

## ILONA MARTONFI

### Mikulás nap (Saint Nicholas Day)

In your childhood house

sixth of December, Mikulás nap  
in the morning  
mother braids your hair  
ties it with red polka dot ribbons

buttermilk boiling  
on the woodstove

reddish-yellow Beno on the chain  
chickens' cackling.

Bavarian chalk hills ridge  
Danube river boglands

rubble on the old airfield strip  
ice-covered bomb craters

you live in an old Luftwaffe hangar: Halle # 7  
two-story red brick house attached to a factory  
shed

roofless hallway  
leaded windows, blasted

unpainted cement floors  
short white cotton curtains.

Grandmother Mariska's Lebkuchen  
chocolate Mikulás in cellophane

Dominican nuns in long black habits,

pigtailed Magyar refugee girl of nine  
in the classroom, movie days,  
blinds hang closed,

Herr Lehrer, Anton Mathes,  
fourth grade teacher, molesting you.

*Ilona Martonfi is the author of three poetry books, Blue Poppy (Coracle Press, 2009), Black Grass (Broken Rules Press, 2012), and The Snow Kimono (Inanna, 2015). Ilona has published in Vallum, Accenti, The Fiddlhead, and Serai. She is also the recipient of the QWF 2010 Community Award.*

## DONNA LANGEVIN

### Dinah Nuthead\*

*Saint Mary's Historic City, Maryland, 1660*

You leering old lawyer!

How easy to guess your thoughts  
when I grip the press's  
long black handle  
we call *the devil's tail*.

My bosom bouncing and heaving  
as I push and pull  
the lever  
that lowers  
the platen on to the press board  
after the letters are inked  
I wager you wish  
you were Old Nick himself unlacing  
my bodice while I pump  
his tool that never tires  
unlike your own member.

Later, when you doze  
like a dog by the hearth waiting  
for your contracts to dry  
I stroke a G and a D, and pray  
you never discover  
I'd give a slice of my soul  
to learn the couplings of letters  
that can spell the sun, moon and stars  
the secrets of warts and wings  
and fly me past drudgery.

I can't stop playing  
with the alphabet-blocks  
lined up in the devil's hell-box  
though I'm scared  
by the *i*'s severed head  
the teeth of the *E*  
and the *Y* that insists on asking  
*why must a woman  
who teaches herself to read  
be suspected of witchery?*

*\*Dinah Nuthead helped her husband run a printing press in St. Mary's Historic City, Maryland circa 1660. Though she probably knew the letters of the alphabet, she couldn't read or write. At that time, judges, lawyers, and clergymen were the only ones who were literate.*

*Donna Langevin's latest poetry collections include In the Café du Monde (Hidden Brook Press, 2008), and The Laundress of Time (Aeolus Press, 2015).*

# Biotechnology and Biopiracy

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## Plant-based Contraceptives in the Americas and the (Mis)management of Nature

RACHEL O'DONNELL

*Ce texte est une relecture de la nature et du développement biotechnologique international basé sur l'histoire et les politiques du colonialisme, les savoirs naturels, et les méthodes de contraception en Amérique latine. Il nous propose un questionnement créateur face à l'utilisation des contraceptifs naturels et pointe les contextes naturels où on les utilise afin de dénoncer les malentendus autour des traditions médicinales des femmes et du développement des politiques environnementales et internationales.*

In May of 2015, a scientist at the Jamaican Scientific Research Council was granted a new U.S. patent on *Petiveria alliacea* called “Composition and Method for Treating Cancer” (Brooks 1). The “invention” of the plant compound in the laboratory relates to the treatment of various disease states with Dibenzyl Trisulfide (DTS), a phytochemical that can be extracted from *Petiveria* in the laboratory. As its name denotes, the patent relates to the use of DTS for therapeutic treatment for cancer. According to the patent application, the drug developed will have the potential to treat a wide range of cancers and other diseases. Some of the cancer cells

that this drug has been found to be effective against include neuroblastomas and sarcomas, brain and skin cancers. One of the major findings, according to the patent, is that this drug made from the DTS compound does not appear to affect healthy cells, whereas most contemporary cancer treatments also damage healthy cells in the body.

