample of the live virus collected from an infected individual was placed in the open wound. This medical procedure was advertised and described in several Colonial newspapers:

As to the operation of inoculation (original emphasis), it is known to all. I only observe, that when performed, by applying the fresh matter from a ripe pock, on the point of a lancet or needle, it is much the most certain [55].

Rush also supported the notion that a patient's diet was critical to successful smallpox treatment:

I come now to consider the best method of preparing the body for the small-pox. This must be done, 1st by Diet, and 2^{dly} by Medicine. The diet should consist chiefly of vegetables ... Tea, coffee and even weak chocolate, with biscuit or dry toast, may be used as usual, by persons accustomed to that kind of aliment [56].

Physicians of the era indicated through their writings that chocolate would not cure smallpox, *per se*, but recognized chocolate's weight inducing capabilities and commonly listed chocolate as a component of patient's diets. Salem Hospital in 1773 issued a ruling that stated in part:

Of the Patients Diet, It is Ordered – 1. That the Diet which shall be provided and allowed by the Overseers, with the Advice of the Physician, shall be strictly adhered to; and none other made Use of without his special License [57].

Rule number three listed the allowable foodstuffs and among them were both chocolate and cocoa nut shells. Rule five stated, in part, that the “using of the Diet provided for the commons, and all other allowed Articles, according to the different Stages of the smallpox, shall be determined by the Physician [57].” It is apparent from this document that physicians determined patients' diets, and that hospital caregivers were to adhere strictly to the prescribed diet and not substitute or deviate from the listed foods. Both cocoa and chocolate consistently were included in hospital, patient bills of fare throughout this era and cocoa was still prescribed well into the 20th century [46].

2.5 Yellow fever

Yellow fever is caused by a virus of the Flaviviridae family transmitted from mosquitoes to humans [58, 59]. Yellow fever is not transmitted person to person; rather the infected mosquito must bite a person to transfer the disease. The *Aedes aegypti* (species associated with yellow fever) mosquito feeds when temperatures reach 15–17°C, and breeds in standing bodies of water [60]. This limits habitat to moist tropical regions. Interestingly, *Aedes aegypti* mosquitoes thrive in the same geographical regions where cocoa is grown and produced. Indeed, Benjamin Rush suggested that “chocolate shells” were vectors for the disease [61]. It

is thought, however, that during the 18th century yellow fever carrying mosquitoes arrived in North American eastern ports *via* cargo ships in water barrels, or from infected slaves from the Caribbean islands and South Africa [60]. Consequently port cities experienced the most severe yellow fever outbreaks, and southern ports with warmer climates endured the worst epidemics. An exception to this rule was the northern city of Philadelphia which endured one of the worst yellow fever outbreaks in American history.

The 1793 yellow fever outbreak in Philadelphia may be the most notorious in American History. Philadelphia, then the seat of the United States government and one of the largest ports on the Eastern seaboard, experienced a death toll of approximately 5000, or 10% of the city's population [62]. During the summer of that year, George Washington, Thomas Jefferson, Alexander Hamilton, and other elected officials and the city's elite fled to the surrounding countryside to keep from contacting the disease. Left behind were a significant number of freed slaves and a few courageous civic leaders. Among them was the physician Benjamin Rush who recruited Richard Allen, Absalom Jones, along with other freed African-American slaves to help him attend the sick and dying. Rush – in good faith and with presumed knowledge of the time – informed the African-Americans they were immune from yellow fever. With this advice, tragically, at least 240 Blacks perished that year in Philadelphia from the disease (Public Broadcasting System, *Africans in American, Brotherly Love*, <http://www.pbs.org/wgbh/aia/part3/3p1590.html>; accessed 06/06/2007). It should be noted that without the help of the African-American community caring for the sick, significantly more European-Americans in Philadelphia would have died due to dehydration and other treatable manifestations, but little acknowledgment or mention has been attached through the years to their sacrifice.

After Philadelphia began to recover, Matthew Carey a prominent publisher penned his version of the crisis titled: *A Short Account of the Malignant Fever, Lately Prevalent in Philadelphia*, which was so popular that four editions were printed [63]. His account chronicled Richard Allen attending to the sick, but included no positive mention of the hundreds of African-Americans who placed their lives in harm's way. Quite the contrary, Carey accused African-Americans of looting homes when families fell to the disease. As Allen and Jones may have feared that their neighbors and friends would not be able to find household work after the epidemic ended on account of Carey insinuating rhetoric, they subsequently wrote and published a clarifying pamphlet entitled, *A narrative of the proceedings of the black people, during the late awful calamity in Philadelphia, in the year 1793: and a refutation of some censures, thrown upon them in some late publications*, a tract that outlined the heroic actions of Philadelphia's African-American citizens [64].

