Local Biologies and the Chemical Infrastructures of Global Health

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The text

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Abstract

Chemicals are key material features of the infrastructure of global health. While the models for disease control deployed in global health projects tend to treat chemicals as stable objects, I ask what might happen if we saw them instead as unstable things, implicated in fluid interactions. A view of health as constituted of things rather than objects has three advantages. First, it pushes theories of biopower in global health beyond attention to the bureaucratic regimes of life-management. Second, it shows how health-seeking practices belie neat spatial scales. Third, chemicals reveal the aesthetic nature of health.

Keywords

global health, chemicals, local biologies

Biologies locales et infrastructures chimiques de la santé mondiale

Résumé

Les produits chimiques jouent un rôle matériel clé dans l'infrastructure de la santé mondiale. Tandis que les modèles de contrôle des maladies utilisés dans les projets de santé mondiale ont tendance à traiter les produits chimiques comme objets stables, je souhaite examiner ce qui pourrait se produire lorsqu'on les envisage comme des choses instables, impliqués dans des interactions fluides. Il existe trois avantages à utiliser un concept de santé comme composée de choses plutôt que d'objets. En premier lieu, ce point de vue déplace les théories du biopouvoir dans la santé mondiale au-delà de l'attention pour les régimes bureaucratiques de la gestion de la vie. En second lieu, cela démontre comment les pratiques de recours au soin démentent des échelles spatiales simplistes. Troisièmement, les produits chimiques révèlent la nature esthétique de la santé.

Mots-clefs

santé mondiale, produits chimiques, biologies locales

Sommaire

Introduction

Nicaraguan community health workers (CHWs) are on intimate terms with the organophosphate insecticide temephos. It comes in 25-kg sacks of brownish granules. Nicaraguans call it *abate*, a hispanization of the trade name "Abate," given to it by the chemical giant BASF. Abate chokes insect larvae in the water where they hatch, and it is the World Health Organization-endorsed first line of defense against the *Aedes aegypti* mosquitoes that transmit the dengue virus among humans.

There are several ways to use temephos. It can be dissolved and sprayed through a tube connected to a knapsack tank. It can be released over large bodies of water from aircraft. In Nicaragua, the most common delivery device is the human hand. *Aedes aegypti* is a domestic mosquito. It lays its eggs in the tiniest of water features: flower pots, sinks, tubs, and old tires. Curbing its propagation requires an intimate mode of attack. In regularly scheduled *abatización* campaigns, groups of CHWs visit houses and surgically eliminate mosquito breeding sites by slipping the granules into those intimate water features.

Nicaraguan *abatización* is one of scores of acts of chemical disturbance that constitute the day-to-day operations of global health. Here, I define global health as the complex of biomedical experimentation, humanitarian intervention, and public health training that have been brought to bear against a variety of health concerns, perhaps most notably infectious diseases including HIV/AIDS, malaria, and dengue (Neely and Nading, n.d.). Global health is distinguished from previous eras of international health, in which bilateral state-to-state action drove health interventions, by the prominent role of non-governmental philanthropic organizations in funding and implementing such experiments and interventions. Those who practice and advocate for global health tend to imagine health as a universal human right and pandemic disease as an encompassing threat to economic security and traditional state-centric political orders, as well as individual well being. Given this universalizing thrust, global health interventions tend to presume not only that human bodies in different places react to pathogens in a reliably similar manner but also that standardized biotechnical interventions can be translated across spaces and contexts.

In this working paper, I examine how two chemicals fit into the infrastructure of global health and the lives of health workers in Nicaragua. One chemical is abate, used to control the mosquitoes that transmit the dengue virus. The other is chlorine (mostly in the form of diluted bleach), used to disinfect surfaces and purify water. Both temephos and chlorine are useful killers. They end the lives of mosquitoes and microbes in order to preserve those of humans. While the models for disease control deployed in global health projects often tend to treat such chemicals as stable *objects*, I ask what happens if we treat them instead as what archaeologist Ian Hodder (2014) calls *human-made things*, creations on which the continued existence of human beings (an existence that is always entangled with that of nonhumans) depends. I argue that abate and chlorine constitute nodes in what I refer to, following Michelle Murphy, as global health's "chemical infrastructure" (Murphy, 2013).

An interest in using chemicals to manage the entanglement of humans and nonhumans dates back to well before the era of global health. This interest is perhaps most pronounced in the history of intervention into zoonotic infectious disease systems, in which complex relationships among microbes, insects, animals, people, and their shared landscapes produce epidemics. The discourses and practices of contemporary global health approaches to zoonoses maintain an insistence on the status of bodies, animal vectors, and pathogens as stable, discrete objects. "End malaria," appeals tell us. "Stop dengue." Chemicals, from drugs to insecticide to disinfectants, can help accomplish these objectives.

In this paper, I take the entanglement between human and nonhuman, and between organic and inorganic material, not as a problem for health interventions to overcome but as a starting point for understanding health itself. I argue for a view of health (global or otherwise) as constituted not of discrete objects in atomistic conflict, but of constantly becoming things, implicated in fluid interactions. As Tim Ingold has argued, what distinguishes "things" from "objects" is that whereas objects are discrete and uniform, "things leak, forever discharging through the surfaces that form temporarily around them" (2010: 4). I further argue that as "made things," chemicals are ontological engines: tools with which humans actively identify and remake *life forms*—sometimes to

kill them, other times to dull their reproductive capacity, and other times to change their molecular composition. But chemicals are also "theory machines," or "epistemology engines:" tools for thinking about the *forms of life* that link human and nonhuman beings, and how knowledge is produced about them (Idhe, 2000; Helmreich, 2011).

