

Oleoresin Capsicum: The Racial-Political History of a Ubiquitous Chemical Munition

Terence Keel, *UCLA*
Jonah Walters, *UCLA*

Abstract: Oleoresin capsicum (OC) is a substance contained in capsicum peppers that produces a range of physiological responses in mammals, including inflammation and respiratory constriction. It is also the active ingredient in the most widely used chemical munition in the United States. OC-based pepper sprays are now issued to police officers by nearly every law enforcement agency in the country. Police use of pepper spray is supported by an ostensibly evidence-based consensus that OC exposure presents no significant risk of lethal injury. This essay examines the peculiar durability of that nonlethality consensus in the face of mounting contradictory evidence. It traces the trajectory of European science that links race and capsaicin sensitivity from colonization to slavery to the twentieth century, while also narrating the emergence of OC-based pepper spray as a distinct and highly desirable category of police weapon. It concludes by exposing medicolegal death examination practices that continually rehabilitate the nonlethality consensus by naturalizing deaths caused by or linked to OC exposure.

Oleoresin capsicum (OC), colloquially known as pepper spray, is the most common chemical munition in use by U.S. law enforcement today. Since OC's widespread adoption by police agencies in the late 1980s, officers have come to rely on the product to a remarkable

Terence Keel is a professor at UCLA with a split appointment in the Department of African American Studies and the UCLA Institute for Society and Genetics. He is also the Founding Director of the Lab for BioCritical Studies. He has written extensively about the relationship between race, religion, law, and modern science. His widely acclaimed first book, *Divine Variations* (Stanford, 2018), explains how religion helped produce scientific racism. He is now writing a second book on the American medical examiner system that details how forensic pathology, law enforcement, and autopsy science engage in practices that limit state accountability for deaths in custody. 3323A Life Sciences Building, Box 95722, Los Angeles, California 90095, USA; tdkeel@ucla.edu.

Jonah Walters is a postdoctoral fellow at the UCLA Institute for Society and Genetics and a research affiliate of the Lab for BioCritical Studies. His research focuses on in-custody deaths, the science and technology of restraint, and medicolegal death examination. He is at work on a book about the history of less-than-lethal weapons in American policing, which interrogates the practices through which police agencies, commercial munitions manufacturers, and civilian scientists maintain the expert consensus that certain categories of armaments are fundamentally nonlethal. He received a Ph.D. in geography from Rutgers, the State University of New Jersey. 3323A Life Sciences Building, Box 95722, Los Angeles, California 90095, USA; jonahwalters@ucla.edu.

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extent for immobilizing and incapacitating persons they regard as resistive. Hundreds of thousands of officers in jurisdictions throughout the country carry spray canisters of OC as they go about their daily duties on the street or inside carceral institutions. The widespread use of pepper spray by American law enforcement is a purportedly evidence-based practice, in that it is validated by a broad technical and public consensus that OC is a nonlethal (or “less-than-lethal”) armament that presents no significant risk of death.

But U.S. residents who routinely experience or witness police violence have long observed that exposure to pepper spray can, and sometimes does, result in death; indeed, there are many such documented incidents, several of which we describe later. Still, the consensus that OC is fundamentally nonlethal has been mostly unaffected by the accumulation of real-world evidence that contradicts its key premises. Not only does this consensus continue to reproduce itself discursively, but it also continues to exercise itself materially on the bodies of those whom police officers attempt to subdue and restrain. The durability of the nonlethality consensus even in the face of mounting evidence to the contrary is the paradox that we examine in this essay.

We draw on a number of sources to narrate the history of pepper spray and question the nonlethality consensus. These sources include firsthand accounts of American chattel slavery by formerly enslaved people; a large sample of American news articles reporting on pepper spray and related products from 1950 to the present day; documents filed in federal court as exhibits in criminal and civil cases; clinical studies funded by the U.S. Air Force, the Federal Bureau of Investigation (FBI), and the U.S. Department of Justice (DOJ); and two autopsies, one produced by medical examiners in Baltimore and another by medical examiners in Los Angeles, that document police uses of force involving the deployment of pepper spray. Using this wide range of source material, we account for the complex historical and technical processes through which the Mesoamerican chili pepper—the capsicum fruit, from which oleoresin capsicum is derived—was transformed into the most common chemical munition in the United States.

Tracing the history of the capsicum fruit to the colonial era, we find that European scientific and technical knowledge regarding capsaicin (the key component of capsicum) has been conditioned by beliefs about innate racial tolerances to the substance that would later be used to justify its nonlethality. In the U.S. context, this epistemological trend extended from colonial contact through the period of nineteenth-century chattel slavery, when capsaicin was deployed to punish and subdue unruly enslaved people. In weaponizing the capsicum fruit, the enslaver’s guiding logic was to devise a technology of discipline that could weaken the will of a noncompliant subject without immediately killing him or her. Just as European colonists came to understand that Black and Indigenous people could be effectively punished with capsaicin, European scientists came to believe that Black and Indigenous people’s supposedly natural affinities for hot temperatures and pungent diets evinced an innate tolerance for the substance. These racialized assumptions would later become universalized and lead to the development and popularization of pepper spray by scientist-entrepreneurs, police experts, and federal law enforcement agencies in the twentieth century.

The history we expose calls into question the veracity of scientific studies that have claimed OC-based chemical munitions to be consistently and predictably nonlethal. We argue that the nonlethality consensus was not the outcome of impartial empirical study but, rather, has tended to be the premise and precondition of scientific inquiry into OC’s effects. In the late twentieth century, police experts and scientist-entrepreneurs, stimulated by federal financial support, proposed oleoresin capsicum as a technical solution to the political problem created by officers’ persistent use of lethal force against Civil Rights activists, New Left protesters, and others. The result was the emergence of an epistemological disposition that was already invested in the nonlethal character of OC, whether or not the scientific evidence supported this claim. Today this hegemonic disposition is reproduced through the repetitive exercise of official expertise along a continuum of

violent actions that extends from the slave plantation to the traffic stop, the holding cell, the hospital bed, and the autopsy room.

The final section of this essay exposes a key site on this continuum by demonstrating how coroners and medical examiners contribute to the durable reproduction of the nonlethality consensus over time. We examine autopsy reports produced after OC-involved deaths in two cities to suggest that medicolegal death examination may launder evidence of pepper spray's lethality by attributing death not to OC exposure but to a decedent's own aberrant—and generally Black—biology. Medical examiners and coroners thus fulfill a key epistemological function by insulating the nonlethality consensus from criticism and obscuring its contradictions. We conclude by reflecting on what our account of OC's racial and political history suggests about racism, scientific knowledge production, and police power in the United States.

THE HISTORICAL DEVELOPMENT OF OLEORESIN CAPSICUM

Oleoresin capsicum is a substance extracted from capsicum fruits that acts on the sensory neurons of mammalian tissues to produce a range of physiological responses, including inflammation and respiratory constriction, when inhaled or ingested. The peppers from which OC is extracted were first cultivated by Indigenous people in what is now central Mexico before migrating to the Antilles, where they were encountered by European colonizers and imperfectly integrated into a global market for food and medicinal commodities. As the fundamental ingredient in pepper spray, OC itself is today a lucrative and diversified commercial product, marketed to police agencies by a constellation of competitive private entities in a regulatory environment that demands little transparency and enforces few actionable standards.