In September of 1793, Governors from Massachusetts [65], North Carolina [66], and New York [67] issued proclamations that quarantined ships that originated from Philadelphia. Further, John Hancock, Governor of Massachusetts required sheriffs within the state to examine persons and their baggage arriving in Massachusetts either by land or sea. Benjamin Rush, the well-known Philadelphian physician, academic, attending doctor, and chronicler of the yellow fever outbreak, wrote a series of letters to his friends and colleagues that described the etiology and his treatment of yellow fever. Rush recounted that the outbreaks occurred during the summer months and ended during the cold months and was due to “vegetable putrefaction.” In a letter to Dr. John Redman, President of the College of Physicians, he wrote:

Yellow Fever in the West Indies, and in all other countries where it is endemic, is the offspring of vegetable putrefaction ... a quantity of damaged coffee, was exposed at the time (July 24) and in a situation (on a wharf, and in a dock) which favoured [sic.] its putrefaction, and exhalation [68].

Rush believed, erroneously, that yellow fever was airborne due to rotting vegetable matter. He defended his argument by citing examples where people within the same geographic region as the rotting coffee contracted yellow fever.

Although Rush supported purging (*via* oral administration of mercury to induce vomiting) and blood-letting as first steps to alleviate the clinical symptoms of yellow fever witnessed, he also advocated good nutrition practice as a means to patient health restoration. In another letter dated October 11th, 1793, Rush described his treatment for yellow fever: *As soon as the pulse is reduced, I indulge them in weak chocolate [69].*

The following year Rush wrote and published his book (Fig. 2) on the Philadelphia epidemic where he cited chocolate three times as part of the treatment for yellow fever [70]. Within his several medical texts that span 4 years, Rush also suggested incorporating chocolate as part of a liquid diet for the treatment of gout [71]. Rush, however, was not the only physician who endorsed chocolate as part of an overall therapeutic diet for yellow fever patients.

James Tytler (not identified with doctoral credentials) compiled and authored the medical entry of the *Encyclopaedia [sic.] Britannica*. In 1799, Tytler referenced Rush's work in his own book: *A Treatise on the Plague and Yellow Fever [72]*. Tytler wrote:

Chocolate differs considerably from both [tea and coffee], possessing no exhilarating virtue, or only in a small degree, but is more nutritive, and in South America constitutes a considerable part of the food [72].

A contemporary of Tytler, Samuel Brown, advocated the following diet for yellow fever:

Food – None, till after the crisis. Then begin with the lightest and mildest kind, and such as is easiest on digestion, and such as can be taken in a liquid form. Weak tea

OF THE
Bilious remitting Yellow Fever,
AS
IT APPEARED
IN THE
CITY OF PHILADELPHIA,
IN THE YEAR 1793.

By Benjamin Rush, M.D.
PROFESSOR OF THE INSTITUTES, AND OF CLINICAL MEDICINE,
IN THE UNIVERSITY OF PENNSYLVANIA.

PHILADELPHIA,
PRINTED BY THOMAS DOBSON,
AT THE STONE-HOUSE, N° 41, SOUTH SECOND-STREET.
MDCCXCIV.

Figure 2. Benjamin Rush describes the course and effects of the epidemic, and posits possible causes and cures of the disease. Courtesy of Archives and Special Collections, Dickinson College, Carlisle, PA.

and coffee, milk or water porridge, milk in water; roasted or baked fruits, chocolate, sago [73].

Baltimore, another port city nearby Philadelphia, experienced a yellow fever outbreak in 1794. Dr. Drysdale, reflecting back and writing in 1805, also believed that patients required a nutritious diet for full recovery. He prescribed “something a little nutritious” and “the symptoms soon indicated, whether stimulating soups, oysters, chocolate, mush and milk, &c. [sic.] might be admitted” [74]. Conversely, he thought “to use stimulating or tonic medicines, was dangerous” [74].

Intermittent outbreaks of yellow fever continued in North America throughout the 19th century, and chocolate as part of an overall nourishing, liquid diet remained listed on hospital bills of fare. Physicians and hospital overseers, still, were not the only advocates of chocolate consumption in

disease treatment. By the early 19th century, nutrition advice abounded and printed materials vis-à-vis scholarly journals and lay magazines published their respected health advice. Included among them was the relationship between cocoa and chocolate consumption and good health.

3 Homeopathic use of chocolate

Beginning in 1827, the *Journal of Health*, edited by two unnamed Philadelphia physicians, was published biweekly. Its esteemed value is reflected in the correspondence between two women that stated:

We have too long neglected to give it [the journal] a passing notice, but are happy to know, that even without our backwood's [sic.] testimony to its merits, they have become known and acknowledged over the whole United States [75].