In the next section of this paper, I elaborate on the idea that chemicals constitute both the substrate of biological processes and much of the material infrastructure of global health. In the following three sections, I suggest that a view of that infrastructure as constituted of things rather than objects has three advantages. First, it pushes theories of biopower in public health beyond attention to the bureaucratic regimes of life-management. Chemicals can be counted, but in their localized leakages, they become vehicles for fashioning new forms of concern. Second, it forces us to abandon notions of neat spatial scales. Like other global technologies, chemicals can be broken down and reproduced in a variety of settings, though that breakdown is never absolute, and that reproduction is not always and everywhere the same (Law and Mol, 2001; Woolgar and Lezaun, 2013). Third, a thing-centric view reveals the aesthetic aspects of local biologies, which are too often overlooked in both global health practice and in critical analysis. As Michelle Murphy notes, chemicals are knowable not so much in their visibility but in their tactility (Murphy, 2013). Chemicals are frequently *felt*, rather than seen. Drawing on ethnographic material from Nicaragua, I argue that sensory interactions with chemicals produce knowledge about bodies and environments.

Local Biologies, Chemical Infrastructure, and Theory

Recently, medical anthropologists interested in global health have begun to engage Margaret Lock's (1993) notion of "local biologies," the study of how "history inscribes biological difference" and of "how and why claims to the biological and social are leveraged within historical, cultural, embodied, and political economic relationships" (Brotherton and Nguyen, 2013: 290; Koch, 2013: 309). While global health interventions rely upon the assumption of a biological similarity in bodies across disparate localities, the concept of local biologies presents bodies not as "everywhere biologically the same," but as differentially produced—biologically as well as socially—by social and political processes. These processes include global health interventions themselves (Brotherton and Nguyen, 2013: 288; Lock and Nguyen, 2010).

The analytical benefit of bringing the concept of local biologies to bear on global health is considerable. Implicit in the concept of local biologies is not only the notion that bodies vary materially due to historical conditions but also that bodily biologies are linked in some meaningful way to extrabodily ecologies. "Locality," as Hugh Raffles puts it, is "a set of relations, an ongoing politics, a density, in which places are discursively and imaginatively materialized and enacted," and if "a dynamic instability and fluidity in 'nature,' both biophysical and discursive" is one point of entry to the local (Raffles, 1999: 324-325). If follows, then, that nonhuman ecology, as much as bodily biology, counts as a "local" phenomenon of the type that Lock imagined. For anthropologists who would critically engage with global health, the notion of local biologies creates the possibility of working, as Stefan Helmreich puts it, "athwart theory," "tacking back and forth between seeing theories as explanatory tools and taking them as phenomena to be examined" (Helmreich, 2011:138). In studies of health, working athwart theory means asking how biomedical models of health are materialized in technologies and bodies, but also asking how such theoretical constructions, once materialized, "complicate our descriptive paths as we navigate…the 'real' world" (Helmreich, 2011: 134; Lock and Nguyen, 2010). Insofar as the subjects of global health include patients, practitioners, and others in the Global South, a genuinely "local" biology would certainly include attention to how theoretical models about bodies and ecologies reconfigure material relations when they *enter* new places. But such an approach would also attend to the opposite process. It would ask how what Raffles (1999) calls "local theory," the dense congeries of representations, nonhuman action, history, and experience, ramify *outward* from particular places to complicate the descriptive paths of anthropologists and biomedical practitioners who claim an interest (either critical or practical) in global health. This paper is in part an attempt to integrate anthropological, scientific, and "local" theory in this multidirectional way.

It does this by adopting a view of health as constituted of and by things. Such a view reminds us not just of the locality of biology but of the "inescapably ecological" nature of health (Nash, 2007). Central to an ecological imaginary of health is a view of the body as physically porous—as leaky. It is widely accepted in biology that human guts, skin, muscles, and blood are "infolded" with nonhuman material (Haraway, 2008). Close attention to the dynamic community of intestinal microbiota and the proliferation of animal-borne disease—to name just two examples—shows that the zones where body and environment meet form less a rigid barrier than a fluid boundary (Hinchliffe, et al., 2013; Nading, 2013; Benezra, Destefano, and Gordon, 2012). This boundary is populated by organic beings but also by inorganic chemicals, including methyl mercury, formaldehyde, and other industrial chemicals. Recent research into the problem antibiotic-resistant bacteria, and the uncertain hormonal effects of triclosan-infused soaps all underscore the role of inorganic materials, in addition to animal vectors, viruses, and bacteria, in charting the murky interface between what the philosopher Don Ihde calls "embodied being and environing world" (Ihde, in Haraway, 2008: 249; see also Landecker, 2014; Orzech and Nichter, 2008; Allen, 2003; Fortun, 2001). Perhaps more than viral or bacterial interfaces, attention to inorganic chemicals, embedded in largescale systems of landscape manipulation and cultivation, shed light on the ways in which technologies—many of them driven by global capitalism—create new kinds of leakages between human and environment, and the new forms of difference captured in Lock's notion of local biologies.