The Jamaican Scientific Research Council reports that the cancer-fighting compound that was developed into this pharmaceutical was extracted from a local plant called Guinea Hen Weed, which is a common name in Jamaica for *Petiveria alliacea*. Many initial reports announcing the “discovery” also comment on how plants like Guinea Hen Weed have long been used by rural Jamaicans to cure a wide range of illnesses. Plants used by rural communities in local medical practice have been pursued by scientists with interest in “discovery,” classification, research, and the global market. Indeed, in the first publications on *Petiveria*'s curative properties for cancer in 2007, the scientist with this most recent patent reported,

The data compiled in the present

review on dibenzyl trisulfide (DTS) isolated from *Petiveria alliacea* L (the guinea hen weed or anamu) revealed that the compound and its derivatives could be of tremendous pharmaceutical interest. (Williams et al. 17)

In the title of the article itself, the researcher includes local names Guinea Hen Weed and anamu for reference. How did the Jamaican scientist discover the activity of this plant compound? Why is the research understood as necessarily connected to pharmaceuticals? How did these plants end up being tested in the laboratory? The science of botany often disregards these questions of historical and cultural process, as well as the social, political, and economic relationships involved in the creation of a drug and its connection to plant-based knowledge.

Mainstream media has since reported on the scientists' findings and drummed up “global” excitement about a possible cancer cure. Many media reports include reference to the offer to the scientists from the pharmaceutical companies to patent the development; the total offered has

already exceeded 100 million dollars (Lowe et al. 94; Williams et al. 23).

On the website of Cornell University, a graduate student has compiled five pages of information on *Petiveria alliacea* as part of a medicinal database. Thirty-one medicinal uses are listed there, including treatments for intestinal parasites in livestock and hysteria, rheumatism and

coincides with efforts made to resist the family planning initiatives imposed on Mayan communities from development organizations operating in Western medical traditions. This case study of a particular region's knowledge about *Petiveria* focuses on resistance to family planning at the highest levels, starting in the 1960s, which persisted for more than three

cells via "signal transduction" modes of action (Cohen 309). Dibenzyl trisulphide (DTS) is one such molecule (Figure 1) and was first coded in the laboratory when its insecticidal/repellent activities were discovered. DTS was first isolated from the root of *Petiveria alliacea* at a university laboratory in Brazil in 1990 (Sousa et al. 6353).<sup>1</sup>

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**Apacina is a plant made into a tea that some women drink to prevent a pregnancy. Women have maintained this contraceptive usage of the plant, and the ongoing use of the plant and the development of the local knowledge surrounding it can be seen to represent efforts to resist twentieth century changes in their communities.**

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rabies in humans. In addition to its traditional medicinal use, *Petiveria* has gained the attention of a number of organic chemists. At least twelve different biologically active compounds have been assayed from root, leaf and seed of the plant. A study published in 2001 reported that the presence of two diastereomers of S-benzyl-L-cysteine, isolated from fresh roots. This is reportedly the first evidence of these compounds occurring in nature.

Apacina is the Guatemalan word I am familiar with as a researcher in rural Guatemala for *Petiveria alliacea*, a plant made into a tea that some women drink to prevent a pregnancy. It has a very strong acrid smell and an almost unpalatable taste. Mayan women sometimes boil it for use after intercourse and save the pot of tea to drink over three days. Interestingly, women have maintained this contraceptive usage of the plant, and the ongoing use of the plant and the development of the local knowledge surrounding it can be seen to represent efforts to resist twentieth century changes in their communities.

The maintenance of traditional plant-based forms of contraception

decades and impeded the spread of family planning. Multiple doctors and nurses in APROFAM (Asociación Pro Bienestar de la Familia or the Association for Family Well-being), the major family planning agency in Guatemala, partially funded and supported by USAID (United States Aid for International Development), in clinics throughout highland Guatemala spoke of the "resistencia" to family planning in Mayan communities. Despite the establishment of a dynamic private family planning association in the mid-1960s, 40 years later, Guatemala ranks last in contraceptive use in Latin America (Population Reference Bureau 2014). This resistance to change and Western forms of health care and pharmaceutical application deserves more attention than can be provided in these pages.