The correspondence continued in its gossipy tone by regaling a woman's review of the then current, nutrition (health) book: *The Catechism of Health*. The female gossip column writers argued in support of a nutritious diet for good health. *The Catechism of Health* was written in a question/answer format, and included the following:

Question: What effect has chocolate on health?

Answer: When perfectly pure, boiled in fresh milk, and drank in moderation, it is both wholesome and nourishing. The impure chocolate generally made use of, is, however, pernicious to health [76].

This passage is important, too, because unscrupulous chocolate manufacturers commonly added starches (flour from corn and potatoes) to the chocolate “cakes” in order to increase volume and profits, and this fraudulent habit had become known to the public.

In 1800, Anthony Florian Madinger Willich, M.D. wrote a book entitled *Lectures on Diet and Regimen*, where he stated in the subtitle that his book was “calculated chiefly for the use of families, in order to banish the prevailing abuses and prejudices in medicine [76].” Willich defined dietetics as: “a systematic view of all objects relative to health in general, and to food and drink in particular [76] and criticized his contemporaries on writing diet advice books that were “judge[d] ... according to the agreeable or disagreeable effect it produce[d] on their own palates and constitutions, and hence recommend their favourite [sic.] articles to others [76].” Under his section on Food and Drink, Willich devoted considerable space to the consumption of chocolate:

Chocolate, especially when boiled with milk and eggs, is exceedingly nourishing: but the spices with which it is mixed, such as cinnamon, cloves, musk, vanilla and the like, make it more heating and less wholesome. Vanilla, which we always find in the Spanish Chocolate, is an extremely volatile and pungent aromatic; even its flavour [sic.] is frequently insupportable to hysteric and hypochondriac per-

sons ... The common chocolate, prepared with sugar, eggs, milk and water, is the most nutritive and wholesome [76].

Willich differentiated cacao from chocolate, which was the custom during his era and stated that “of itself [cocoa] is less heating and lighter than if made into chocolate, but it is not so nourishing” [76]. He believed that if young people drank chocolate it could “induce a febrile state [76].”

Druggists also played significant roles in assisting lay persons in homeopathic care and self-medication. The druggist Henry Beasley pointed out in his *Receipt Book*:

As the ingredients of some of the following compounds are usually sold by druggists, who may be expected to furnish information as to the manner of using them, and as they may all be regarded as auxiliaries to medical treatment, some notice of them here seems desirable [77].

Chocolate's place in a home-style “medical bag” is highlighted in Table 1. Beasley delineated chocolate as a medicinal article from other tonics and recreational beverages by separating them under different headings: *Dietetic Articles* (chocolate) and *Beverages*, (recreational) [77]. Both lay practitioners and physicians wrote at length on homeopathic medical treatment during the middle 19th century, and this was a common theme that ran throughout the texts of the 1850s.

Chocolate was viewed as a foodstuff that nourished the sick and invalid and accordingly was endorsed. Consistently, the homeopathic texts repeated subheadings such as “dietetic rules,” [78] or “rules for diet [79].” Within the rules, advice was provided that pointed out: “Aliments allowed... cocoa, chocolate (unspiced)...” [80]. Sometimes authors sub-divided health advice by ailment. Fredrick Humphreys' *Humphreys' Homeopathic Mentor or Family Advisor in the use of Specific Homeopathic Medicine*, for example, suggested for whooping cough:

Let the child live on light diet, little or no meat, cake, pastry, or rich, or heavy food, but an abundance of mucilaginous drinks ... [such as] chocolate [81].

One author, Dr. Joslin, numbered his dietetic rules for the prevention of cholera:

[Rule] 12. Drink water, cocoa, pure unspiced chocolate, toast-water, barley-water, or weak tea [82].

Also noteworthy was that several publishers of medical-related books also were proprietors of medicine dispensaries. William Radde, for example, published many homeopathic texts from various authors, and in the back of his books were advertisements for his own store, as in the following example:

Wm. Radde, 322 Broadway, New-York, respectfully informs the Homeopathic Physicians and the friends of the System, that he is the sole Agent for the Leipzig Central Homoeopathic Pharmacy, and that he has always a good assortment of the best Homoeopathic Medicines, in complete sets or single vials [82].

Listed among the medicines sold by Radde was homeopathic chocolate!