How did such a product come to exist? Answering that question requires that we account for the social transformation of the Mesoamerican chili pepper over time: first from a local staple to a global commodity, and later from a culinary and medicinal product to the fundamental ingredient of what is today the most ubiquitous chemical weapon in use by police and private consumers alike. Each step in this process was shaped by scientific knowledge regimes premised on European notions of biological differentiation between racialized groups. Indeed, from the earliest days of its integration into the global mercantilist market, the capsicum fruit was tightly associated in the European imagination with racial difference. On the basis of prevailing modes of biological and geographical determinism, Europeans imagined that racialized Others, particularly Indigenous Americans and enslaved Africans, possessed a special aptitude for ingesting piquant foods and withstanding the physiological effects of capsaicin exposure. These racist beliefs not only persisted but have evolved into the now widespread conviction held by scientists, law enforcement, and munitions manufacturers that OC is nonlethal.

The history of OC in European science therefore begins with race-specific beliefs about non-European immunity and develops over time into a scientific and political consensus that imagines a universal captive able to withstand the lethal effects of this ancient pepper when taken into the custody of police. Today, pepper spray is one of the weapons most commonly used by U.S. law enforcement officers, including those who govern captives in American prisons. Black Americans are incarcerated at nearly five times the rate of white Americans, and Latinx Americans are incarcerated at 1.3 times the rate of white Americans.¹ Given these rates of incarceration, it is clear that the people most likely to be subjected to OC as wards of the state today are the descendants of enslaved Africans who were traded with the chili pepper when it was first discovered by Europeans in the fifteenth century, followed by the descendants of the Indigenous Mesoamerican populations

¹ Ashley Nellis, "The Color of Justice: Racial and Ethnic Disparity in State Prisons," Report: The Sentencing Project, 13 Oct. 2021, <https://www.sentencingproject.org/app/uploads/2022/08/The-Color-of-Justice-Racial-and-Ethnic-Disparity-in-State-Prisons.pdf>.

who originally introduced Europeans to the pepper and now represent a large percentage of the exploited migrant agricultural labor force helping produce the commodity in North America.²

FROM CULTIVAR TO COMMODITY

Fruits of the capsicum genus (notably *Capsicum annuum*) were first cultivated by human groups as early as 7000 B.C.E.³ Archaeological evidence demonstrates that inhabitants of the Tehuacán Valley in modern central Mexico not only harvested *C. annuum* for mass human consumption but also stored seeds between growing seasons. Like maize, capsicum was among the major sources of nutrition for pre-Columbian inhabitants of the Tehuacán Valley and was traded as a key food product with other Indigenous groups. This contributed to a wide geographic diffusion of the plant species, which maintained a high degree of genetic diversity despite its common nutritional application.⁴ By the time Europeans arrived, chili peppers grew both naturally and as a result of human cultivation across much of modern Mexico, as well as significant portions of the Central American isthmus, the hump of South America, and the chain of human-inhabited islands that would come to be known as the Caribbean.⁵

Christopher Columbus was among the first Europeans to recognize the novelty of the chili pepper.⁶ He remarked on the species' superiority to its culinary cognates upon arriving in Hispaniola in 1492, noting the fruit's intense piquancy compared to *Piper nigrum* (black pepper), a species previously known to Europeans to which capsicum varieties bear no relation. Columbus delivered a bushel of the novel chilis to the Spanish royals upon his return to Europe. He also left a crew of men behind in Hispaniola with instructions to enslave Indigenous inhabitants for the purpose of gathering mineral and agricultural specimens that could be transformed into commodities in the emergent transatlantic mercantilist market. Predictably, among the specimens-cum-commodities he demanded was the chili pepper.

Despite these origins, it was not the Spanish but the Portuguese who were most responsible for the chilis' early global diffusion. Portuguese traders integrated the novel chilis (along with other New World agricultural marvels, notably maize, beans, and squash) into colonial-commercial routines to which the trade in enslaved Africans was central. *C. annuum* circulated through the transit routes of Portuguese enslavers, reaching Africa (via the Portuguese colonies of Cape Verde,

² Exact aggregate data on the fatal or nonfatal use of OC by law enforcement within or beyond carceral facilities is extraordinarily difficult to gather given the limited legal guidelines mandating that these institutions publicly release this information. For more see GBD 2019 Police Violence U.S. Subnational Collaborators, "Fatal Police Violence by Race and State in the USA, 1980–2019: A Network Meta-Regression," *Lancet*, 2021, 398(10307):1239–1255. For more on the racial makeup of U.S. agricultural workers see Phillip Martin, "Mexican Workers and U.S. Agriculture: The Revolving Door," *International Migration Review*, 2002, 36:1124–1142, <http://www.jstor.org/stable/4149494>; and Nelson Carrasquillo, "Race and Ethnicity from the Point of View of Farm Workers in the Food System," *Race/Ethnicity: Multidisciplinary Global Contexts*, 2011, 5:121–131, <https://doi.org/10.2979/racethmulglocon.5.1.121>.

³ Scott Fitzpatrick, "The Pre-Columbian Caribbean: Colonization, Population Dispersal, and Island Adaptations," *Paleoamerica*, 2015, 1:305–331.

⁴ Jose Guadalupe Martínez-Ávalos, Crystian Sadiel Venegas-Barrera, Rodolfo Martínez-Gallegos, Jorge Ariel Torres-Castillo, Fabián Eliseo Olazarán Santibáñez, Arturo Mora-Olivo, Antonio Guerra-Pérez, Leonardo Uriel Arellano-Méndez, and Fortunato Garza Ocañas, "A Review on the Geographical Distribution, Fruit Production, and Concentration of Capsaicinoids in *Capsicum annuum* var. *glabriusculum* in the Northeastern Region of Mexico," *Preprints*, 2018, 2018110517, <https://doi.org/10.20944/preprints201811.0517>; and Craig H. Kraft, Cecil H. Brown, Gary P. Nabhan, and Paul Gepts, "Multiple Lines of Evidence for the Origin of Domesticated Chili Pepper, *Capsicum annuum*, in Mexico," *Proceedings of the National Academy of Sciences of the United States of America*, 2014, 111(17):6165–6170, <https://doi.org/10.1073/pnas.1308933111>.

⁵ Martínez-Ávalos et al., "Review on the Geographical Distribution, Fruit Production, and Concentration of Capsaicinoids in *Capsicum annuum* var. *glabriusculum*."

⁶ Marjorie Shaffer, *Pepper: A History of the World's Most Influential Spice* (New York: St. Martin's Griffin, 2013); and Richard Shweid, *Hot Peppers: The Story of Cajuns and Capsicum*, rev. ed. (Chapel Hill: Univ. North Carolina Press, 1999).

Sao Tome, and Príncipe) and India by the turn of the sixteenth century.⁷ By the mid-sixteenth century, specimens and descriptions of *C. annuum*, together with similar chili species such as *C. chinense* and *C. frutescens*, appeared in German, English, and French gardens and compendia of botanical species. Over the next several centuries, worldwide diffusion of the novel chilis was so comprehensive that they became integrated into diverse culinary traditions in Europe, Africa, and southeast Asia.⁸

Several things stand out about the expert and popular discourses that attended capsicum fruits during the period of colonial encounter and early commercial diffusion. First among these is the apparently universal acknowledgment of capsicum fruits' unique disciplinary and curative properties. Paradoxically, Europeans understood capsicum fruits to be simultaneously generative and ameliorative of physical pain. The pungency of capsaicin fruits is an evolutionary adaptation designed to protect the pepper from being eaten by animals, and colonialists in the Caribbean and North America likely seized on this unique inflammatory quality by using capsicum fruit as an animal repellent to protect staple and commercial crops.⁹ In fact, chili peppers, in both plant and chemical form, continue to be widely used around the globe as a repellent for bears, elephants, deer, and other animals that raid and consume commercial and domestic plants.¹⁰ At the same time, however, European colonialists also observed the therapeutic use of capsicum by Indigenous and enslaved African populations. Since its discovery, Europeans have understood capsicum fruit to have a Janus effect, both producing and relieving pain and irritation on and within the body.