Recent studies have revealed that of the top 150 propriety drugs used in the Western hemisphere, 57 percent contained at least one major active compound derived from natural sources (Setzer et al. 21). One of the major aims of the pharmaceutical industry is to find small molecules that regulate the biochemistry of disease

Guinea Hen Weed is also used as a tonic by the Caribs on Dominica and Jamaica. In Grenada, it is commonly used by traditional healers for coughs, colds and as an effective 'cleaner' for the intestines. Its active compounds are often cited in scientific papers:

Cudjoe root [a local name for *Petiveria alliacea*, see Appendix 1] is well established, if only half-remembered, in Grenadian folk botany and medicine, used predominantly for sinusitis and colds, but also for diarrhea/dysentery and gynecological complaints. It has been shown to contain unique sulfur compounds (e.g. dibenzyl trisulphide) with immunostimulant and antiviral activities, both of which have value in diarrheal disease (e.g. Rotavirus). (Whittaker et al. 490)

It also features prominently into the medical traditions of Obeah in St. Kitts (Urueña et al. 30) and Grenada/Carriacou.

At the same time we see plants growing in use in pharmaceuticals, in

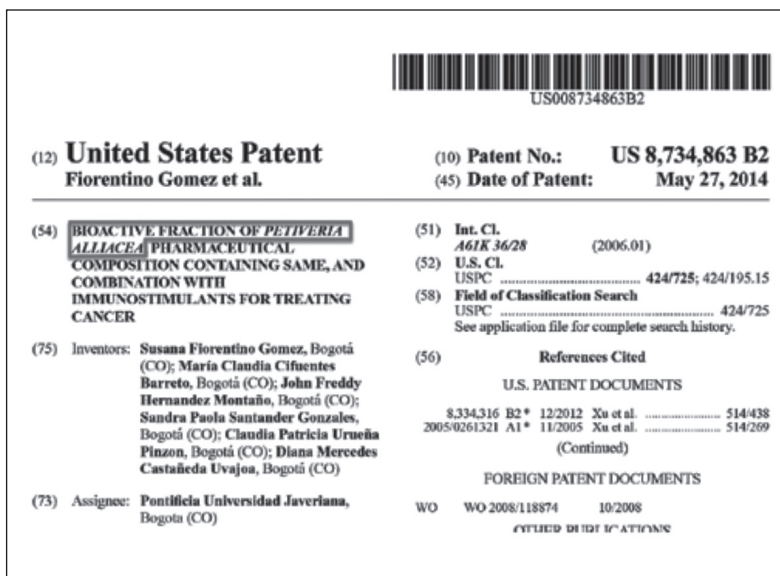


Figure 1: Original cancer-fighting patent on *Petiveria alliacea*, 2014 patent that led to the 2015 Jamaica patent mentioned above

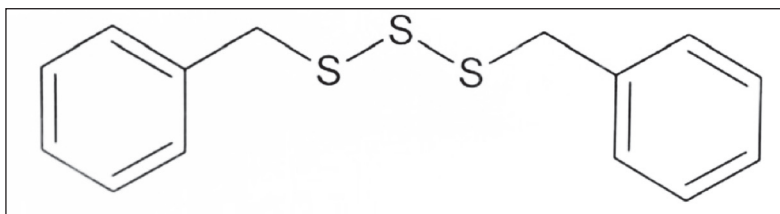


Figure 2: Lawrence A.D. Williams, H. George Levy, U.S. patent application number US20080070839 A1..

our present political condition under contemporary neoliberal globalization, we are seeing an intensification of control over women's bodies. Much of this control manifests itself as reproductive control. In Latin America, especially, contraception and abortion have been contentious issues, and 'population control' remains an important component of international development policy. The United States has a long history of promoting sterilization and Western forms of pharmaceutical contraception globally; international organizations are making inroads in international family planning programs and birth control efforts. Struggles for justice over these issues have emerged in recent decades, especially surrounding forced sterilization and international adoption. We also see current debates over the right to control of fertility in

Latin America, including the right to control birth and bodies and maintain access to contraception. Recent press over why most Brazilian women get c-sections highlight Brazil's attempts at pregnancy surveillance, including recent legislation to maintain state records of all pregnancies in an attempt to control population increase. With the stated aim of meeting the UN Millennium Development Goal of reducing maternal mortality, enacted a law in 2012 to establish a national system of registration, surveillance, and monitoring of pregnant and postpartum women. Under PM 557, every pregnant woman who enrolls is entitled to a small payment to assist with prenatal care, and the law intends to "improved access, coverage, and quality of maternal health care, especially in high-risk pregnancies" (Wilson 24).