Chemical encounters are key to the formation of the contemporary Nicaraguan body-politic. Consider the latest news from the sugar mills. An epidemic of kidney failure is sweeping through the region of Chichigalpa. According to La Isla Foundation, 46% of all male deaths in Chichigalpa over the past ten years were caused by this disease, whose exact cause remains unknown but for which proximity to agro-chemicals appears to many to be a likely factor (Beaubien, 2014). Or consider Nemagon. Farmers who worked in banana plantations owned by Dole in the 1960s and 1970s claim that this pesticide, the trade name for Dibromochloropropane, has made them sterile, and may be at the root of a spate of unexplained cancers (Guevara, 2014). In her work on "chemical infrastructures," Michelle Murphy (2013) calls attention to the intergenerational and spatial afterlives of those chemicals—like pesticides and PCBs—that once promised "better living" but now act as reminders of the embodied effects of a passing industrial capitalist age:

> Chemical infrastructures, importantly, are spatially and temporally extensive. They are distributed and translocal, connecting moments of production and consumption, moving across national borders, traversing scales of life. They are temporally uneven, as some chemicals break down quickly and others refuse to decompose, and thus are present for long durations. Some chemicals cause immediate responses in organisms, others provoke effects that take generations to see, as they slowly injure organisms, ecologies, or even planetary atmospheres (Murphy, 2013).

It is in this post-industrial afterlife that questions about health tend most often to enter the human-chemical story. In this paper, however, I turn attention to those chemicals whose theoretical and material role in producing states of human health is primary (and supposedly positive), rather than secondary (and largely negative). Abate and chlorine, two substances whose purpose is to "kill in the name of life," constitute key nodes in global health's chemical infrastructure.

Global health's chemical infrastructure begins in theory. As Helmreich (2011: 138) argues with reference to the 2010 Gulf of Mexico oil spill, the "empiricity" of global events "[becomes] manifest through machines instantiating theories." His examples include climate models and disaster simulations. Well before the oil spill, such theoretical constructions became active, leaky things in the world. Theoretical ideas about the nature of water and oil were mobilized by experts, governments, and on-the-ground actors who engineered blowout preventers, oil rigs, and chemical dispersants—the stuff of petrochemical infrastructure (see Appel, 2012). In the construction of this infrastructure, theoretical ideas about the relationship between seawater and oil were materialized, and in the spill, such ideas were put to the test and (theoretically) refined. Following Helmreich, one way of tracking the empiricity of global health problems might be to ask how theoretical ideas about chemicals become materialized in an analogous kind of material infrastructure. As I show below, epidemiological, entomological,

and economic models calculate the costs of chemicals, the rate of nonhuman death they will cause or human life they will save, and the number of, as the Bill and Melinda Gates Foundation puts it, "healthy, productive [human] lives" that will result. To materialize theories about chemicals, global health projects enroll actors from clinicians to citizen advocacy groups to CHWs to laboratorians.

Nevertheless, many of the most recognizable chemical encounters in global health are pharmaceutical. If the concept of local biologies emphasizes how "history inscribes biological difference," ethnography reveals how such difference shapes the usage, meaning, and even efficacy of therapeutic drugs (Brotherton and Nguyen, 2013: 290; cf. Biehl, 2007). Therapies do not enter bodies in a social vacuum. Instead, they enter populations that are already biologically and socially differentiated. What look like globally "standard" treatments (two prominent examples include AIDS and tuberculosis therapies) re-shape, rather than obliterate, local biologies (Nguyen, 2010; Koch, 2011). Pharmaceuticals, however, are only part of global health's chemical infrastructure. Non-pharmaceutical chemicals like insecticides and antiseptics, which are used to prevent rather than treat infectious disease, can be analyzed in an analogous fashion. Chemicals such as abate and bleach also tend to come as part of standardized technological interventions and protocols. Once released into biologically and socially diverse landscapes, these chemicals, too, inscribe biological difference, reshaping rather than obliterating local biologies.

Connected through conceptual and material infrastructures, chemicals permit epidemiologists, policymakers, and anthropologists think about the forms of social, political, and economic life through which people relate to unseen microbes and myriad larvae. But infrastructures, like chemicals, are not sealed environments. Even as they make tremendous demands on people to interact with one another in prescribed ways, they also leak. This is especially the case in moments when models of human-chemical interactions formulated by policymakers are implemented by local actors—when standardized, universalizing theories about chemicals and health meet "local theories" (Raffles, 1999). I turn now to those moments.

Biopower beyond Bureaucracy

Antibiotics, insecticides, antiretrovirals, laboratory cleaners, and reagents are both constituted in biomedical models and constitutive of global health's biomedically-driven infrastructure. The WHO's mosquito control protocols, which depend upon abate, are in this way akin to laboratory protocols for dengue, HIV, or influenza diagnostics, all of which rely upon the presence not only of costly reagents but of simple chlorine bleach solutions. In Nicaragua, the application of abate is supposed to proceed in a rigid fashion. CHWs receive strict orders about how much of the granulated organophosphate to deliver, and in which spaces. A 50-gallon water barrel should receive 25 grams, a flower pot five. Each local health center receives a quantity of abate from the national health ministry, determined by the yearly allocation of funds for dengue prevention by the Pan American Health Organization. For the purposes of the intervention, abate is presumed to have an efficacy of 60 days. This means that if homeowners allow it to remain in their barrels and flower pots, *Ae. aegypti* larvae cannot survive there for that period of time.

As I have described elsewhere, abate is part of a standardized and mobile set of technologies for public health accounting and intervention (Nading, 2014). CHWs receive not just the chemical but worksheets for tracking the number and type of water receptacles into which they have deposited it. They receive maps for navigating neighborhoods—broken up into numbered houses and blocks—and instructions about how to discuss the workings of the chemicals themselves. CHWs must teach themselves and householders how live with abate and without mosquitoes. In the correct doses, abate should be lethal to mosquitoes and harmless to humans.