These properties are now understood to be the result of capsaicin (8-methyl-N-vanillyl-6-nonenamide) activating ion channels found in nerve fibers responsible for pain and heat sensitivity within cells located in the skin, joints, respiratory system, alveolar region, and gastrointestinal tract of mammals.¹¹ But it was not until the nineteenth century that European chemists came to understand the chemical properties of the naturally occurring irritant within chili pepper. Christian Friedrich Bucholz identified the irritant in 1816; it was then given the name "capsaicin" in 1876 by J. C. Thresh; and finally, in 1898, a pure form of the compound was isolated by K. Micko. Today it is well understood that low quantities of capsaicin are capable of reducing a pain transmitter

⁷ Jean Andrews, "A Botanical Mystery: The Elusive Trail of the Datil Pepper to St. Augustine," *Florida Historical Quarterly*, 1995, 17:132–149; and Andrews, "Diffusion of Mesoamerican Food Complex to Southeastern Europe," *Geographical Review*, 1993, 83:194–204.

⁸ Jean Andrews, *Peppers: The Domesticated Capsicum* (Austin: Univ. Texas Press, 1984); Dave Dewitt, *Chile Peppers: A Global History* (Albuquerque: Univ. New Mexico Press, 2020); and Stewart Walton, *The Devil's Dinner: A Gastronomical and Cultural History of Chili Peppers* (New York: St. Martin's, 2018).

⁹ Paul Rozin, Leslie Gruss, and Geoffrey Berk, "The Reversal of Innate Aversions: Attempts to Induce a Preference for Chili Peppers in Rats," *Journal of Comparative and Physiological Psychology*, 1979, 79(93):1001–1014; J. J. Tewksbury, C. Mancho, D. C. Haak, and D. J. Levey, "Where Did the Chili Get Its Spice? Biogeography of Capsaicinoid Production in Ancestral Wild Chili Species," *Journal of Chemical Ecology*, 2006, 32:547–564, <https://doi.org/10.1007/s10886-005-9017-4>; and Jose de Jesus Luna-Ruiz, Gary P. Nabhan, and Araceli Aguilar-Meléndez, "Shifts in Plant Chemical Defenses of Chile Pepper (*Capsicum annuum* L.) Due to Domestication in Mesoamerica," *Frontiers in Ecology and Evolution*, 2018, 6, art. 48, <https://doi.org/10.3389/fevo.2018.00048>.

¹⁰ S. H. Buck and T. F. Burks, "The Neuropharmacology of Capsaicin: Review of Some Recent Observations," *Pharmacological Reviews*, 1986, 38:179–226; Igor Khorozyan and Matthias Waltert, "Variation and Conservation Implications of the Effectiveness of Anti-Bear Interventions," *Scientific Reports*, 2020, 10(1):15341, <https://doi.org/10.1038/s41598-020-72343-6>; and Robert Montgomery, Jamie Raupp, Methodius Mukhwana, Ashley Greenleaf, Tutilo Mudumba, and Philip Muruthi, "The Efficacy of Interventions to Protect Crops from Raiding Elephants," *Ambio*, 2021, 51:716–727, <https://doi.org/10.1007/s13280-021-01587-x>.

¹¹ Stuart Bevan and János Szolcsányi, "Sensory Neuron-Specific Actions of Capsaicin: Mechanisms and Applications," *Trends in Pharmacological Sciences*, 1990, 11:330–333, [https://doi.org/10.1016/0165-6147\(90\)90237-3](https://doi.org/10.1016/0165-6147(90)90237-3); and U. Oh, S. W. Hwang, and D. Kim, "Capsaicin Activates a Nonselective Cation Channel in Cultured Neonatal Rat Dorsal Root Ganglion Neurons," *Journal of Neuroscience*, 1996, 16:1659–1667, <https://doi.org/10.1523/JNEUROSCI.16-05-01659.1996>.

called Substance P.¹² Many physicians now prescribe topical creams such as Axsain or Zacin that have capsaicin as the active ingredient to treat skin burns and irritation, osteoarthritis, rheumatoid arthritis, and fibromyalgia. Yet overexposure to capsaicin can have the opposite effect, creating burns on the skin, severe irritation, and, as we discuss later, inflammation in the olfactory and respiratory system that can lead to death.

Another noteworthy feature of early scientific discourse about capsaicin is the strong association of the novel chilis with slavery, indigeneity, and Blackness and the related perception of a special tolerance to the fruit's unique piquancy in the non-European body.¹³ From the late fifteenth century, European merchants and slave owners noted the prodigious use of chilis in the culinary practices of the Indigenous populations from which they sourced the pepper and of the Africans whose enslavement coincided with capsaicin fruits' transformation into a global commodity. In the British Caribbean and adjacent southern colonies, capsaicin was commonly referred to as "Ginnie" pepper. Very early we find evidence of Europeans believing that the incorporation of the pepper into the diets of native and African bodies suggested that they, unlike Europeans, were either naturally immune to its irritating effects or carried an innate tolerance for the food source.¹⁴

European medicine and science during the early colonial period held that humans existed in a natural state of ecological harmony with their native environment.¹⁵ Food and climate were included in this understanding. These assumptions were consistent with humoral theories of the body that had been in circulation in Europe since antiquity, which held that people from warm climates carried hot temperaments and so could naturally withstand heat, whether from environments like the plantation fields of the Deep South or the Caribbean or from food sources like the novel chili pepper among Indigenous Americans. During the colonial era, Spanish settlers feared that if they enjoyed the diets of Indigenous people they might be weakened, die, or become transformed into some unnatural state that made them less European.¹⁶ Yet the European adoption of new diets also provided evidence that bodies could change and develop tolerances to foreign foods.

The chili pepper was a food that played both roles in the European imagination: it legitimized beliefs about different racial tolerances to its irritating effects while also showing the adaptability of all human bodies to the plant. Even though Indigenous and African people who lived in warm climates had an innate tolerance for peppers, it was possible for Europeans to adapt to the food and the warm climates that produced it. Early in their encounter with the peppers, Spanish settlers believed that only those with strong stomachs should eat chilis. Only after the pepper had become a global commodity was it fully integrated into humoral understandings of disease and bodily states, an integration accomplished in part through the suggestion that eating chilis could warm the cold and lethargic European body. Ideas about innate versus universal tolerances for capsaicin proved durable well beyond the era of early modern science and indeed never fully subsided in the West.

¹² C. F. Bucholz, "Chemical Investigation of Dry, Ripe Spanish Peppers," *Almanach oder Taschenbuch für Scheidekünstler und Apotheker*, 1816, 37:1–30; J. C. Thresh, "Isolation of Capsaicin," *Pharmaceutical Journal and Transactions*, 1876, 6:941–947; and Shaherin Basith, Minghua Cui, Sunhye Hong, and Sun Choi, "Hamessing the Therapeutic Potential of Capsaicin and Its Analogues in Pain and Other Diseases," *Molecules*, 2016, 21:966, <https://doi.org/10.3390/molecules21080966>.