This type of surveillance is directly related to the ways in which women's bodies are considered in modern science and medicine. Women are not protected from state control of their bodies, and a genealogy of contraceptive plant knowledge easily highlights the relationship between women and empire. The critique of the embeddedness of gender relations in both the practice of science and scientific knowledge itself has been one of the most important contributions of feminist science studies (Harding 1997: 303; Subramanian 956). Feminists have also tracked how science and scientific knowledge exist in markets, capital, and the economy. Many have called modern science a scientific-industrial complex to point to the links between scientific knowledge, post-colonial peoples, and market application. The development of *Petiveria* as a cancer-fighting treatment must have come directly from the knowledge of lay people in the Caribbean, but we have no understanding of this development as a cultural process, or even a reference point to figure out how this knowledge traveled from local people to the scientific community in the development of a cancer-fighting drug. Feminists and critical science scholars have also connected laboratory funding and practice to global circuits of capital (Wilson 94), noting the false divide between 'science' and 'industry,' with universities supporting science and funding coming from industry. The flows of global science mirror the flows of capital, especially with the creation and marketing of drugs, and commodification of natural resources such as seeds, soil, and water. Therefore, bioprospecting and stories of pharmaceutical development are really at the heart of feminist science studies. Sandra Harding (2008) writes that it is difficult to produce any 'objectivity' in science and the myth

Memorial Sloan Kettering Cancer Center

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INTEGRATIVE MEDICINE / ABOUT HERBS, BOTANICALS & OTHER PRODUCTS / SEARCH ABOUT HERBS

## Petiveria alliacea

**Integrative Medicine**

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Our Approach

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Therapies, Classes & Workshops +

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About Herbs, Botanicals & Other Products -

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Overview



**Common Names**

- Anamu
- Mucura
- Apacina
- Guinea herweed

Figure 3: *Petiveria alliacea*, Memorial Sloan Kettering Cancer Center ([mskcc.org/cancer-care/integrative-medicine/herbs/petiveria-alliacea](http://mskcc.org/cancer-care/integrative-medicine/herbs/petiveria-alliacea)).

of value-free knowledge. Situated knowledge (Haraway 1991: 183), and strong objectivity (Harding 1991, 138) have been particularly valuable in imagining a new ‘science’ that would incorporate women’s and lay people’s knowledge. The postcolonial focus on Western science sees its developments as one category of many, and also considers how indigenous knowledge has been appropriated, and how science has been implicated in violent forms of colonialism. Alternative knowledge systems, practices, and sciences have been viewed more recently as equally worthy of inquiry (Shiva 2010; Harding 2008), arguing that sciences must be understood in the plural (Subramanian 1966).

Ultimately, the way we use *Petiveria* and the way it is used in the laboratory reflects our understanding of science, women’s bodies, and narrow scientific study. In fact, so called ‘folk medicine’ has long made use of aqueous and alcoholic extracts from *Petiveria alliacea*, so this ‘invention’ was made first by the people doing this work in the Caribbean, Central and South America (Hernandez et al.) and thought it may have been modified in the laboratory, it is impossible to suggest that this knowledge arrived in the

laboratory without local knowledge.