The rigid enumeration of spaces, granules, and CHW labor-time is at the heart of the mosquito control project. Such enumeration is globally standardized, both to create commensurability and to regulate action across the dengue-endemic world. In Nicaragua, warnings about the judicious use of abate are a constant theme of CHW trainings. Overuse is economically costly, but it can also lead to mosquito resistance. The management of chemicals is thus tied to the management of the laboring bodies of health workers.

The use of killer chemicals in health is in this way an example of how the creation and maintenance of global health infrastructure constitutes a form of governmentality. It demands particular dispositions both of the technicians who manage it and of the patients and publics who theoretically benefit from that management (Foucault, 1990; Lakoff and Collier, 2008). Yet the possibility of insect or microbial resistance, or of economically irresponsible human usage, means that the management of risk through chemicals creates new, unforeseen problems (Beck, 1992; Rose, 2007). Accounting by numbers is supposed to create technological commensurability, but numbers leak: they can divide as well as unite, and they lay risk atop risk (Landecker, 2014; Muehlman, 2012).

As a carefully rationed intervention, *abatización* demands that those who use it conceive of mosquito-killing chemicals (and mosquitoes themselves) as stable objects. But abate also leaks. For CHWs in Nicaragua, the insistence on accountability by ministry officials is offset by an absence of protective equipment. No gloves, masks, or other clothing come along with the abate granules. For CHWs, this lack of protection means that working days end not just in neatly crafted bureaucratic statements, but in nausea, headaches, and irritated skin. (This should come as no surprise, since the company that invented abate, BASF, helped develop the chemically similar nerve agents Sarin and VX for the German army during World War II. Their chemical makeup contains a history of other forms of would-be world domination, predicated in part upon the eradication of other kinds of supposedly sub-human enemies.)

Ideas about the "locality" of biology are central to medical entomology. Entomologists know that the tolerance of insect larvae to abate varies from place to place, and the scientific literature in medical entomology is filled with papers that document tests of insect tolerance to poisons. These tests nearly all refer to mosquito populations associated with particular locations (i.e. cities or regions) (see, e.g. Hemingway and Ranson, 2000). "Local" populations of *Ae. aegypti* are differently able to "detoxify" themselves after exposure to abate, depending upon the history of chemical interventions in the places where they have reproduced. In her account of antibiotic resistance in the United States, Hannah Landecker (2014) shows how the biological makeup of resistant bacteria contains a history of biopolitical and risk-management strategies. A set of temporalities also appears embedded in the biology of mosquitoes. Laboratory experiments on insecticide tolerance attempt both to recreate past developmental processes and to conjure representations of how such processes might proceed in the future. Entomologists interested in the metabolic mechanisms of detoxification expose generation after generation of wild-caught mosquitoes to abate and other chemicals in order to observe the metabolic changes that result in tolerance. Such work produces artificially tolerant populations of experimental (i.e. no longer wild) mosquitoes that represent potential populations of free-ranging ones. The descendants of "wild" mosquitoes become experimental creatures—the materialization of theory. The publication and application of such experiments, which estimate time-to-tolerance at different levels of exposure is intended to lead to better theoretical models about chemical-bodily interface at the level of the insect. Such models then become active, leaky things in the world (Helmreich, 2011). A mounting body of evidence about resistance has become a pretense for the tight governance of chemicals. Biopolitics here takes root at the molecular level of insect resistance (Rabinow and Rose, 2006). The labor of chemical applicators in Nicaragua and elsewhere is bureaucratically managed not necessarily because of concerns about human health but because of predictive models about mosquito evolution.

Even as the capacity of the mosquito body to develop *tolerance* to organophosphates enables a biopolitical management of public health, CHW bodies quickly develop *vulnerabilities* that threaten that management. Upset stomachs, headaches, and skin irritation are common complaints among CHWs in Nicaragua. In reaction to this, some CHWs take matters (and matter) into their own hands. Wages are minimal, so some help themselves to in-kind payments—hoarding stashes of abate at the end of the working day and later trading it to neighbors and friends. Some neighbors use this escaped abate not against mosquitoes but against ants or cockroaches. Released into the landscape in this way, abate subverts neat bureaucratic accountings. As it leaks from the biological and epidemiological models of global health and entomology into the social worlds of CHWs, abate percolates from one locality (the health institution) to another (the community economy).

For global health planners, abate is part of a packaged dengue intervention model (Helmreich, 2011: 138). The chemical intervention is one of a set of schemas for understanding how dengue epidemics occur and how they might be controlled. Others include mosquito life-cycle models, ideas about signs and symptoms, and treatment algorithms. Each becomes a "thing in the world" once it is implemented locally. When the Nicaraguan Ministry of Health or analogous actors implement the models to change landscapes, or when entomologists test control regimes against wild mosquito populations, local biologies leak into other local biologies. Standardized theoretical models about how chemicals behave in the world are neither a prerequisite to such leakages nor a solution to them. Instead, it is theoretical models that catalyze those leakages (Helmreich, 2011; Mol, 2002).

In a sense, the CHWs' worksheets and plastic spoons are part of a suite of activities that produce a "Nicaraguan version" of the disease. The Health Ministry develops its own bureaucratic models for the distribution of the chemical—and presumptions about its efficacy—to calibrate payment for services rendered by the CHWs. Finally, the CHWs integrate abate into their own "local theories" about their health and that of the people among whom they live (Raffles, 1999). They judge chemical's tendency to cause unwelcome bodily effects against its potency as a tradeable (and effective) household tool. Since they go into the world nearly simultaneously, none of these theoretical models of chemical efficacy is responsible by itself for shaping local biologies.