¹³ Rebecca Earle, "If You Eat Their Food . . . : Diets and Bodies in Early Colonial Spanish America," *American Historical Review*, 2010, 115:688–713, <https://doi.org/10.1086/ahr.115.3.688>; and Earle, *The Body of the Conquistador: Food, Race, and the Colonial Experience in Spanish America, 1492–1700* (Cambridge: Cambridge Univ. Press, 2012).

¹⁴ Andrews, "Botanical Mystery" (cit. n. 7), p. 139 ("Ginnie" pepper); and Phillip Miller, *The Gardener's and Botanist's Dictionary*, 8th ed. (London, 1768) (non-Europeans' presumed immunity or tolerance).

¹⁵ Karen Ordahl Kupperman, "Fear of Hot Climates in Anglo-American Colonial Experience," *William and Mary Quarterly*, 1984, 41:213–240.

¹⁶ Georgia Irby, "Climate and Courage," in *The Routledge Handbook of Identity and Environment in the Classical and Medieval Worlds*, ed. Rebecca Kennedy and Molly Jones-Lewis (London: Routledge, 2016), pp. 247–267 (humoral theories); and Earle, "If You Eat Their Food . . ." (cit. n. 13) (Spanish settlers' fears).

Writing in 1995, for example, the food historian Jean Andrews suggested that, upon arrival in colonial Florida, captive Africans “found the natives there using the extremely pungent, highly aromatic fruits profusely” and so “readily adopted” the peppers “to satisfy their innate craving for their spicy African foods.”¹⁷

FROM FOOD TO WEAPON

How did the chili pepper, after existing for thousands of years as a food and medicinal product, come to be transformed into a weapon? In North America, one answer lies in slavery. American abolitionists during the early nineteenth century recorded the use by overseers of both chili peppers and ground black pepper as a weapon to punish enslaved Black people. It is unclear how far back this practice can be traced, but the historian C. L. R. James notes the use of peppers as a form of punishment in the Caribbean as early as the seventeenth century.¹⁸ Given the fact that colonists had access to the commodity starting in the late fifteenth century, it is reasonable to assume that the practice of using the pepper as a weapon to punish human chattel coincided with its usage to protect staple and commercial crops from raiding animals.¹⁹

In the context of North American slavery, the adaptation of chili and black pepper into a weapon was particularly gruesome. In 1839 the American abolitionist Theodore Dwight Weld noted that “slaves are terribly lacerated with whips, paddles, &c.; red pepper and salt are rubbed into their mangled flesh.”²⁰ The most vivid accounts of this violence come from former slaves themselves, who were interviewed by ethnographers during the late 1930s under the Federal Writers’ Project of the Works Progress Administration. These interviews show the widespread weaponization of peppers on plantations throughout the South. We share a few of these accounts in detail, as the formerly enslaved tell the story better than we ever could.

Eighty-nine-year-old H. B. Holloway of Little Rock, Arkansas, recalled the following during an interview at his home in 1936:

White folks was cruel in slavery times. You see I was free and could go where I wanted too, and I see’d a lot. Old Myer Green would take a Nigger and tie his feet to one side of a railroad track and tie his hands to the other ‘side, end whip him till his blood ran. Then he would take him down to the smoke house and rub him down with lard and red pepper. “Rub plenty in,” he would say. “Don’t let him spoil.”

When interviewed in Little Rock, Arkansas, ninety-year-old Sallie Crane remembered being “whipped from sunup till sundown. Off and on, you know. They whip me till they got tired and then they go and res’ and come out and start again. They kept a bowl filled with vinegar and salt and pepper settin’ nearby, and when they had whipped me till the blood come, they would take the mop and sponge the cuts with this stuff so they would hurt more.” In an interview with the historian Viola Muse on 3 December 1936, “Father” Charles Coates recalled the use of weaponized peppers, as well as restraints and solitary confinement, on a plantation in Richmond, Virginia. He was 108 years old when he shared his story but could still recall the vivid details of being on the plantation of a man named Mr. Hall. Coates explained:

¹⁷ Andrews, “Botanical Mystery” (cit. n. 7), p. 138. For earlier views see Earle, “If You Eat Their Food. . . .” p. 703; and Kupperman, “Fear of Hot Climates in Anglo-American Colonial Experience” (cit. n. 15).

¹⁸ Theodore Dwight Weld, *American Slavery as It Is: Testimony of a Thousand Witnesses* (New York, 1839); and C. L. R. James, *Black Jacobins: Toussaint L’Ouverture and the San Domingo Revolution* (New York: Vintage, 1963), pp. 12–13.

¹⁹ Buck and Burks, “Neuropharmacology of Capsaicin” (cit. n. 10).

²⁰ Weld, *American Slavery as It Is* (cit. n. 18), p. 125.

On the Hall plantation there was a contraption, similar to gallows, where the slaves were suspended and whipped. At the top of this device were blocks of wood with chains run through holes and high enough that a slave when tied to the chains by his fingers would barely touch the ground with his toes. This was done so that the slave could not shout or twist his body while being whipped. The whipping was prolonged until the body of the slave was covered with welts and blood trickled down his naked body. Women were treated in the same manner, and a pregnant woman received no more leniency than did a man. Very often after a severe flogging a slave's body was treated to a bath of water containing salt and pepper so that the pain would be more lasting and aggravated.

Coates went on to explain how after being whipped and bathed in salt and pepper, slaves were “put in a room and locked up for two and three days at a time without water or food.”²¹

These interviews with formerly enslaved Black Americans reveal the horrific violence inflicted by slave owners and overseers using capsicum as an instrument of punishment and submission (often in concert with similar food substances, like black pepper and salt). It is not lost on us that the formerly enslaved describe this violence in terms that conjure scenes of entertainment and cannibalism. Their stories capture how this food-source-turned-weapon literally seasoned the flesh of Black Americans, preparing backs, necks, limbs, and other parts of the body for exacting punishment that persisted long after the initial spectacle of violence, consuming in the process the fighting spirit of the enslaved.²² Of course, during the nineteenth century it was widely believed by physicians and ethnologists that enslaved Africans possessed extraordinary pain tolerances that justified greater uses of force—whether in the context of punishing them, conducting medical experiments on them, or forcing them to work more.²³ Similar misconceptions applied to Indigenous people in North America, who during this time were believed by Protestant missionaries and white settler communities to be closer to the animal world of nature than to European civilization—and so less vulnerable to reason and pain.²⁴

²¹ Federal Writers' Project, *Slave Narrative Project*, Vol. 2: *Arkansas*, Pt. 3: *Gadson–Isom*, “S. S. Taylor interview of H. B. Holloway,” Library of Congress, <https://hdl.loc.gov/loc.mss/mesn.023>; Vol. 2: *Arkansas*, Pt. 2: *Cannon–Evans*, “Samuel S. Taylor interview of Sallie Crane,” Library of Congress, <http://hdl.loc.gov/loc.mss/mesn.022>; and Vol. 3: *Florida*, *Anderson–Wilson*, “Viola Muse interview of ‘Father’ Charles Coates,” Library of Congress, <http://hdl.loc.gov/loc.mss/mesn.030>.

