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Editors



Chocolate and Health



 Springer

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(Editors)

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ISBN 978-88-470-2037-5

ISBN 978-88-470-2038-2 (eBook)

DOI 10.1007/978-88-470-2038-2

Springer Milan Dordrecht Heidelberg London New York

Library of Congress Control Number: 2011929634

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5 4 3 2 1

2012 2013 2014

Cover design: Ikona S.r.l., Milan, Italy

Typesetting: C & G di Cerri e Galassi, Cremona, Italy

Printing and binding: Grafiche Porpora S.r.l., Segrate (Mi), Italy

Printed in Italy

Springer-Verlag Italia S.r.l., Via Decembrio 28, I-20137 Milan

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Cocoa and chocolate are consumed throughout the world, as they provide instant enjoyment and pleasure. Chocolate is one of the most popular examples of foods consumed during comfort eating.

Due to the high polyphenol content of cocoa, coupled with its widespread presence in many food items, this food is now of particular interest from the nutritional and “pharmacological” viewpoints. Indeed, the number of publications concerning cocoa and chocolate is increasing steadily. As an example, more than 1,300 publications regarding “cocoa” or “chocolate” have been added to the PubMed database during the last 5 years; this is an increase of about 60% on the previous 5 years. Of such publications, an increasing proportion concerns the effects of polyphenols and, in particular, flavonoids on human biology and health. Finally, we witness an increasing number of patents covering industrial processes that aim at maintaining the highest possible amount of polyphenols in cocoa.

Cocoa and chocolate, on the other hand, are also correctly viewed as highly caloric foods and their use is often restricted by primary care physicians and dieticians, especially when weight loss is needed.

This book provides a state-of-the-art discussion on cocoa and chocolate, covering the multiple facets of their production, consumption and biological activities. The authors provide in-depth analyses of the manifold aspects of these foods. Notably, this book covers all aspects of the biological activities of cocoa, with particular reference to the cardiovascular system (which attracts the majority of research) and to patterns of consumption. The effects of cocoa and chocolate on the cardiovascular system are complex and comprise the control of risk factors (such as elevated blood pressure) or more basic effects such as stabilization of nitric oxide, a molecule whose activity is crucial in cardiovascular physiology. Notably, the effects of chocolate on plasma lipid levels (to which a specific chapter of this book is dedicated, Chapter 10) appear to be much less noticeable than what is usually perceived.

Moreover, it is now clear that cocoa and chocolate do not contain addictive substances in amounts high enough to cause cravings. Indeed, cravings are the result of an unhealthy relationship with the food, resulting from attributions displayed in newspaper and magazine headlines such as “chocolate is addictive”, but the alleged craved-for chemicals are merely myths.

In terms of health benefits, cocoa indeed has the highest polyphenolic contents of all foods on a per-weight basis and markedly contributes to the total dietary intake of flavonoids. The main subclasses of flavonoids found in cocoa are flavanols, particularly the flavanol monomers catechin and epicatechin, and their oligomers, also known as procyanidins. Although the precise mechanisms responsible for their purported health benefits are unclear and likely to be manifold, flavonoids and flavanols have been shown to possess a range of cardiovascular-protective properties, including antioxidant and antiplatelet effects, immunoregulatory activity, and vasorelaxation (as outlined in this book).

In summary, this is to our knowledge the first comprehensive book on health effects of cocoa and chocolate, and readers will find an updated discussion on this topic completed by a detailed analysis of the various aspects of chocolate production.

Research in this area is rapidly progressing and other effects of cocoa on health are being discovered. Thus, we would welcome comments and feedback and we hope you will enjoy reading this book.