Knowledge of the properties of medicinal plants is seen as a local common resource in much of the world, not something to be held privately and made use of for individual profit-seeking. It is clear that the use of traditional knowledge pinpoints plant medicinal uses efficiently; without the use and abuse of Indigenous communities, the biotechnology industry would have no place to turn. Transnational corporations have defended their intellectual property rights and often won their freedom to purchase and patent biological materials, to the detriment of indigenous communities in the Global South. It has been clear that much of this biological knowledge gained and patented by transnational corporations is knowledge that comes from indigenous communities themselves, as problems have arisen where one indigenous community is contracted for their knowledge, but another may use it. *Anthurium tessmannii* is contraceptive in Colombia by three different indigenous nations, for example. The same medicinal compound may be used in various Indigenous communities (either for the same or different medicinal uses), but

corporations have been able to claim that they acquired their biomaterials from whatever country and community they choose—under terms and conditions most favourable to them.<sup>2</sup> Knowledge of local geographies, geologies, animals, plants, classification schemes, medicines, pharmacologies, agriculture, navigational techniques, and local cultures that formed significant parts of European sciences’ picture of nature were provided in part by the knowledge traditions of non-Europeans.

Such work, then, reminds us that plant collecting and knowledge about medicinal plants have been globally extensive and systematic before the colonialism took hold and that not only Europeans continued to learn about and classify the plant knowledge of the Americas. Genealogies of contraceptive plants correspond nicely with contemporary discussions about the patenting of natural knowledge and what has come to be termed ‘biopiracy,’ the exploitation of traditional knowledge through political means.

Scientists invested in plant biotechnology argue that the intensification of agriculture is necessary because of natural limitations that require

enhanced and more efficient plant breeding to inspire “the release of economical, high-return and patentable plant-derived products” (Meiri and Altman 41), stressing the importance of this research to the pharmaceutical and agricultural industries. They argue that corporate funds must support advanced research and development in biochemistry, physiology, genomics and biotechnology of agricultural and medicinal plants (Borlaug), citing the population explosion as a global crisis and biotechnology as necessary solution (Meiri and Altman 3). The new plant biotechnology centers around three major areas: first, as an aid to “classical” breeding of plants, including ongoing genome mapping projects in global food staples, such as rice, maize and tomato, in an effort to shorten the time required for breeding cycles (Meiri and Altman 10-12). Second, the generation of engineered organisms: in view of the ‘limitations’ of naturally-occurring genes, a more ‘efficient’ engineering of plants has resulted in improved plants that grow faster or taller, or are able to withstand less water. Scientists value “the creation of novel, and otherwise impossible genetic recombinations” (Meiri and Altman) or the creation of plants in the laboratory that would not exist in nature without the hand of the scientist. Further work is being done to integrate microorganisms into plant production systems, that is, to develop plants that have genetic material to resist microorganisms that may harm them, such as fungi, bacteria, and insects using both laboratory-engineered plants and microorganisms.<sup>3</sup>

During the last two decades, new biotechnologies have been adapted to agricultural practices, meaning plants are being used in ways and in scientific disciplines where they never were before, and this will continue and intensify in the next decade. Plant biotechnology (especially in

vitro regeneration and genetic modification) is changing the way we understand and know plants, as it affects everything about them, from their growth and characteristics to the ability to reproduce themselves. Plants are being specifically redesigned to produce specialty foods, biochemicals and pharmaceuticals.

In contemporary biotechnological development discourse, then, a complex ecosystem is reduced to individual plant properties, pieces of a system are taken to be a knowledge of its whole, particular properties are placed hierarchically above others, depending on the values of a particular population and time-period, to allow for the manipulation of the ones deemed significant. In particular time periods, including our own, contraceptive plant properties were not deemed significant or important and a plant is commonly reduced to its commercial value, manufactured into a commodity, and reduced again to a profit for pharmaceutical industry. Women’s knowledge of plants and nature is manipulated to increase the production and distribution of these commodities, which are in turn legitimized scientifically as a productivity increase, even though its destruction decreases the reduction of diversity and the power or use of any medicinal property, recreating life and violating the ecosystem in the name of progress, science, and development. Profit is then the only gauge of a plant’s value, and life as nature’s organizing principle disappears. In science, the value is in the application, not in knowledge for other reasons, such as knowing for its own sake or for the betterment of human situation. The epitome of scientific understanding, the controlled experiment, is what Vandana Shiva calls “a political tool for exclusion such that people’s experimentation in their daily lives was denied access to the scientific” (2010: 31). Contemporary scientists

are bound by such controlled experiments and as a result, disseminate research findings that correspond to a directly observable natural world.