²² In *The Delectable Negro*, Vincent Woodard described the brutality of the plantation as a parasitic economic institution based on the extraction of labor and life force from the enslaved. For Woodard, slavery entailed “a range of consumptive acts, some resulting in immediate death but most involving the passage of time and the incremental feeding upon the human host”: Vincent Woodard, *The Delectable Negro: Human Consumption and Homoeroticism within U.S. Slave Culture* (New York: New York Univ. Press, 2014), p. 6.

²³ Vincent Brown, *The Reaper's Garden: Death and Power in the World of Atlantic Slavery* (Cambridge, Mass.: Harvard Univ. Press, 2010); Sean Morely Smith and Christopher D. E. Willoughby, eds., *Medicine and Healing in the Age of Slavery* (Baton Rouge: Louisiana State Univ. Press, 2021); Harriet A. Washington, *Medical Apartheid: The Dark History of Medical Experimentation on Black Americans from Colonial Times to the Present* (New York: Doubleday, 2006); and Willoughby, *Masters of Health: Racial Science and Slavery in U.S. Medical Schools* (Chapel Hill: Univ. North Carolina Press, 2022).

²⁴ See Carol Higham, *Noble, Wretched, and Redeemable: Protestant Missionaries to the Indians in Canada and the United States, 1820–1900* (Calgary: Univ. Calgary Press, 2000). There remains a debate among neurologists over the measurement and experience of pain among Black, Native, and Indigenous populations. See Kelly M. Hoffman *et al.*, “Racial Bias in Pain Assessment and Treatment Recommendations, and False Beliefs about Biological Differences between Blacks and Whites,” *Proc. Nat. Acad. Sci. USA*, 2016, 113(16):4296–4301, <https://doi.org/10.1073/pnas.1516047113>; and Vani A. Mathur *et al.*, “Racial Bias in Pain Perception and Response: Experimental Examination of Automatic and Deliberate Processes,” *Journal of Pain*, 2014, 15:476–484, <https://doi.org/10.1016/j.jpain.2014.01.488>. Despite the recognition that racial bias exists in pain measurement among clinicians and scientists, there remains the belief that Indigenous populations have higher pain tolerances than other groups. See Shreela Palit *et al.*, “Exploring Pain Processing Differences in Native Americans,” *Health Psychology*, 2013, 32:1127–1136, <https://doi.org/10.1037/a0031057>.

The present-day practice of using OC to subdue individuals taken into custody by police or turned captive within carceral institutions carries from the past beliefs about consuming the life force of a pain-resistant, nonrational, and truculent body in defiance of authority, power, and compliance. Yet the will of a noncompliant subject is not quantifiable—will is not a material substance like blood or flesh that can be physically extracted, nor can it be measured in such a way as to ascertain how much may be removed before producing death. Such values do not exist for human will; there is no universal limit point where the use of peppers-turned-weapons can be declared fatal or nonfatal for any and all humans. The use of this peculiar munition in the context of American slavery makes it painfully obvious that it is the authority figure wielding the weaponized capsicum who ultimately determines whether it becomes lethal. Today, the production and use of oleoresin capsicum continues to be haunted by arbitrary determinations about the substance's lethality pioneered on slave plantations.

HALT! AND MACE

In the twentieth century, the most direct antecedents for what we now call pepper spray were known by brand names: Halt! and Mace. Chemically speaking, Halt! represents the most direct predecessor of contemporary pepper spray, in that its active ingredient is OC. By contrast, Mace's active ingredient is the synthetic lachrymator phenacyl chloride (CN). Today, CN gas, together with cognate chemicals like CS (2-chlorobenzylidene malononitrile) and nonivamide, is commonly known as "tear gas."²⁵ The nearly simultaneous emergence of Halt! and Mace in the early 1960s, as well as their mutually reinforcing trajectories in niche markets oriented not toward private citizens but toward public agencies, initiated a process that ultimately resulted in the development of OC-based pepper spray in the 1980s and U.S. police agencies' widespread adoption of the product soon after.

Halt!, a dog repellent, was the invention of the forestry and wildlife management professors James Hobart Jenkins and Frank Hayes, who brought their OC solution and spray-can delivery method to market in 1960.²⁶ The product may have been marketed to private citizens for general use, but its success was propelled by its early adoption by a massive public agency that issued canisters of Halt! to its field agents. A magazine feature called "Don't Let Bowser Put the Bite on You," widely reproduced in 1961, reported that the U.S. Postal Service "conducted a 3-month test of 10,000 [Halt!] spray cans," going on to describe Halt! as a "harmless, humane mixture of 15 percent oleoresin capsicum (extract of cayenne pepper) and 85 percent mineral oil." The "burning sensation" it produces "wears off within 10 to 15 minutes," the article continued, but is potent enough that "the chastised animal generally puts its tail between its legs and retreats."²⁷ The Postal Service was evidently satisfied with its experiments and began making Halt! available to all its letter carriers as a matter of policy.

Whereas Halt! seems to have been designed and marketed only as an animal repellent, Mace was always intended, from the moment its inventors conceived of it, not as a deterrent for unruly animals but, rather, as a weapon to be used by one person against another. We know this because its inventors, the married couple Alan and Doris Litman, often repeated a revealing story about Mace's inspiration. In their telling, the invention's origins lay in the disorientation and fear the inventors experienced as a professional white couple in their late twenties living in rapidly integrating

²⁵ Nonivamide, also called pelargonic acid vanillylamide (PAVA), is a capsinoid TRPV1 ion channel agonist; in this way, it is more similar to OC-based pepper sprays than to CS or CN.

²⁶ "Doggone!" *Associated Press*, 18 Sept. 1963.

²⁷ Jack Harrison Pollack, "Don't Let Bowser Put the Bite on You," *Jackson (MS) Clarion-Ledger*, *Pasadena (CA) Independent Star-News*, *Albuquerque (NM) Journal*, *Cedar Rapids (IA) Gazette*, *Long Beach (CA) Independent*, *Allentown (PA) Morning Call*, *Hartford (CT) Courant*, *El Paso (TX) Times*, 31 Jan. 1965.

Pittsburgh, Pennsylvania. In newspaper interviews, the Litmans explained that the self-defense sprays already on the market—including, presumably, Halt!—could not satisfy the needs of white women and other urban residents who feared interpersonal crime. The Litmans elaborated that existing products were either impractical, in that they risked incapacitating the user as well as an assailant, or insufficiently fast-acting to deter human aggressors. The Litmans therefore went about experimenting with alternative ingredients, including CN and kerosene, as well as tweaking spray-can design, ultimately devising the product they would call “Chemical Mace,” in a reference to the archaic bludgeoning instrument.²⁸

Clearly, then, the impetus for Mace’s development lay in part in midcentury white American anxieties about the spatial encroachment of Black people on territories previously imagined to guarantee white insularity. In particular, the Litmans developed their product in response to an imagined crisis of white women’s widespread sexual violation by Black men in public space—an unfounded social anxiety prevalent among affluent and upwardly mobile white urbanites as U.S. cities became increasingly integrated during the 1950s and 1960s.²⁹ This was the social problem to which Mace’s inventors sought to present a technical solution. The Litmans initially planned to market the product directly to urban women by appealing to their desires to deter not animals but racialized human others in the integrated city.³⁰ Almost immediately, however, the product attracted the attention of a new kind of consumer—one with an official, rather than personal, interest in subduing racialized subjects—and in that way transcended the marketing vision of its inventors. The institutional buyers for Mace would be police agencies. When Mace was ultimately released to the commercial marketplace in 1965, through an unveiling at that year’s International Association of Chiefs of Police conference, it was marketed directly to local and regional police departments around the United States.³¹