Table 1. Recipes from *The Druggist's General Receipt Book*^{a)}

Recipe Name		Ingredients	Author's Comments
Chocolate		<i>Finest</i> cocoa nuts Sugar Vanilla Other flavorings	Prepared from the finest cacao nuts (seeds of theobroma cacao) after roasting, winnowing, <i>etc.</i> , by grinding them on a hot stone plate, or beating them in a hot mortar, to a smooth paste
Cocoa	Paste	Seeds of theobroma cacao	Fifty percent weight in cocoa, the rest sugar and water, with sometimes the addition of sago meal or other farina
	Soluble powder		A common proportion for soluble cocoa appears to be two-thirds of pure cocoa, one third of sugar or farina (wheat flour, sago meal, potato flour, arrowroot)
Rock, Roll, Flake Cocoa		Seeds of Theobroma cacao	
Homoeopathic Cocoa		Seeds of Theobroma cacao	Claims to be unadulterated, but usually mixed with saccharine and farina
Broma		8 oz pure cocoa 3½ oz sugar 4½ oz sago meal, arrow-root, &c. [sic]	
Wacaka Des Indes		2 oz roasted cocoa beans 6 oz sugar ¼ oz cinnamon ½ drachm [sic.] (dr.) vanilla (powdered with part of the sugar) 3 gram ambergris 1½ gram musk	Sometimes a dr. of prepared annatto is added, and the ambergris and musk omitted
Racahout Des Arabes		1 oz chocolate powder 3 oz rice flour 9 oz sugar 3 oz potato arrow-root 1 dr. vanilla (pulverized with part of sugar).	This is professedly a preparation of acorns ^{b)} (perhaps those of the <i>Quercus ballotta</i> , which are naturally sweet, or of other kinds deprived of their bitterness by being buried in the earth)
Dictamia		7 oz sugar 4 oz potato arrow-root 3 oz flour of brent barley (<i>triticum monococcum</i>) 1 oz Trinidad chocolate 1 oz Granada chocolate 15 gram vanilla	
Palamoud		1 oz chocolate 4 oz rice flour 4 oz potato arrow-root 1 dr. red sanders in fine powder	Mix. By chocolate is meant the cacao beans roasted and pulverized without addition. Indian arrow-root or Tous les Mois may be substituted for the potato arrow-root
White Chocolate		3 lb white sugar 27½ oz rice flour 8 oz English or Indian arrow-root ½ oz vanilla (tincture) 8 oz butter of cacao 4 oz powdered gum Arabic	Form a paste with boiling water, and put it into moulds [sic.]

a) Adapted from: Beasley, H., *The Druggist's General Receipt Book*. 1857. Philadelphia: Lindsay and Blakiston.b) Ingredient list produces *imitation* Racahout Des Arabes.

4 Concluding remarks

Contemporary scholars have focused primarily on researching and chronicling chocolate's medicinal history by examining Mesoamerican Codices and European Treatises. The North American 18th–20th century texts offer scholars starting points to identify cultural and medical norms and practices during the Colonial and early Federal Periods of American history.

Eighteenth century Anglo-Americans brought from Europe long-held medical beliefs to the newly formed Colonial Territories. Medicine practiced in 17th and 18th century Europe was based upon the humoral hot–cold/wet–dry system of bodily balance where illness was perceived as an imbalance to the system. Classifying foodstuffs into hot/cold and wet/dry was practiced in both Mesoamerica and Europe during this era: persons who became sick were prescribed foods of specific heat and dryness categories that supposedly returned them to “balance.”

Chocolate is a unique food in that many of its perceived properties are opposites within the humoral classification system. The tannins inherent in chocolate are astringent. At the same time, chocolate melts at body temperature and offers a smooth sensory property in the mouth. Theobromine keeps consumers alert. The high fat content of chocolate satiates the consumer and creates a feeling of fullness lending itself to slothfulness. Adding spices and aromatics to chocolate further complicates chocolate classification into hot/cold and wet/dry quadrants. Whether the beverage was based on cocoa (defatted) or chocolate made with vanilla and/or spices, mixed with milk or water, steeped with shells for a tea, or frothed into a fancy concoction a constant throughout the centuries was that the beverage based on cocoa beans was used to treat illness. This tradition that contemporary scholars trace to originating in Mesoamerica continued in 18th century North America after European settlement. Evidence to support chocolate's sustained medicinal use repeatedly appears in 19th and early 20th centuries newspapers [83], books [84, 85], journals [86, 87], and magazines [88] and other print media.

There is a rich history of chocolate usage to combat some of North America's most horrific epidemics. It was recognized that chocolate consumption could aid in weight gain. Further, as a beverage, chocolate's high fat ratio created a product with a viscosity that almost seemed like a solid food. Being a liquid, however, supported the idea that the invalid should not consume solid foods because digestion taxed the body. As a result, chocolate consumption fit the prevailing medical treatment paradigm and was widely utilized. Chocolate manufacturers took advantage of these views by creating “homeopathic” chocolates.