In International Development Studies, population statistics are often used to measure poverty and development statistics, including measures of family planning and reproductive health. The World Health Organization (WHO) estimates that 500,000 women die from pregnancy-related causes worldwide, and that perhaps one-third of those stem from unsafe abortion (WHO Feb. 2015). The WHO also ranks Guatemala as the most difficult to implement family planning initiatives, citing the ethnic makeup of the population as reason for it (WHO 2010). The scholars who write on the history of abortifacients often suggest that although plants were popular contraceptives, they were never particularly reliable (Himes; Riddle). Political Scientists likewise argue that these preparations were passed down prior to implementing Western medicine and disappeared because they were found to be unreliable and cause severe side effects. In fact, some say, plant-based contraception only disappeared when surgical abortion became much more accessible (Siedlecky 105).<sup>5</sup> Instead, plant knowledge and contraceptive recipes are still widely used and remain outside the knowledge realm of modern science, which would explain why the results (contemporary child spacing) do not appear to justify their reputation. Still, it is necessary that medical science record their efficacy? Many ethnobotanical studies mention plants used for menstrual regulation, but little information is provided, such as preparation dosage, reported effectiveness, or analysis of how women seek this care. In addition, individual women circulate information about abortifacients mainly by word of

mouth and maintain their efficacy by developing this knowledge locally

Indeed, the assumption that plant-based abortifacients have disappeared because of their lack of effectiveness remains prominent in the Western Medical Tradition. In contemporary scholarly work, it is common to depict the contemporary Western world as automatically and without question

liberal globalization and corporate control of local knowledge and life forms. In the twentieth century, the solution to environmental and political problems often fell on the backs of Third World women, who were faulted for overpopulation and accused of ignorance to Western birth control, amid a political agenda that pressed for the sterilization of poor

for “natural” medicines and nature’s remedies are vast. The Native American Ethnobotany database at the University of Michigan-Dearborn brings up 160 plant species that can produce abortion. Still, scholarly treatment of folk methods of birth control remains focused on its absurdity, and some catalog magic and superstition along with herbal and

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more ‘advanced’ than in previous historical periods. This is incorrect more often than not, and may cause us to ignore or dismiss the knowledge and understanding that people have gained in earlier times. The historical record demonstrates that women throughout many cultures and time periods have been managing their fertility without Western scientific methods of doing so, and have been long adept at understanding precise uses and misuses of nature. They have likewise made use of ambiguity in language in order to allow space for a variety of reproductive options, including plant-based ones. It is also common to assume that earlier times were more inflexible in comparison with our more “enlightened” age, but many feminists have demonstrated how women have historically had more freedoms regarding their bodies across times and in cultures, not less. Indeed, the twentieth century can in part be categorized as an era marked by the intensification of control over women’s bodies (Bush 242; Ehrenreich and English 5-15).

The maintenance of fertility control remains part of this cultural maintenance and resistance to neo-

women worldwide. Indeed, instead of further investigating plant-based contraceptives and making them worthy of scientific investigation, recent efforts have been to patent particular life-forms and develop them under corporate ownership for profit in laboratories.

In the Guatemalan countryside, erosion is a continuing problem from slash and burn agriculture and monoculture that pushed indigenous communities further and further into the highlands. As a result, much natural plant life is dying out. We might also cite capitalist development as part of the destruction of this natural knowledge. A midwife I interviewed in the highlands of Guatemala was very angered to tell me that that the younger midwives do not have as much knowledge of plants “and do not know where to find them” (Personal communication, 2014). She cited that they were too urban and that only midwives “further out” (that is, in more remote locations) had more knowledge of where to find Apacina.

Pharmaceutical companies are well aware of the plant-based remedies that have spurred drug development, and indeed, their marketing campaigns

barrier methods. Indeed, comments in many botanical texts refer in passing to plants that may have “some antifertility activity,” reminding us that to much of the scholarly world, at least, this information remains hidden. Further, we cannot assume that because an herbal drug has not been tested, it has no contraceptive effect.