As the historian Stuart Schrader has documented, many leaders in the burgeoning field of police technical expertise would already have been familiar with CN and its cognates owing to their imbrication in an extensive network of U.S.-based but globally influential counterinsurgency intellectuals.³² The deployment of tear gases was at this point a well-established element of the global counterinsurgency repertoire; having earlier been deployed on battlefields, tear gas entered international law enforcement arsenals during the Cold War. Its worldwide dispersal was facilitated by U.S. technical assistance programs that sought to restrain unruly publics by enhancing police capacity around the world. Through this technical assistance, numerous law enforcement departments came to see tear gas as an essential tool for controlling public demonstrations, despite the fact that its wartime use had been explicitly banned by the 1925 Geneva Convention.³³ The spray-can design of Mace allowed police and others to deploy tear gas against individuals, rather than solely against crowds. This innovation aligned with a broader pattern in American policing during

²⁸ Daniel A. Gross, “The Forgotten History of Mace, Designed by a Twenty-Nine-Year-Old and Reinvented as a Police Weapon,” *Smithsonian Magazine*, 2014; and Don Vipand, “MACE: How Dangerous?” *Victoria (BC) Times-Colonist*, 2 July 1968.

²⁹ Khalil Gibran Muhammad, *The Condemnation of Blackness: Race, Crime, and the Making of Modern Urban America* (Cambridge, Mass.: Harvard Univ. Press, 2010); and Calvin John Smiley and David Fakunle, “From ‘Brute’ to ‘Thug’: The Demonization and Criminalization of Unarmed Black Male Victims in America,” *Journal of Human Behavior in the Social Environment*, 2016, 26(3–4):350–366, <https://doi.org/10.1080/10911359.2015.1129256>.

³⁰ Greg Beato, “Pepper Spray’s Progressive Origins,” *Reason*, 2011, <https://reason.com/2011/12/01/pepper-sprays-progressive-origins>.

³¹ William Hoop, “Spray Chemical Aids Police in Riot Control,” *United Press International*, 4 Aug. 1967.

³² Stuart Schrader, *Badges without Borders: How Global Counterinsurgency Transformed American Policing* (Berkeley: Univ. California Press, 2017), esp. Ch. 7: “The Imperial Circuit of Tear Gas,” pp. 192–213.

³³ James D. Fry, “Gas Smells Awful: U.N. Forces, Riot-Control Agents, and the Chemical Weapons Convention,” *Michigan Journal of International Law*, 2010, 31:475–558; and Natasha Williams, Maija Fiorante, and Vincent Wong, *The Problematic Legality of Tear Gas under International Human Rights Law* (Toronto: International Human Rights Program of the Faculty of Law, Univ. Toronto, 2020).

this period, as police and their political allies sought to reframe the political threat of Black uprising as a problem of individual Black criminality, to be addressed through intensive street policing and frequent arrests.

Police departments' adoption of Mace was rapid and widespread. By 1967, newspapers around the United States routinely carried stories about the newfangled chemical munition. In a wire report picked up by a number of local newspapers, the Pittsburgh-based reporter William Hoop related an anecdote about a policeman in Youngstown, Ohio, who used Mace to confront "a disorderly Negro crowd," elaborating that "a single whiff [of Mace] is enough to make even the most belligerent person docile as a kitten." Countless other news articles published that year related similarly sensational anecdotes, nearly always supplemented by breathless quotations from police officials about Mace's efficacy, novelty, and safety.³⁴ But the subsequent use of the product by beat cops on the street (and, in several nationally prominent incidents, against student anti-war protesters) led to political debate about Mace's desirability and legality. For example, the NAACP in New York led a widely publicized legal campaign to ban the use of the product, arguing that it allowed police to inflict injurious violence on Black youth and others without fear of reprisal, since Mace was almost universally regarded by police regulators as a humane alternative to beating.³⁵

Slowly but decisively, medical expert opinion also began turning against Mace. Writing in the *New England Journal of Medicine* in 1969, a team of researchers in Miami, Florida, claimed, on the basis of clinical observations, that repeated exposure to even small amounts of Mace could result in skin lesions and blistering.³⁶ Other doctors, especially ophthalmologists, documented instances of severe scarring to corneal and retinal tissues as a result of Mace exposure.³⁷ After examining a patient exposed to Mace in San Francisco, the physician Thomas Bodenheime told a reporter based in Washington, D.C., that the product "could cause a fatality." A Stanford professor of pharmacology issued a similar warning, telling the *Los Angeles Times* that "for anyone with a serious cardiovascular disease or pulmonary condition the experience [of Mace exposure] could be fatal."³⁸ Even the President's Commission on Civil Disorders, established after the 1967 urban rebellions, advocated federal research to determine whether Mace was safe for widespread use.³⁹

This public outcry prompted a trend that persists today: police officers attempted to provide theatrical demonstrations of chemical munitions' supposed harmlessness by using police bodies as test subjects. Perhaps the most sensational example of this kind of theater came in June 1968, when Cook County Sheriff Joe Woods gathered a large crowd of journalists and public officials in Chicago, stripped to his undershirt, and ordered an associate to discharge a burst of Mace against his chest. (He claimed to suffer "no ill effects.")⁴⁰ The deployment of Mace against police trainees or cadets as part of normal weapons training also emerged in a number of departments around this

³⁴ Hoop, "Spray Chemical Aids Police in Riot Control" (cit. n. 31); and Gloria Wolford, "Mace Gas Chalks Up String of Successes in Coping with Riots," *Cedar Rapids (IA) Gazette*, 23 Nov. 1967.

³⁵ "NAACP Tries to Stop Mace," *United Press International*, 19 Sept. 1967; and "NAACP Condemns Gas Spray," *Rochester (NY) Democrat and Chronicle*, 5 Aug. 1967.

³⁶ Neil S. Penneys, Ronald M. Israel, and Sidney M. Indgin, "Contact Dermatitis Due to 1-Chloroacetophenone and Chemical Mace," *New England Journal of Medicine*, 1969, 281:413–415; and Alan L. Pearlman, "Chemical Weapons on the Home Front," *ibid.*, pp. 242–243.

³⁷ "Mace Called Help Here But Ribicoff Cites Army View That Chemical Can Scar Eyes," *Battle Creek (MI) Enquirer*, 20 May 1969; and "Skin Rashes Said Caused by Mace," *Spokane (WA) Review*, 24 Aug. 1969.

³⁸ Don Kirkman, "Doctor Warns MACE Could Damage Eyes," *Scripps-Howard*, reproduced in *Knoxville (TN) News-Sentinel*, 3 May 1968 (Bodenheime's assertion); and Linda Matthews, "Reports on Aftereffects of MACE Set Off Dispute," *Los Angeles Times*, 16 May 1968.

³⁹ Kirkman, "Doctor Warns MACE Could Damage Eyes"; and Matthews, "Reports on Aftereffects of MACE Set Off Dispute."