Less clear, however, is why chocolate fell from “favor” or “out of vogue” as a medicine of choice, a pattern that began sometime after the third decade of the 19th century. Some scholars suggest that when the industrial revolution

reached its pinnacle, manufacturers needed to increase their consumer base [89]. Technological advances in manufacturing dramatically altered chocolate production patterns – based upon consumer demand. While chocolate was served to the infirm as a beverage – with or without substantial amounts of sugar added (Table 1) – it also began to be produced as a confection in solid form.

Solid, confectionary chocolate was readily accepted by North American consumers and two new markets were created: one market was for chocolate in the form of penny candy (primarily sold to children) and the second market was for fancy, boxed, gift chocolates that became objects of exchange in adult courtship rituals [90]. Whatever the impetus to the decline of chocolate as a medicinal, by the 1950s chocolate was associated with three marketing concepts: fun, pleasure, and snacking. It would take another 45 years for the medical community to come full circle and suggest that the forebears who advocated chocolate consumption and disease attenuation were indeed correct. Current laboratory research findings suggest a positive association between dark chocolate consumption and improved heart health. Chocolate as part of an overall healthy eating pattern does promote good health – then as now.

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5 References

- [1] Devoto, B. (Ed.), *The Journals of Lewis and Clark*, Houghton Mifflin Company, Boston 1953.
- [2] Simoons, F. J., *Food in China. A Cultural and Historical Inquiry*, CRC Press, Boca Raton 1991.
- [3] Bottero, J., *The Oldest Cuisine in the World. Cooking in Mesopotamia*, University of Chicago Press, Chicago 2004.
- [4] Darby, W. J., Ghalioungui, P., Grivetti, L. E., *Food. The Gift of Osiris*, Academic Press, London 1977.
- [5] Emery, W. B., *A Funerary Repast in an Egyptian Tomb of the Archaic Period*, Nederlands Instituut voor het Nabije Osten, Leiden 1962.
- [6] Dillinger, T. L., Barriga, P., Escarcega, S., Jimenez, M., et al., Food of the Gods: Cure for humanity? A cultural history of the medicinal and ritual use of chocolate, *J. Nutr.* 2000, 130, 2057S–2072S.