Chemicals Undoing Scales

Leakages occur in the very process of chemical production and usage. Organophosphates are a fairly generic kind of substance. They are made in sites around the world for many reasons, and they are regulated in a variety of ways. The second entry that appears in a Google search for "temephos" is the United States Environmental Protection Agency's temephos fact sheet, which states, "Residential risk is not of concern since temephos has no residential use, and its use in mosquito abatement programs does not result in residential exposure" (EPA, 2001: 2). The WHO, by contrast, has approved vendors in two countries (Brazil and India) for the production of abate that can be applied *in the residential spaces* where most *Ae. aegypti* live and breed. EPA regulations notwithstanding, residential (and workplace) exposure is a virtually guaranteed element of WHO standards for temephos, which state that "It is also used for mosquito control in potable water" (WHO, 2010: 30).

One could trace the path of Nicaragua's abate (a brand called "Skeeter 1%," made by a subsidiary of Clarke, a company with deep roots in North American mosquito control) back to its point of origin (a Brazilian chemical factory), but such tracings would provide a misleading picture of how the chemical is (re)produced. To understand the production of abate, then, one cannot limit analysis to the factory floor. The circuits of chemical production are not "iterative," nested in neat geographical scales, but "itinerant," moving not from place to place, but through the fluid spaces of bodies, households, and institutions (Ingold, 2010: 10). Abate is made and remade—materially and theoretically—in multiple sites by multiple actors (Woolgar and Lezaun, 2013; Mol, 2002). What Murphy calls "molecular relations"—the forms of connection among bodies, environments, and chemicals—"exceed the chain metaphor" often used in social theory to describe how things move through social spaces (Murphy, 2013; cf. Appadurai, 1986; Law and Mol, 2001). Chemicals can be re-produced in a variety of sites in the sense that identical compounds can be made, but efficacy varies depending on social relations that transcend simple local-global visions of space. Is a CHW's adverse reaction to abate exposure, for example, a global health event?

This brings us, finally, to chlorine. Chlorine, in the form of sodium hypochlorite, or bleach, can also be produced almost anywhere. According to Pan American Health Organization protocols, bleach is essential to the management of laboratories, hospitals, and health centers. Guides provide strict instructions for preparation, dilution, and storage (PAHO, 2009). Bleach is so integral to the local operations of global health that—unlike abate—the leading organizations state no preference about which company or factory should make it. As long as medical practitioners begin with a diluted sodium hypochlorite solution, they can enact the protocols. Global health's chlorine supply is thus never "chained," metaphorically or otherwise. Chlorine—found in a variety of compounds and solutions, is instead a kind of chemical "rhizome." It is regenerated by a variety of

kinds of relations at a variety of scales (Deleuze and Guattari, 1987).

In a health center in northwestern Managua, Dr. Muñoz makes his own bleach. He uses salt, water, and electrodes to render sodium hypochlorite. To do this, he has colonized a small space in a garage on the grounds of the Managua health center where he works. His bleach-making is ad-hoc and off the books. Dr. Muñoz doesn't get extra money or time from his employers at the Nicaraguan Ministry of Health to perform this chemical labor. Still, several weekends a year, he loads a bucket of homemade disinfectant into the health center's ambulance and plies the surrounding *barrios*, handing it out by the plastic bagful. A skillful gift-givers, he carefully calibrates the dilution and hence the intensity of his relationships. Bleach, like abate, demands care: too much can be dangerous, too little can be ineffective.

Like abate, bleach is a biosecurity intervention, but like abate, it subverts the very scalar and species boundaries it is meant to ensure. Concocted in myriad sites across the world, bleach mediates the environments of national disease diagnostic laboratories, local households, and global health research centers from Paris to San Francisco. Dr. Muñoz hands out little bags of his homemade bleach in exchange for cooperation: a blood sample for routine malaria testing, a dengue mosquito larval assay, or cooperation with a vaccination campaign in which the sterilization of needles with bleach would be a central method.

Here, then, we can see a reversal. Whereas the giving of abate as a gift among neighbors perhaps undermines the neat bureaucratic and biopolitical accounting of people, insects, and spaces, bleach as a gift enables such bureaucratic and biopolitical work. Muñoz's crafting of bleach in his makeshift laboratory is complemented by the process of creating bleach solutions in official laboratory and clinical spaces. Percentages of dilution, forms and appropriate targets of use for bleach are clearly delineated in WHO guidebooks for everything from influenza testing to routine injections of insulin or saline.

In Nicaragua, *barrio* residents don't need a doctor to tell them that "bleach kills germs." But bleach, like abate, goes two ways. By killing *them* for *us*, bleach also acts as a reminder that *they* and *we* live *together*. As simultaneously lethal and lively technologies, bleach and abate draw Muñoz, the CHWs, and their neighbors into a paradoxical kind of social relation. Their distribution—which occurs at the smallest of scales in the most carefully scaled dilutions—instantiates what Heather Paxson (2011) calls a "microbiopolitics," yet where does the chemical sit in relation to *bios*? Chlorine compounds and organophosphates are certainly "vibrant matter," but talk of "life" or its politics oversimplifies the situation (Bennett, 2010). In their vitality, they undermine simple life/death, purity/danger binaries. They do not simply put things in and out of place. In scalar terms, they are not just the locally applicable tools of a global project. Bleach and abate are effective as gifts because they have volition. Even with its fundamentally "basic" (in the chemical and sociological sense) tactility, bleach doesn't stand for itself. Its symbolic name, NaClO (temephos's name is $C_{16}H_{20}O_6P_2S_3$), is the story of a relationship. This leads to the question of aesthetics.