⁴⁰ Cheryl Tritt, "Mace Spray Beats Clubs—Area Police," *Akron (OH) Beacon Journal*, 7 July 1968; and "Mace Me, Man," *Tucson (AZ) Daily Citizen*, 31 May 1968.

time; this practice remains widespread today, with various pepper spray products standing in for Mace. These stylized performances of physical sacrifice and embodied esoteric knowledge came to constitute a kind of repertory science theater for police. They amounted to solidarity-building rituals that helped to solidify law enforcement support of controversial munitions while also insulating those same police from criticism. In later decades, these demonstrations would influence the research designs of police-aligned civilian scientists, who mimicked such ritualized practices in experimental trials, sometimes with police cadets in the role of research subjects. Despite this kind of pageantry, however, the slow deterioration of official and public support for Mace continued into the 1970s. Still, federal agencies ultimately failed to establish any binding measures that would have required police to alter their practices meaningfully. As a result, Mace never fell entirely into disuse as a police armament. But the product's declining popularity in this period did create a social problem that, in the eyes of police experts, reformers, and some scientists, demanded a technical solution.

In the final decades of the twentieth century, a new category of product would emerge to meet that perceived need, thanks in large part to the concerted efforts of federal research agencies and commercial weapons manufacturers. This new product would link the active ingredient in Halt!—which, owing to its exclusive use as an animal repellent, had been subjected to none of the rigorous public criticism Mace endured—with the ethos of Mace as a law enforcement armament, understood by beat cops and police experts alike to be a humane alternative to nightsticks and firearms. This new product would come to be known first by several brand names and later simply as “pepper spray.”

PEPPER SPRAY

In 1978, an unlicensed bail bondsman by the name of Archie Lee Hamilton burst into a private residence in Hollywood, Florida, brandishing an instrument the home's occupant took to be a gun. “I looked down that barrel,” the fifty-seven-year-old woman later testified. But Hamilton's attorneys insisted that what their client wielded was not a gun at all. In fact, it was a newfangled piece of self-defense technology, called the Nebulizer XL, that purportedly posed no threat of lasting injury to those against whom it was deployed. The lawyers' argument was apparently compelling; the agency responsible for prosecuting Hamilton's alleged misconduct dropped the charges against him.⁴¹

In nearly every respect, the Nebulizer XL was designed to look and feel like a gun. It consisted of a pistol-grip buttstock, a safety, and an on/off trigger switch. But instead of the long barrel of a handgun, the business end of the Nebulizer was a heavy-duty flashlight bulb positioned atop the nozzle of a spray can containing a 1 percent oleoresin capsicum solution in isopropyl alcohol. Newspaper reporters referred to the device as a “pepper juice gun.” To our knowledge, the Nebulizer XL, marketed as early as 1974 but not patented until 1977, was the first OC-based commercial weapons product explicitly intended for use against human beings. A newspaper ad that ran in dozens of American newspapers in 1974 boasted that the product's combination of high-powered parabolic light and finely dispersed pepper mist was “safe and effective” for repelling both human and animal aggressors.⁴²

Like Mace, the Nebulizer XL was marketed to a group of private citizens its manufacturers imagined to be uniquely vulnerable to interpersonal crime. “Women who live alone or work at

⁴¹ Brad Bumsted and Kevin Bloom, “Reformers Aim at Corruption in Bail Bond Business,” *Gannett News Service*, 14 Feb. 1982.

⁴² Phil Barber, “Galli Fears Pepper Juice Gun Might Fall into Hands of Kids,” *Reno (NV) Gazette-Journal*, 27 Apr. 1977. Advertisements for the Nebulizer XL appeared in the *San Bernardino (CA) County Sun* on 16 June 1974, in the *Miami News* on 18 Nov. 1977, in the *Orlando (FL) Sentinel* on 22 Nov. 1977, and in the *Miami Herald* on 1 Feb. 1978, to name just a few of many examples.

night—always potential rape victims—will find the product contributes to their feelings of personal security,” the manufacturers’ representatives argued in a fact sheet submitted to Nevada state legislators in 1977. And like Mace, the Nebulizer XL seemed to offer a lucrative opportunity for any company poised to bring its OC-based solution to the police market. In 1977, Gardner “Chip” Whitcomb and Geraldine Luckey Whitcomb established Luckey Police Products for exactly that purpose, launching the product “Cap-Stun” in 1982.⁴³ This new product eliminated the flashlight component of the Nebulizer XL and replaced the pistol-grip dispersal mechanism with a typical spray-canister design, some variants of which were small enough to place in a key-ring holster. The product found buyers among anxious urbanites and was also adopted by outdoor recreationists as a repellent for a host of pests, further boosting sales.⁴⁴ But the Whitcombs and their associates were hardly content with incrementally expanding the prior market position of the Nebulizer XL. Their aspiration was to secure large institutional contracts of the kind that had benefited Halt! and Mace before them. Throughout the 1980s, then, Luckey Police Products encouraged law enforcement agencies to adopt Cap-Stun as a field weapon, with uneven success. But the company’s efforts were finally rewarded in 1987, when Cap-Stun attracted the interest of the Federal Bureau of Investigation.

The relationship between the FBI and the Cap-Stun manufacturers was symbiotic. For the FBI, police overuse of lethal weapons represented a pressing social problem that demanded a technical solution. And by the 1980s, the category of lethal weapons had grown capacious enough to include not only firearms but, increasingly, Mace as well. But police agencies, having grown accustomed to Mace, were resistant to any attempt to strip them of chemical lachrymators entirely. Federal agencies like the FBI therefore sought to satisfy both the police and their critics by popularizing the supposedly safe and natural oleoresin capsicum of Cap-Stun as a replacement for the dangerous and synthetic tear gas contained in Mace. Indeed, it was the product’s fundamental nonlethality, assumed as a given and so never confirmed by rigorous scientific trials, that differentiated it from Mace.

In 1987, the FBI appointed an agent named Thomas W. W. Ward to be the director of its Less-Than-Lethal Weapons Program, housed in the Firearms Research Division.⁴⁵ Shortly thereafter, the Less-Than-Lethal Weapons Program initiated an official investigation into OC in general and Cap-Stun in particular, with an eye toward making recommendations to municipal police departments throughout the country. In 1989 Ward issued a widely distributed memorandum that purported to summarize the results of a comprehensive research program into Cap-Stun’s safety and efficacy as a police armament. Police departments across the country, many of them sensitive to the political volatility of Mace, responded by enthusiastically adopting the product. By the end of 1990, Luckey Police Products had signed contracts with more than a thousand U.S. police departments.⁴⁶

While there are plenty of circumstantial and historical factors that should inspire skepticism about the impartiality of the FBI’s Cap-Stun research, we needn’t rely on speculation. In 1996 Ward pled guilty to accepting more than \$50,000 in kickbacks from the Whitcombs and their

⁴³ Minutes of the Nevada State Assembly Judiciary Committee, 13 Apr. 1977; and “Gardner Whitcomb Obituary,” *South Florida Sun-Sentinel*, 21 Dec. 2008.

⁴⁴ Robert C. McCormick, “Safe Car: Spy Devices Make Vehicles Secure, Costly,” *Tucson (AZ) Citizen*, 4 Aug. 1989.

⁴⁵ In our account of the collaboration between Luckey Police Products and the FBI via Special Agent Thomas W. W. Ward, we have drawn extensively from publicly available court records, especially in *United States of America v. Thomas W. W. Ward*, U.S. District Court for the Southern District of Florida, 96-cr-00076-DLG (1996).