- [7] Coe, S. D., Coe, M. D., *The True History of Chocolate*, Thames and Hudson, London 1996.
- [8] Hall, E., Hall, S., *Rules for Regulating Salem Hospital*, Samuel and Ebenezer Hall, Salem 1773.
- [9] Mink, P. J., Scrafford, C. G., Barraj, L. M., Harnack, L., *et al.*, Flavonoid intake and cardiovascular disease mortality: A prospective study in postmenopausal women, *Am. J. Clin. Nutr.* 2007, 85, 3, 895–909.
- [10] Kenny, T. P., Keen, C. L., Schmitz, H. H., Gershwin, M. E., Immune effects of cocoa procyanidin oligomers on peripheral blood mononuclear cells, *Exp. Biol. Med.* 2007, 232, 293–300.
- [11] Heiss, C., Finis, D., Kleinbongard, P., Hoffmann, A., *et al.*, Sustained increase in flow-mediated dilation after daily intake of high-flavanol cocoa drink over 1 week, *J. Cardio. Pharm.* 2007, 49, 74–80.
- [12] Gaskins, N. D., Sloane, P. D., Mitchell, C. M., Ammerman, A., *et al.*, Poor nutritional habits: A modifiable predecessor of chronic illness? A North Carolina Family Medicine Research Network (NC-FM-RN) study, *JABFM* 2007, 20, 124–134.
- [13] Erdman, J. W., Balentine, D., Arab, L., Beecher, G., *et al.*, Flavonoids and Heart Health: Proceedings of the ILSI North America Flavonoids Workshop, May 31–June 1, 2005, Washington, DC, *J. Nutr.* 2007, 137, S718–S737.
- [14] Baba, S., Osakabe, N., Kato, Y., Natsume, M., *et al.*, Continuous intake of polyphenolic compounds containing cocoa powder reduces LDL oxidative susceptibility and has beneficial effects on plasma HDL-cholesterol concentrations in humans, *Am. J. Clin. Nutr.* 2007, 85, 709–717.
- [15] Wang-Polagruto, J. F., Schramm, D. D., Holt, R. R., Ensunsa, J. L., *et al.*, Chronic consumption of flavanol-rich cocoa improves endothelial function and decreases vascular cell adhesion molecule in hypercholesterolemic postmenopausal women, *J. Cardio Pharm.* 2006, 47, S177–S186.
- [16] Drake, D., Epidemic Cholera in *The National Era*. 1849/05/24: Washington DC, 1849.
- [17] Scarlet Fever; Yellow Fever; Consumptions; Souls, in *Norwich Packet*. 1795/01/08: Norwich, CT, 1795.
- [18] Salem, January 5, in *The New Hampshire Gazette*, 1796/01/16: Portsmouth, NH, 1796.
- [19] Hartford, December 28, in *Salem Gazette*. 1785/01/04: Salem, MA, 1784.
- [20] Relative to The Distemper Prevailing in Philadelphia, in *Salem Gazette*, 1793/09/10: Philadelphia, PA, 1793.
- [21] Preventative Against the Raging Yellow Fever, in: *The Federal Gazette, and Philadelphia Evening Post*. 1793/09/13: Philadelphia, PA, 1793.
- [22] Tarbell, J. A., *The Sources of Health and the Prevention of Disease: or, Mental and Physical Hygiene*, Otis Clapp, Boston 1850.
- [23] Graziano, M. M., Food of the Gods as mortals' medicine: The uses of chocolate and cacao products, *Pharm. Hist.* 1998, 40, 121–168.
- [24] *A Manual of Homoeopathic Cookery, Designed Chiefly for the Use of Such Persons as are Under Homoeopathic Treatment, by the Wife of a Homoeopathic Physician; With Additions by the Wife of an American Homoeopathic Physician*, William Radde, New York 1846.
- [25] Laurie, J., *The Parent's Guide: Containing the Diseases of Infancy and Childhood and their Homoeopathic Treatment. To Which is Added a Treatise on the Method of Rearing Children from Their Earliest Infancy: Comprising the Essential Branches of Moral and Physical Education*, Rademacher and Sheek, Philadelphia 1854.
- [26] Albala, K., *Eating Right in the Renaissance*, University of California Press, Berkeley 2002.
- [27] Grivetti, L. E., Aztec patterns and Spanish legacy. (Nutrition past–nutrition today: Prescientific origins of nutrition and dietetics, part 4), *Nutr. Today* 1992, 27, 13–25.
- [28] Bollet, A. J., *Plagues and Poxes: The Impact of Human History on Epidemic Disease*, 2 Edn., Demos Medical Publishing Inc., New York 2004.
- [29] Chocolate and broma, *Sci. Am.* 1849, 5, 2.
- [30] J. S. S., Cholera. Letter to the Editor, in: *The New York Daily Times*, 1852/08/24: New York, NY, 1852.
- [31] When cholera met its match, *Science* 2001, 294, 2435.
- [32] Yu, O., Wong, S. L., Secrets of Medicine in Ancient Egypt, in: *History of Medicine Days*, The University of Calgary, Calgary 2004, p. 10.
- [33] Ghalioungui, P., Dawakhly, D. E., *Health and Healing in Ancient Egypt*, The Egyptian Organization, Cairo 1965.
- [34] Nunn, J. F., *Ancient Egyptian Medicine*, University of Oklahoma Press, Norman 1996.
- [35] Hippocrates [of Cos.] On Epidemics, in: *The Genuine Works of Hippocrates*, trans. Francis Adams, William and Wilkins Company, Baltimore 1939, pp. 98–141.
- [36] Fairchild, A. L., Oppenheimer, G. M., Public health nihilism vs pragmatism: History, politics, and the control of tuberculosis, *Am. J. Public Health* 1998, 88, 1105–1117.
- [37] Peters, J. C., *A Complete Treatise on Headaches and Diseases of the Head. 1. The Nature and Treatment of Headaches. 2. The Nature and Treatment of Apoplexy. 3. The Nature and Treatment of Mental Derangement. 4. The Nature and Treatment of Irritation, Congestion, Inflammation and Dropsy of the Brain and its Membranes. Based on T. J. Rückert's Clinical Experience in Homoeopathy*, William Radde, New York 1859.
- [38] Burt, W. H., *Therapeutics of Tuberculosis: Or Pulmonary Consumption*, A. J. Tafel, Philadelphia 1876.
- [39] Bellows, A. J., *The Philosophy of Eating*, Hurd and Houghton, New York 1867.
- [40] Schmitz, H. H., Chevaux, K. A., Dombroski, A., Jerome, R., inventors; Mars, Inc.: USA, assignee. *Compositions and Methods for Improving Vascular Health*, United States patent 6610320, 2003 August 26.
- [41] King, J., *The Causes, Symptoms, Diagnosis, Pathology, and Treatment of Chronic Diseases*, Moore, Wiltach & Baldwin, Cincinnati 1867.
- [42] Morality for the Month of November, 1869, *Chicago Medical Examiner* (1860–1871), 1870, 11, 56.
- [43] Friedenwald, J., Ruhrah, J., *Diet in Health and Disease*, 3 Edn., W. B. Saunders Co., Philadelphia 1910.
- [44] Sea weed for food, in: *The Pittsfield Sun*, 1856/12/25: Pittsfield, MA, 1856.
- [45] Chase, A. W., *Dr. Chase's Recipes, or, Information for Everybody. An Invaluable Collection of About Six Hundred Practical Recipes*, Alvin Wood Chase, Ann Arbor 1860.
- [46] Farmer, F. M., *Food and Cookery for the Sick and Convalescent*, Little, Brown, and Company, Boston 1905.
- [47] Smith, E., *Foods*, D. Appleton & Co., New York 1873.
- [48] Display Ad 10, in: *Los Angeles Times*. 1896/05/17: Los Angeles, CA, 1896.