Feeling Chemicals

Doña Feliciana, a Nicaraguan health inspector, is in charge of confirming the presence of chlorine in her local water supply. She sets out four times a year with litmus strips and a color scale to ensure that the gas (which goes by the name *cloro*—also Spanish for "bleach") has penetrated the infrastructure to make water potable. She dribbles water from faucets and hoses onto her strips and, squinting in the sunlight, holds them up to the color scale.

> "Is this pink, or red?" she asks the ambulance driver who is chauffeuring her from site to site.
>
> "For me, that's red," he says.

Red is no good. She needs pink. Still, she matches the color to a pH value and marks it down on a bureaucratic record sheet not unlike the one used by the CHWs to document their distribution of abate. At this point in the water supply, chlorine is present, but not in the right way. Like the CHWs who manipulate and account for abate, Doña Feliciana finds herself integrated in the materialization of a model for health that is based upon assumptions about chemical reactions. Through the water and the litmus paper, chlorine's presence (in the right form) signals the absence of fecal coliforms and many other harmful but invisible things.

Like the CHWs, Doña Feliciana is enacting several kinds of locality at once (Yates-Doerr

2014). She notes a location in time: the position of this test relative not only to that of the last test but to that of the last reported breach of water quality. She is accounting for a point in geographical space. And she is attesting to the infusion of an entire infrastructure—a distributed, fluid space—with a chemical. Only by simultaneously pinpointing bleach and affirming its diffusion can she make her sector of the municipal grid fit a global ideal of "quality water." Chlorine is the "theory machine" here, and water "quality" is the thing it helps Doña Feliciana, her superiors, and public health experts to theorize (Helmreich, 2011). In Doña Feliciana's accounting for water quality, aesthetics come before numbers. What is primary is the relationship between the strips and the water, rendered in pH, or "potential hydrogen." Yet that relationship can only be enumerated *after* it is rendered on a sensory scale. Potential hydrogen thus comes to Doña Feliciana through diffraction: not a direct representation of difference, but a representation of the *effects of difference* (Barad, 2007).

The ethical and technical weight on Doña Feliciana's shoulders is heavy. She must read the color-scale as closely as possible, because chlorine, like abate, must be distributed in controlled quantities. She must be cautious in her readings because any inaccuracy could mean either poisoning or infection. Her embodied reading of the scale thus not only re-theorizes water quality, but re-produces water quality. Her body, the color scale, the pipes, and the liquid medium are bound together. Thing and theory, like body and chemical, are infolded into one another (Helmreich, 2011; Haraway, 2008; Barad, 2007).

Abate is also known through sensory engagement. The closet at the Managua health center where Dr. Muñoz stores his abate is ripe with the odor—a sulfurous, vaguely fecal smell. Spend a few moments in this confined space, and you begin to sense the drift of the chemical vapor into the sinuses and lungs, and eventually upward and downward. Headaches and nausea result from this leakage. (Again, abate is a chemical weapon.) CHWs are warned not to lose the small plastic spoon that comes with their equipment package. Otherwise, they will find that their hands eventually start burning as the abate granules dissolve through sweat glands.

In her work on chemical infrastructures, Murphy calls attention to the integral role of sensation:

> Many different disciplines and communities of experts make knowledge about chemical infrastructures, but in piecemeal ways—some experts study chemicals in fish, other experts engineer smoke stacks, while others diagnose illnesses. Yet others feel chemical infrastructures by working and living in sites saturated by industrial chemicals. Quotidian acts of breathing, drinking, and smelling can become knowledge-making moments in chemical infrastructures (Murphy, 2013; see also Murphy, 2006).

Global health's chemical infrastructure, however, relies upon acts of *un*feeling as much as of feeling. Usage guidelines for Skeeter 1%--written in English on the packages Nicaraguan health centers receive—clearly state that respiratory and skin protective equipment should be used at all times by those who work with the chemical. These warnings mean little in Nicaragua, and not just because they are in English. While complaints about upset stomachs and headaches permeate the CHWs' conversation on breaks and outside work, during the *jornadas de abatización*, talk of injury is muted. The protocol for eliminating mosquitoes, after all, depends upon acceptance of the notion that abate, properly distributed in the environment, is not harmful to people. There is a technical and ethical weight to these aesthetic judgments, too, but in this case that weight is even more clearly gendered. In much of Nicaragua, the work of *abatización*—which takes place mostly in the intimate spaces of homes—is performed by *women* CHWs (Nading, 2012). Conversations about mosquito breeding sites tend to take place among women, and clandestine exchanges of the chemical after the campaigns are a "traffic between women" (Roberts, 2012). A painful kind of biological localization emerges as a result of the commitment of CHWs to dengue control, a global health project that exacerbates gendered "biological differentiation" even as it attempts to intervene in a presumably standardized body and environment (Lock, 2013).

Like Doña Feliciana, the CHWs find themselves in a chemical double-bind. Their work materializes standardized ideas about the vulnerability of bodies to dengue, even as it produces bodily difference. They are "confronted with dual or multiple obligations that are related and equally valued, but incongruent" (Fortun, 2001: 13). Individual exposure is, paradoxically, a pathway to population protection. Temephos is both a

tool for treating potable water" and a chemical with "no residential use" (EPA, 2001). As Kim Fortun argues in her analysis of chemical exposure and those who attempt to publicly represent it, double-bind situations "[provide] a lens for observing experiences produced by established rules and systems, yet not adequately described in standard explanations of how those systems function and change" (2001:13). Seen as things in the world, theoretical models (both global and local) for safety and efficacy do not clash due to differences in language or concepts; rather, they leak into one another through injuries to the bodies of people and insects.