October 2011

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Chocolate as Medicine: A Changing Framework of Evidence Throughout History

1

Philip K. Wilson

1.1 Introduction

In 1753, the noted nosologist, Carl Linnaeus, named it *Theobroma cacao*, food of the Gods. Two and a half centuries later, Joanne Harris emphasized this exotic's erotic sensations in her award winning fiction debut, *Chocolat*. For millennia, healers have touted its myriad medicinal, yet mystical, abilities. By the 1950s, chocolate, what had long been used as a drug, a food and as a source of currency, was being marketed merely as a pleasure-filled snack. Over the next half century, the craving to carve out chocolate's healthy, medicinal qualities resurged.

I haven't had this much good news since the early [19] 70s when I learned I had passed all of the math requisites for my college degree. First it was the study that found napping was good for us and now it's the news that cocoa may boost brain function and delay decline as we age. That's right, two of my favorite things which previously had gotten bad raps, have now been determined to be good for me [1].

Few natural products have been purported to effectively treat such a wide variety of medical disorders as has chocolate, ranging from a "specific" to an aphrodisiac to a panacea. Many of these claims go as far back as Aztec medical practice. There, remedies concocted from cacao beans formed in pods of the "Chocolate Tree" were used to soothe stomach and intestinal complaints, control childhood diarrhea, reduce fevers, steady the fainthearted, expel phlegm by provoking cough, reduce the passage of blood in stool and to promote strength before military conquests as well as before "acts of venery". In later eras, chocolate remedies were used to combat emaciation, decrease "Female Complaints", delay hair growth, promote the expulsion of kidney stones, increase breast milk production, prolong longevity, both encourage and prohibit sleep, clean teeth and diminish one's timidity [2].

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For centuries, chocolate's aphrodisiac aspect was purported.

*'Twill make Old Women Young and Fresh
Create New-Motions of the Flesh,
And cause them to long for you know what,
If they but Tast[e] of Chocolate [3].*

Dr Munday's *Treatise on Foods* noted a patient "in a miserable condition" who, after "supping of Chocolate ... [was] recovered in a short Time; but what is more extraordinary is, that his Wife in Complacency to her Husband, having also accustomed herself to sup Chocolate with him, bore afterwards several Children, though she was looked upon before not capable of having any" [4].

Seeking support for chocolate's aphrodisiac qualities, some turned first to the Bible and the Classics, then created "What If" history. For example, if the Biblical "Rachel had known [of chocolate], she would not have purchased mandrakes for Jacob. If the amorous and martial Turk should ever [have] taste[d] it, he would despise his Opium. If the Grecians and Arabians had ever tried it, they would have thrown away" their remedies in favor of "our rude Indian" decoction [5]. Elsewhere, some rather outlandish side effects of chocolate's otherwise healthy benefits were reported. According to the Marquise de Sévigné, the Marquise de Cœtlogon delivered a child as "black as an Indian". The reputed cause: she drank too much chocolate during her pregnancy [6]! More common was the side effect, as noted in the personal narratives of Thomas Gage and William Hughes, that regular chocolate drinkers just got a bit larger over time.

The "buttery parts" of the cacao tend to "fatten" people because "the 'hot ingredients' of medicinal chocolate serve as a type of pipe or conduit ... and make it pass by the liver, and the other parts till they arrive at the fleshy parts, where finding a substance which is like and comfortable to them, ... [they] convert themselves into the substance of the subject [whereby] they augment and fatten it" [7].

Accounts of chocolate's reputed medical value typically recount the chronological discoveries of cacao seed (bean) products and the sequential improvements in cacao preparations. However, little attention has been directed to the various types of evidence used to support such claims. Among the earliest evidence for chocolate's use as a medical compound are the remaining iconographic works and fragments of Olmec, Maya, Zapotec, Mixtec and Aztec art. Additional records from these eras are provided in groups of writings preserved under such names as the Florentine and Tulede Aztec Codices and the Dresden and Madrid Mayan Codices. In recent decades, new forms of evidence have been uncovered in the remnants of *Theobroma cacao* found in the pottery and crockery of the Mokaya of Mesoamerica dating back to 1900 BC [8].