- [49] Display Ad 10, in: *Los Angeles Times*. 1897/02/21: Los Angeles, CA, 1897.
- [50] Hayes, T., *A Serious Address, on the Dangerous Consequences of Neglecting Common Coughs and Colds, with Ample Directions for the Prevention and Cure of Consumptions. To Which are Added, Observations on the Hooping Cough and Asthma*, First American from the 4th London Edn., Samuel Etheridge, Boston 1796.
- [51] A disparagement of chocolate, *Lancet* 1912, 179, 1704–1705.
- [52] Grivetti, L. E., Boston chocolate, Newspaper Articles and Advertisements (1705–1825), in: Grivetti, L. E., Shapiro, H. Y. (Eds.), *Chocolate. Heritage of the Americas. An Anthology of Historical Essays*, Wiley, Hoboken, New Jersey (in press).
- [53] No headline, in: *Boston Evening Post*, 1764/03/12: Boston, MA, 1764.
- [54] Rush, B., *Medical Inquiries and Observations*, Vol. 1, 2 Edn, Thomas Dobson, Philadelphia 1794.
- [55] To the American States, in: *The Norwich Packet and the Connecticut, Massachusetts, New-Hampshire, and Rhode-Island Weekly Advertiser* 1777/06/23: Norwich, CT, 1777.
- [56] Rush, B., *Medical Inquiries and Observations*, Vol. 1, Pritchard & Hall, Philadelphia 1789.
- [57] Hall, S., Hall, E., *Rules for Regulating Salem Hospital*, Salem Massachusetts Hospital, Salem 1773.
- [58] World Health Organization, *Yellow Fever Fact Sheet*, 2001, Accessed 6/20/2007; Available from: <http://www.who.int/mediacentre/factsheets/fs100/en/>.
- [59] Schmaljohn, A. L., McClain, D., *Alphaviruses (Togoviridae) and Flaviviruses (Flaviviridae)*, in *Baron's Medical Microbiology*, Baron, S. (Ed.), University of Texas Medical Branch at Galveston, Galveston 1996, pp. 2894–2942.
- [60] Patterson, K. D., Yellow fever epidemics and mortality in the United States, 1693–1905, *Soc. Sci. Med.* 1992, 34, 855–865.
- [61] Rush, B., *Medical Inquiries and Observation*, Matthew Carey, Philadelphia 1815.
- [62] *Mortality. An Account of the Baptisms and Burials in the United Churches of Christ Church and St. Peter's*, by Matthew Whitehead and John Ormrod, clerks; and Joseph Dolby, sexton. Also – An abstract of the Baptisms and Burials of the Various Congregations of the City and Suburbs of Philadelphia. From December 25, 1792, to December 25, 1793, United Churches of Christ Church and St. Peter's, Philadelphia 1793.
- [63] Carey, M., *A Short Account of the Malignant Fever, Lately Prevalent in Philadelphia*, Mathew Carey, Philadelphia 1793.
- [64] Jones, A., Allen, R., *A Narrative of the Proceedings of the Black People, During the Late Awful Calamity in Philadelphia, in the year 1793: And a Refutation of Some Censures, Thrown Upon Them in Some Late Publications*, William W. Woodward, Philadelphia 1794.
- [65] Hancock, J., *Proclamation. 1793 Sept. 21*, Adams and Larkin (Broadside), Commonwealth of Massachusetts 1793.
- [66] Dobbs, R., *Proclamation. 1793 Sept. 28*, Martin, F. X. (Broadside), State of North-Carolina 1793.
- [67] Clinton, G., *Proclamation. 1793 Sept. 13*, State of New York (Broadside), New York 1793.
- [68] Rush, B., *An Enquiry into the Origin of the Late Epidemic Fever in Philadelphia: in a Letter to Dr. John Redman, President of the College of Physicians, from Doctor Benjamin Rush*, Mathew Carey, Philadelphia 1793.
- [69] Rush, B., New-York, October 11, in *Connecticut Courant*, 1793/10/21: Hartford, CT, 1793.
- [70] Rush, B., *An Account of the Bilious Remitting Yellow Fever, as it Appeared in the City of Philadelphia, in the year 1793*, Thomas Dobson, Philadelphia 1794.
- [71] Rush, B., *Medical Inquiries and Observations. Volume 5. Medical Inquiries and Observations: Containing an Account of the Yellow Fever, as it Appeared in Philadelphia in 1797, and Observations Upon the Nature and Cure of the Gout, and Hydrophobia*, Budd and Bartram, Philadelphia 1798.