Yet the effects of such leakages are not all injurious. Chlorine and abate both do good work on and around Nicaraguan bodies. Even as they endured the dizziness and nausea induced by abate, CHWs found that working with the organophosphates made their fingernails harder and smoother. This made their hands into better canvases for inexpensive polishes. No one would admit that this particular bodily-chemical infolding amounted to a fair trade for low pay and upset stomachs, but it did matter. Like most parents in Nicaragua, the CHWs wash the skins of their children's fruits and vegetables in a light bleach solution, knowing that ingesting a bit of *cloro* was preferable to ingesting the eggs of a worm or a bacterial parasite.

Down the road from Dr. Muñoz's lab, Gertrudis cleans houses for a living. She thinks through the presence and absence of dirt with her nose, her eyes, and her hands. She calibrates the mix of water and *cloro* appropriate for scrubbing a tile floor to that which is appropriate for whitening socks and tee shirts. Bleaching is about working the budget, and about being patient. Shades of white matter. Not all *cloros* are created equal. If you've got the money, Clorox is better than the kind they ladle into plastic bags. Bleach is artifice all the way down, from the electrolysis of salt and water, to application on floors and dishes to kill *microbios,* to dyeing school uniforms (stained whites are grounds for punishment).

As an aesthetic practice, chemistry remakes the body in manifold ways, just as it remakes the world, for better and for worse. It "deals with combinations of elements that conserve some identity while associating and dissociating" (Stengers, 2011: 51). The work of health is more than simply the action of humans on objects, or vice versa. Local biology happens as inorganic chemicals meet become entangled with organic life on the living/dead borderland marked by skin, fingernails, and hair, enabling particular kinds of relationships and feelings.

Conclusion

In global health, chemicals play a key role in theoretical models about how to manipulate a (theoretically) standardizable body and environment. The material qualities of chemicals are integrated into these models. The models become things-in-the the world in the form of material practices like bleaching and abatización. A certain amount of abate (theoretically) kills a certain amount of mosquito larvae over a certain period of time. Yet as abate leaks into water, soils, and skins, new kinds of relationships emerge. Bodies get sick. Insects become resistant. Nails get harder. An intervention model, put into practice, engenders new, empirically observable things, which themselves also leak.

Chemistry's position in human affairs is quite apart from that of plants, animals, and dirt. The periodic table—not quite a totem, really—is one way of ordering radical elements. In chemistry, purity (too much oxygen, too much chlorine) very often *is* danger. The elements we work with, fill our cavities with, or clean our houses and bodies with, are always already relationships, compounded, multiplied. In chemistry, we don't so much think with elements as free them to act, with one another, and with us. So chemistry, as a set of theories, is key to *bios* as a catalyzing force, as a substrate, and as an infrastructure. If *bios* is relational, then chemistry calls attention to how the body's "materiality plays an *active* role in the workings of power" (Barad, 2003:809).

Killer chemicals are thus useful for global public health's understanding of itself, as well as for anthropological critiques of global public health. A concern for the worlds *created by* such interventions helps us understand how global health plays a role not just in surveying (and supposedly improving) bodies, but in shaping biologies. The era of global health is not just a response to life in that other "global" era (the Anthropocene), but part of its making. Indeed, a vision of "global health" arguably exists because of a changing ecology that is infolding the nonliving world more firmly than ever into the becomings of the living one.

References

Allen, Barbara (2003), *Uneasy Alchemy: Citizens and Experts in Louisiana's Chemical Corridor Disputes*. Cambridge, MA: MIT Press.

Appadurai, Arjun (ed). (1986), *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge: Cambridge University Press.

Appel, Hannah (2012), "Walls and White Elephants: Oil Extraction, Responsibility, and Infrastructural Violence in Equatorial Guinea." *Ethnography* 13(4):439-465.

Barad, Karen (2003), "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter." *Signs* 28(3): 801-831.

Barad, Karen (2007), *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press.

Beaubien, Jason (2014), "Mysterious Kidney Disease Slays Farmworkers in Central America." National Public Radio, April 30.

Beck, Ulrich (1992), *Risk Society: Towards A New Modernity*. London: Sage.

Bennett, Jane (2010), *Vibrant Matter: Towards a Political Ecology of Things*. Durham: Duke University Press.

Benezra, Amber, Joseph deStefano, and Jeffrey Gordon (2012), "Anthropology of Microbes." *Proceedings of the National Academy of Sciences* 109, no. 17: 6378–81.

Biehl, Joao (2007), *Will to Live: AIDS Therapies and the Politics of Survival*. Princeton: Princeton University Press.

Brotherton, Sean and Vinh-Kim Nguyen (2013), "Revisiting Local Biology in the Age of Global Health." *Medical Anthropology* 32(4): 287-290.

Deleuze, Gilles and Felix Guattari (1987), *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.

Environmental Protection Agency (EPA) (2001), "Temephos Facts." EPA Document 738-F-00-018.

Fortun, Kim (2001), *Advocacy after Bhopal: Environmentalism, Disaster, New World Orders*. Chicago: University of Chicago Press.

Foucault, Michel (1990), *The History of Sexuality: Volume 1*. New York: Vintage.