Throughout much of history, the importance and relative weight of oral tradition has been paramount. Indeed, this was the means by which people in earlier times generally learned of chocolate's potential health benefits. Without diminishing the importance of oral traditions, this chapter focuses primarily upon documentary history drawn from surviving recorded evidence. Here, chocolate's medical use is explored by examining the types

of evidence generated in three distinct Euro-American eras: (1) The Early Modern Period, (2) Eighteenth through Early Twentieth Centuries, and (3) Modern Biomedical Worldviews. However, before turning to these eras, a brief reflection upon the “evidence” used to support general modern biomedical and health claims is warranted.

1.2 Valuing Medical “Evidence” in the Past and Present

In our era, the therapeutic efficacy of medical practices and remedies has been recast within the mold of Evidence-Based Medicine (EBM). Beginning in the early 1990s, the then newly established clinical discipline of EBM referred to the “conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” [9]. Clinical expertise is combined with newly supported biomedical evidence obtained through systematic literature searches to ensure the delivery of the highest quality health care. EBM also incorporates a “thoughtful identification and compassionate use of individual patients’ predicaments, rights and preferences in making clinical decisions about their care” [9]. Including the patient in the decision-making process conforms with the late Cornell University internist, Eric Cassell’s notable directive that to effectively relieve suffering, physicians must be ever mindful of a patient’s entire personhood [10].

Since the early 1990s, EBM has been adopted into medical school curricula, celebrated in medical manuals, deliberated in medical literature and featured at myriad medical conferences. The vast international consortium of clinicians and consumers known as the Cochrane Collaboration has provided systematic literature reviews as required by EBM methodology [11]. Despite its popularity, arguments have recently surfaced claiming that EBM is either “old hat” or “impossible to practice” [12]. At the heart of the matter lies the concern in acknowledging what counted as evidence in different eras of medicine’s heritage.

Around the time when chocolate was first introduced into European culture, the terms “experience” and “evidence” were reexamined within scientific and medical contexts. Sir Francis Bacon, best known at the time for his financial prowess as Lord Chancellor under the reign of England’s James I, is credited with providing a new framework for science: the experimental method. If the purpose of science was, as he argued, to give humans mastery over nature, thereby extending both human knowledge and power, then the laws of nature must be better understood. Such understanding, so Bacon proclaimed in *Novum Organum* (1620), was attainable only after shifting scientific thought from deductive reasoning towards an inductive approach coupled with experimentation.

Bacon’s inductive method of interpreting nature, which others later applied to chocolate, involved the assembly of a “sufficient, ... accurate collection of instances”, or evidence, gathered “with sagacity and recorded with Impartial plainness ... from which, after viewing them in all possible lights, to be sure that no contradictory ... [evidence] can be brought, some portion of useful truth”, general law, or hypothesis will be established [13]. He decried that natural philosophers who relied solely upon the authority of the past, which for all university graduates of his day was still the ancient logic (or *Organon*) of Aristotle, failed to advance any new understanding of nature. Bacon advocated the experimental method as the most reliable manner to free science from the

“paralysing dependence of previous students of nature on the rough and ready conceptual equipment of everyday observation” [14].

“Experience” and “experiment”, two synonymous expressions in the Romance languages, were used interchangeably in discussing the Baconian vision of evidence-based healthcare practice. For Baconian physicians, “ordered experience”, founded upon methodological investigation, measurable criteria, and objectivity, counted as “evidence” whereas “ordinary experience” based solely upon chance observation and subjectivity, did not [15].