Some of the most popular contraceptives, such as birth control pills and intrauterine devices (IUDs) have had adverse health consequences for women. Depo-Provera, an injectible hormonal birth control, it has been argued, has been deemed dangerous by women in the developed West and has been outsourced to the Global South. The introduction of the birth control pill appears to have actually increased pregnancies in some areas of the Global South, in part because indigenous methods of child spacing, such as extended breastfeeding or abstinence, have been displaced (McClaren 6). Breastfeeding does not provide a completely effective contraceptive method, but it has no known side effects. Depo-Provera has been linked to cardiovascular and uterine problems. Latin American feminists have attempted to make this

known, but the powerful campaigns of pharmaceutical corporations have squashed their efforts. Many women in rural Guatemala who use Western forms of birth control choose Depo-Provera because this method is easy to hide from family members, as it only requires one injection every three months. Another obvious problem with many of these pharmaceutical contraceptives is that their continual use must be maintained, whereas plant-based contraceptives are only used when needed. In my interviews, many women cited the importance of only drinking the tea after being intimate with a man, a type of control women cannot find in contemporary pharmaceutical forms of birth control. Contraceptive plants offer women a sense of privacy and control because no one else has to know they are using them, including local health providers and families.

As Donna Haraway has written, it is almost impossible to separate nature from ourselves, but we do so consistently, especially in the context of the developing world when the carbon dioxide production of industrial cultures is absorbed by plant materials and the plants themselves become service providers for the industrial economy, providing a clear example of her concept of “naturecultures”: we cannot divide a view of nature from the cultural (Haraway 2000: 25). The botanical history and contemporary biopiracy of Apacina demonstrates how knowledge and power are intimately linked, and this is nowhere more obvious than in the present global political economy. The base of the global economic system shifted in the twentieth century from heavy industry to information technologies and service industries, and scientific innovation has moved decisively to the base of the contemporary economy. Those who own nature and are able to access its product as well as the global knowledge of it

are able to decide how to make use of nature’s resources and profit from contemporary scientific innovation and technological change. The majority of the world’s people, and especially women, have few of these resources, no ownership of pieces of nature nor the resources to access it, and are in fact systematically denied the knowledge of how to gain access to nature’s abundant resources.

Ultimately, what is demonstrated by this non-Western worldview among the Maya K’iche’ is that medicine and food are not separate life pieces, but part of a holistic understanding of health and bodily care. Market-based herb sellers often asked if I wanted Apacín as a food condiment or a remedy; either way, one woman said, the plant has excellent effects, suggesting that plant-based abortifacients and emmenagogues are most often used for a wide variety of women’s health complaints. In rural Guatemala, food and medicine are one and the same, maintained and valued as part of women’s knowledge base. In Western contexts, we rarely recognize the possibilities of plant-based remedies and their political function. Yet for other parts of the world, these understandings, long missing from Western scientific study, are very much part of women’s knowledge bases and everyday lives.

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<sup>1</sup>A substance found in *Petiveria*, dibenzyl trisulphide (DTS), exhibits antitumor and immunomodulatory activities (Williams et al. 17). The ex-

tract displayed several mechanisms of action that may explain its antitumor activity, such induction of cytoskeletal reorganization and DNA fragmentation (Urueña et al. 1). Several compounds isolated from *Petiveria* alliacea compounds have antibacterial and antifungal activities (Benevides et al. 744) and another showed promise as a wound treatment (Schmidt et al. 5223). Anti-inflammatory and analgesic effects have also been studied and reported (Lopes-Martins et al. 245). A 2009 publication supported the molecule’s possible role in the treatment of inflammatory ageing diseases (Williams et al. 57). A product that includes the patented dibenzyl trisulphide compound was indicated for the treatment of cancer in 2015 (Patent 20080070839 A1).

<sup>2</sup>See “A Closer Look at the Royalty Payment Agreement Negotiated by Monsanto Corporation and Washington University ICBG Bioprospecting Agreement for Collection of Peruvian Medicinal Plant.”

<sup>3</sup>From Proceedings of “Plant Biotechnology and In Vitro Biology in the 21st Century,” conference held in Jerusalem, June 1998.

<sup>4</sup>A future project will look at the ways in which migrant women maintain access to this knowledge, even though access to particular plants may become limited.

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