Guevara, Alberto (2014), "Mind the Gap: Selling Revolution, Marginality, and Spectacle in Post-Revolutionary Nicaragua." *Identities*. Available online: http://www.tandfonline.com/doi/abs/10.1080/.U39EsZSSz0o. Accessed 5/23/14.

Haraway, Donna (2008), *When Species Meet*. Minneapolis: University of Minnesota Press.

Helmreich, Stefan (2011), "Nature/Culture/Seawater." *American Anthropologist* 113(1):132-144.

Hemingway, Janet and Hilary Ranson (2000), "Insecticide Resistance in Insect Vectors of Human Disease." *Annual Review of Entomology* 45:371-391.

Hinchliffe, Steve, John Allen, Stephanie Lavau, Nick Bingham, and Simon Carter (2012), "Biosecurity and the Topologies of Infected Life: From Borderlines to Borderlands" *Transactions of the Institute of British Geographers*. 38(4):531-543.

Hodder, Ian (2014), "The Entanglements of Humans and Things: A Long-Term View." *New Literary History* 45(1): 19-36.

Idhe, Don (2000), "Epistemology Engines." *Nature* 406:21.

Ingold, Tim (2010), "Bringing Things to Life: Creative Entanglements in a World of Materials." *Realities Working Paper Series* #15. Manchester, UK: ESRC.

Koch, Erin (2011), "Local Microbiologies of Tuberculosis: Insights from the Republic of Georgia." *Medical Anthropology* 30(1): 81-101.

Koch, Erin (2013), "Tuberculosis is a Threshold: The Making of a Social Disease in Post-Soviet Georgia." *Medical Anthropology* 32(4): 309-24.

Lakoff, Andrew and Stephen Collier (2008), "The Problem of Securing Health." In A. Lakoff and S. Collier (Eds.), *Biosecurity Interventions: Global Health and Security in Question*. Pp. 7-33. New York: Columbia UP.

Landecker, Hannah (2014), "Antibiotic Resistance and the Biology of History." University of Minnesota Institute for Advanced Study Lecture. http://ias.umn.edu/2014/01/30/ias-thursdays-january-30/

Law, John and Annemarie Mol (2001), "Situating Technoscience: An Inquiry into Spatialities." *Environment and Planning D: Society and Space* 19: 609-621.

Lock, Margaret and Vinh-Kim Nguyen (2010), *An Anthropology of Biomedicine*. Malden, MA: Wiley-Blackwell.

Lock, Margaret (1993), *Encounters with Aging: Mythologies of Menopause in Japan and North America*. Berkeley: University of California Press.

Lock, Margaret (2013), "The Epigenome and Nature/Nurture Reunification." *Medical Anthropology* 32(4): 291-308.

Mol, Annemarie (2002), *The Body Multiple: Ontology in Medical Practice*. Durham, NC: Duke University Press.

Muehlmann, Shaylih (2012), "Rhizomes and Other Uncountables: The Malaise of Enumeration in Mexico's Colorado River Delta." *American Ethnologist* 39(2):339-353.

Murphy, Michelle (2006), *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, Women Workers.* Cambridge, MA: Harvard University Press.

Murphy, Michelle (2013), "Distributed Reproduction, Chemical Violence, and Latency." *Scholar and Feminist Online* 11.3

Nading, Alex (2012), "Dengue Mosquitoes Are Single Mothers: Biopolitics Meets Ecological Aesthetics in Nicaraguan Community Health Work." *Cultural Anthropology* 27(4): 572-596.

Nading, Alex (2013), "Humans, Animals, and Health: From Ecology to Entanglement." *Environment and Society: Advances in Research* 4: 60-78.

Nading, Alex (2014), *Mosquito Trails: Ecology, Health and the Politics of Entanglement*. Oakland: University of California Press.

Nash, Linda (2007), *Inescapable Ecologies: A History of Environment, Disease, and Knowledge*. Berkeley: University of California Press.

Neely, Abigail and Alex Nading (Nd.), "Global Health from the Outside: the Promise of Place-Based Research," article under review.

Nguyen, Vinh-Kim (2010), *The Republic of Therapy: Triage and Sovereignty in West Africa's Time of AIDS*. Durham, NC: Duke University Press.

Orzech, Kathryn and Mark Nichter (2008), "From Resilience to Resistance: Political Ecological Lessons from Antibiotic and Pesticide Resistance." *Annual Review of Anthropology* 37:267-282.

Paxson, Heather (2011), *The Life of Cheese: Crafting Food and Value in America*. Berkeley: University of California Press.

Rabinow, Paul and Nikolas Rose (2006), "Biopower Today." *BioSocieties.* 1: 195-217.

Raffles, Hugh (1999), ""Local Theory:" Nature and the Making of an Amazonian Place." *Cultural Anthropology* 14(3): 323-360.

Roberts, Elizabeth F.S. (2012), *God's Laboratory: Assisted Reproduction in the Andes*. Berkeley: University of California Press.

Rose, Nikolas S. (2007), *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-first Century*. Princeton: Princeton University Press.

Stengers, Isabelle (2011), "Comparison as a Matter of Concern." *Common Knowledge* 17(1):48-63.

Woolgar, Steve and Javier Lezaun (2013), "The Wrong Bin Bag: A Turn to Ontology in Science and Technology Studies?" *Social Studies of Science* 43(3):321-340.

World Health Organization (WHO) (2010), *WHO Specifications and Evaluations for Public Health Pesticides: Temephos*. Geneva: World Health Organization.

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Alexis Nuselovici (Nouss), *Étudier l'exil,* FMSH-PP-2013-09, septembre 2013.

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