Bacon’s suggestions for revolutionizing science were more formally embodied in the formation of London’s Royal Society in 1660. This elite body, whose Fellows included the city’s leading physicians, undertook the task of critically appraising the current state of knowledge. Their motto, *nullius in verba*, upon the word or authority of no one, stressed the Society’s reliance upon experiment and personal experience over preconceived theorization. Moreover, the interactive environment within the Royal Society, explicitly according to Bacon’s description of a utopian “college of experience”, encouraged discussion and collaboration between investigators. This Society provided the first venue in which members with similar interests gathered to listen to reports of each other’s experiences with various natural phenomena. The accounts in their publication, the *Philosophical Transactions*, were written from the viewpoint of the observer and, by convention, they contained details of the time, place, and participants or witnesses of a particular experience [16]. The elaborate narrative details in the reports were rhetorically constructed so as to “give the impression of verisimilitude”, compelling the Fellows to accept the reported details as “matters of fact” [17].

Some areas of investigation readily adopted the experimental method as a means of gaining evidence. Other areas, including medical practice, continued to rely upon anecdotal evidence and individual case studies. Indeed, these forms of evidence substantiated much of the use of chocolate as medicine during the Early Modern Period.

1.3 Chocolate as Medicine: The Early Modern Period

Chocolate first became widely documented in the Old World during the 1600s. As part of this popularization, we find a number of monographs describing this new and somewhat mysterious substance. Antonio Colmenero de Ledesma’s *Curioso Tradado de la Naturaleza y Calidad del Chocolate* (1631) widely spread the claims of this new substance through its translations into English, French, Latin and Italian. Among England’s chief chocoholics was the physician, Henry Stubbe. His 1662 book, *The Indian Nectar; or, A Discourse Concerning Chokolata*, was specifically designed to help the English reading public overcome some common misconceptions regarding the strength and frequency of chocolate’s use as a medicine. To support his claims, Stubbe relied upon case histories drawn from the lands of cacao’s origin as the most solid form of evidence.

English soldiers “stationed in ... Jamaica lived [for many months on only] cacao nut paste mixed with sugar ... which they [drank having] dissolved [it] in water”. Women of the New World were also reported as having eaten chocolate “so much ... that they scarcely consumed any solid meat yet did not exhibit a decline in strength” [18].

Stubbe provided additional evidence from case studies of reputable New World physicians.

Chocolate is “one of the most wholesome and pretious [sic] drinks, that [has] been discovered to this day: because in the whole drink there is not one ingredient put in, which is either hurtful in it self, or by commixtion; but all are cordial, and very beneficial to our bodies, whether we are old, or young, great with child, or ... accustomed to a sedentary life” [19].

Chocolate was “all that was necessary for breakfast, because after eating chocolate, one needed no further meat, bread or drink” [20].

Further information regarding New World uses of chocolate is found in William Hughes’ *The American Physician, or a Treatise of the Roots, Plants, Trees, Shrubs, Fruit, Herbs &c. Growing in the English Plantations in America; with a Discourse on the Cacao-Nut-Tree ... and All the ways of Making of Chocolate* (1672). Hughes penned his narrative after serving aboard ship to the West Indies where he became well acquainted with American herbs and their medical uses. In it, he noted that the inhabitants of Nicaragua, New Spain, Mexico, Cuba, and Jamaica so highly treasured the powers derived from the pods of the Chocolate Tree, that they took extreme measures to secure them within the “Shades of Plantain and Bonona[sic]-trees, against the Injuries of their fiery Sun ...”. He also noted anecdotally that Montezuma

is said to have treated Cortez and his Soldiers with it; and you cans carce read an American Traveller, but he will often tell you of the magnificent Collations of Chocolate, that the Indians offered him in his Passage and Journies [sic] through their Country [21].

As a specific example of chocolate’s medicinal properties, Hughes described how

Indians and Christians, in the American Plantations, have been observed to live several Months upon Cacao Nuts alone, made into a Paste with Sugar, and so dissolved in Water; I myself have eat[en] great Quantities of these Kernels raw, without the least Inconvenience; and have heard that Mr [Robert] Boyle and Dr [Henry] Stubbe have let down into their Stomachs some Pounds of them raw without any Molestation; the Stomach seems rather to be satisfied than cloyed with them, which is an Argument they are soon dissolved and digested [21].