- [72] Tytler, J., *A Treatise on the Plague and Yellow Fever. With an Appendix, Containing Histories of the Plague at Athens in the Time of the Peloponnesian War; at Constantinople in the Time of Justinian; at London in 1665; at Marseilles in 1720; &c.*, Joshua Cushing and Brian B. Macanulty, Salem 1799.
- [73] Brown, S., *A Treatise on the Nature, Origin and Progress of the Yellow Fever, with Observations on its Treatment; Comprising an Account of the Disease in Several of the Capitals of the United States; But More Particularly as it has Prevalled in Boston*, Manning and Loring, Boston 1800.
- [74] Dr. Drysdale's history of the yellow fever at Baltimore, in: Coxe, J. R. (Ed.), *The Philadelphia Medical Museum*, The Philadelphia Medical Museum, Philadelphia 1805.
- [75] ART. VIII.1. *Journal of Health Periodical. Philadelphia*, 1829. *The Western Journal of the Medical and Physical Sciences* (1828–1838), 1831, 5, 100.
- [76] Willich, A. F., *Lectures on Diet and Regimen: Being a Systematic Inquiry into the Most Rational Means of Preserving Health and Prolonging Life: Together with Physiological and Chemical Explanations, Calculated Chiefly for the Use of Families, in Order to Banish the Prevailing Abuses and Prejudices in Medicine*. Two vol. abridged in one. Manning and Loring, Boston 1800.
- [77] Beasley, H., *The Druggist's General Receipt Book: Comprising a Copious Veterinary Formulary, and Tables of Veterinary Materia Medica; Numerous Recipes in Patent and Proprietary Medicines, Druggist's Nostrums, etc.: Perfumery and Cosmetics; Beverages, Dietetic Articles, and Condiments; Trade Chemicals, &c. With an Appendix of Useful Tables*, 3 Edn, Lindsay and Blakiston, Philadelphia 1857.
- [78] Pulte, J. H., *Homœopathic Domestic Physician; Containing the Treatment of Diseases; with Popular Explanations of Anatomy, Physiology, Hygiene, and Hydropathy: Also an Abridged Materia Medica*, Moore, Wiltach, Keys & Co., New York 1856.
- [79] Guernsey, E., *The Gentleman's Hand-Book of Homoeopathy, Especially for Travelers and for Domestic Practice*, William Radde, New York 1857.
- [80] Laurie, J., *Elements of Homoeopathic Practice of Physic. An Appendix to Dr. A. G. Hull's Lauries "Homoeopathic Domestic Medicine."* William Radde, New York 1850.
- [81] Humphreys, F., *Dysentery and its Homoeopathic Treatment; Containing also a Repertory and Numerous cases*, William Radde, New York 1853.
- [82] Joslin, B. F., *Homoeopathic Treatment of Epidemic Cholera*, William Radde, New York 1854.
- [83] From the *Journal of Health. Chocolate*, in: *Essex Gazette*, 1832/03/24: Haverhill, MA, 1832.
- [84] Hale, M., *The Ladies' New Book of cookery, A Practical System for Private Families in Town and Country, With Directions For Carving, And Arranging The Table For Parties, etc. Also Preparations Of Food For Invalids And For Children*, H. Long and Brother, New York 1857.

- [85] Lea, E. E., *Domestic Cookery, Useful Receipts, and Hints to Young Housekeepers*, Cushings and Bailey, Baltimore 1869.
- [86] Remarks by a distinguished physician, *The Quarterly Register and J. Am. Edu. Soc.*, 1829, 2, 2.
- [87] Warren, J., Treatment of acute metritis, *Medical and Surgical Reporter*, 1881, 45, 5.
- [88] Advertisement 19, *Harper's Bazaar*, 1879, 12, 1.
- [89] Woloson, W., *Refined Tastes: Sugar, Confectionary, and Consumers in Nineteenth-century America*, The John Hopkins University Press, Baltimore 2002.
- [90] Cooper, G., *Love, War, and Chocolate*, in: *His and Hers*, Horowitz, R., Mohun, A. (Eds.) University Press of Virginia, Charlottesville 1998, pp. 67–94.