Hughes informed his readers, drawing largely upon anecdotal information as well as upon what he termed “experimental Observations”, that “curious Travellers and Physicians do agree” that chocolate “has a wonderful Faculty of quenching Thirst, allaying hectick Heats, [and] of nourishing and fattening the Body”. He related how the English Dominican Friar, Thomas Gage who had spent time in the New World with Hernando Cortés, “acquaints us, that he drank Chocolate in the Indies, two or three Times every Day, for twelve Years together, and he scarce knew what any Disease was in all that Time”, the only noticeable effect was that he grew “very fat”. Others expressed disdain over the use

of pure chocolate, which they considered as “too oily and gross”. Still, they admitted that “the Bitterness of the Nut makes Amends, carrying the other off by strengthening of the Bowels” [22].

Hughes offered his own personal narrative as evidence, informing readers that “he lived, at Sea, for some Months on nothing but Chocolate, yet neither his Strength nor Flesh were diminished”. Indeed, like Gage, he “grew very fat in Jamaica, by Vertue of the Cacao-nut”. Accordingly, he claimed it to be of considerable help in counteracting “lean, weak, and consumptive Complexions”. He also noted that it “may be proper for some breeding Women, and those Persons that are hypochondriacal and melancholy” [22].

Throughout Europe, case study evidence was among the most readily used rhetoric during the Early Modern Period to convince physicians and the public of chocolate’s perceived benefits. Philippe Sylvestre Dufour provided such evidence in his popular and widely translated, *De l’Usage du Caphé, du Thé, et du Chocolat* (1671), as did Henry Mundy in his work for medical audiences, *Opéra Omnia Medico-Physica de Aëre Vitali, Esculentis et Potulentis cum Appendice de Parergis in Victu et Chocolatu, Thea, Caffea, Tobacco* (1685) and Marcus Mappus in *Dissertationes Medicae Tres de Receptis Hodie Etiam in Europa, Potus Calidi Generibus Thée, Café, Chocolata* (1695). Royal physician, Nicolas de Blégnny offered case study evidence supporting chocolate’s use in maintaining and restoring soldiers’ health in his *Le Bon Usage du Thé, du Caffé, et du Chocolat pour la Préservation et pour la Guérison des Maladies* (1687).

Occasionally, cases were recorded from the view of the patient. For example, following festivities celebrating Charles II’s Coronation, the diarist Samuel Pepys noted, “Waked in the morning with my head in a sad taking through the last night’s drink, which I am very sorry for; so rose, and went out with Mr Creed to drink our morning draught, which he did give me in chocolate to settle my stomach” [23]. Like many of the earliest New World geographical and travel narratives, the few patient narratives of chocolate as medicine offered merely anecdotal evidence.

Reaching back to the earliest recordings of chocolate, evidentiary accounts beyond the mere anecdotal focus upon the importance of precise preparations. The Florentine Codex details the elaborate ritualistic preparations required to release cacao’s therapeutic potential. Early travel narratives, such as Francisco Hernández’s *Historia de las Plantas de la Nueva España* (1577), described how cacao’s benefits were enhanced by mixing it with specific other ingredients local to a particular region. Stubbe, in *The Indian Nectar*, argued that all of the ingredients added to chocolate remedies must be precisely correlated with distinct individual constitutions. In addition to cacao itself, he noted,

the other Ingredients for making up Chocolate ... [must] be varied according to the Constitutions of those that are to drink it; in cold Constitutions, Jamaica Pepper, Cinnamon, Nutmegs, Cloves, & c. may be mixed with the Cacao-nut; some add Musk, Ambergrease, Citron, Lemonpeels, and odoriferous Aromatick Oils. In hot consumptive Tempers you may mix Almonds, Pistachos, ... and sometimes Steel and Rhubarb may be added for young green Ladies [18].