⁴⁶ Garret Matthews, “Cap-Stun, Says Kentucky Supplier, Packs a Lot of Oomph,” *Evansville (IN) Courier*, 11 Nov. 1990; Barbara Shelly, “KC Police Add Cans of Stinging Spray to Arsenal,” *Kansas City (MO) Star*, 3 June 1991; “Canister Gives Cops the Edge,” *Miami Herald*, 12 Jan. 1987; and “Pepper Spices Up Florida Police Work,” *Associated Press*, 1 Aug. 1990.

associates. In a sworn statement, Ward confirmed that the bribery scheme took place between 1987 and 1989—the crucial years during which Cap-Stun was supposedly subjected to the testing program that resulted in the FBI's full-throated endorsement of the product.⁴⁷ In 1990, however, immediately following the release of Ward's enthusiastic report, these revelations were still years in the future. First, Cap-Stun would have to weather a very different, and in some ways far more destabilizing, crisis of public legitimacy.

On 10 August 1990 a group of New York City police officers cornered a fourteen-year-old boy in the bathroom of his mother's home in Brooklyn. The newspapers hinted salaciously at the character of the teenager who was the subject of police attention, describing him, variously, as “emotionally disturbed,” “raging,” and “armed.”⁴⁸ The same newspapers credulously reported that the boy failed to be affected by the officers' deployment of an extremely large amount of Cap-Stun—so much that the solution covered his head and clothing. After the boy was doused in pepper spray, the officers deployed an “electric stun device,” causing Cap-Stun's isopropyl alcohol-based solution to ignite. The boy's skin caught fire, as did the curtains of the bathroom where he had tried to hide. He survived but suffered significant burns to his face and arms. The FBI's purportedly voluminous research had apparently failed to identify such an outcome as an imminent possibility.

For Luckey Police Products, the blowback was immediate and profound. The NYPD sent its recently purchased order of Cap-Stun back to the company and solicited a refund. Adding insult to injury, the NYPD quickly announced a new purchase from a competitor brand, Pepper Mace, that had been hastily brought to market and that contained no isopropyl alcohol. A wave of canceled contracts swept in to Luckey from other police departments around the country. Gardner Whitcomb, as the company's most public figure, attempted to strike a balance between expressing solidarity with the NYPD officers involved in the Brooklyn incident and distancing his product from the grievous injuries to which it had contributed.⁴⁹

Nevertheless, by 1991 Luckey Police Products was in crisis.⁵⁰ The near-monopoly Luckey once enjoyed was rapidly giving way to a crowded and competitive market in which Cap-Stun was assailed by numerous other brands. Not only did this threaten Luckey's profitability, it also muddied the waters of public opinion; distinct pepper spray brands came to exhibit a high degree of variance from one another, inspiring investigative reports that raised concerns about the product's suitability as a police weapon.⁵¹ The deepening of this crisis ultimately led Luckey Police Products to transfer control of the Cap-Stun brand to Kamran Loghman (then spelled Cameron Logman), the proprietor and president of Zarc International, a firm that had earlier contracted with Luckey to market Cap-Stun beyond the United States.⁵²

The public disclosure in 1996 of the 1987–1989 bribery scheme had strikingly little effect on the swelling pepper spray industry. (Only Ward, the FBI agent, was convicted and sentenced to

⁴⁷ James Herron Zamora, “Pepper Spray Study Is Tainted: Industry Paid Off FBI Agent Who Did the Research,” *San Francisco Examiner*, 20 May 1996.

⁴⁸ Randy Diamond, “Boy Hurt after Cops Use Chem,” *New York Daily News*, 10 Aug. 1990; and Lane Kelly, “Mace Rival Peppers Firm with Criticism,” *South Florida Sun Sentinel*, 27 Aug. 1990.

⁴⁹ Kelly, “Mace Rival Peppers Firm with Criticism”; and Russel Motley, “Cap Stun Maker Affirms Product's Safety,” *Miami Herald*, 14 Aug. 1990.

⁵⁰ In our account of the sale of Cap-Stun, the dissolution of Luckey Police Products, and the legal conflicts between Gardner Whitcomb and others, we have drawn extensively from publicly available court records, especially in *Zarc International, Inc. v. Gardner L. Whitcomb and Geraldine L. Whitcomb*, U.S. District Court for the Southern District of Florida, 97-cv-06656-JAL (1997).

⁵¹ Bently Orrick, “Cloud Hangs over Cop Sprays: Critics Say Someone Likely Will Die If Police Don't Switch to a Less Potent Formula,” *Tampa (FL) Tribune*, 10 Mar. 1996; Dennis Anderson, “Police Pepper Spray Info in Doubt,” *Associated Press*, 29 Feb. 1996; and Terry Allen, “Critics Question Use of Pepper Spray,” *Rutland (VT) Daily Herald*, 22 Feb. 1998.

⁵² Jim McNair, “Broward Man Sells Rights to Cap-Stun to Md. Firm,” *Miami Herald*, 13 Aug. 1991.

prison; the Whitcombs and their associates faced no legal consequences.) The chemical formulas used in commercial pepper sprays diversified as the market grew. Whereas law enforcement-grade Cap-Stun contained 5 percent OC, newer brands came on the market with products that boasted of higher concentrations.⁵³ But concentration is a poor measure of intensity; because of the wide variance in the piquancy of oleoresin capsicum itself, two products with identical OC volume may in fact be very different from one another. As such, pepper spray manufacturers increasingly came to rely on Scoville rating, not OC volume, as the key indicator of their product's quality, and some brands began boasting of pepper sprays that were orders of magnitude hotter, as measured in Scoville Heat Units (SHU), than any chili pepper found in nature or developed through horticulture.⁵⁴ The Scoville scale, developed in 1912 by the American pharmacist Wilbur Scoville, is based on subjective sensory assessment and is not a recognized scientific standard for evaluating anything, much less the suitability of a chemical munition for deployment against human tissues. Both SHU ratings and maximum concentration limits are therefore completely inadequate for assessing the potential lethality of pepper spray exposure, which remains a moving target.

Today, many OC products are available to both private citizens and law enforcement agencies. In 2020, an industry report appraised the value of the global consumer pepper spray market at almost US \$24 million, with North American buyers accounting for 48.2 percent of global sales.⁵⁵ This figure captures only the private consumer market; we can reasonably surmise that the institutional pepper spray market, in which police agencies represent the primary buyers, is many times larger. In their marketing and advertising activities, pepper spray manufacturers must continually walk a fine line between emphasizing the superior potency of their products relative to their competitors' while also insisting that their enhancements do not threaten the fundamental nonlethality of OC-based products as a class.

Manufacturers and institutional buyers of pepper spray thus benefit from a kind of willful confusion about the qualities and capabilities of OC. This productive ambiguity is reinforced not only by the research products of police-aligned civilian scientists but also by the very laws and guidelines that have been established to regulate pepper spray products. This status quo persists despite the fact that there is, in fact, a widely accepted scientific standard for evaluating the dangers of chemical compounds like oleoresin capsicum, which we address below.

LETHALITY AND REGULATION

While SHU provides a pungency rating for food products, it is not a recognized scientific standard for evaluating dangers posed by chemical compounds. That standard is determined by what chemists and life scientists call the lethal concentration (LC) or lethal dose (LD) of a substance—whether metabolized through inhalation, oral consumption, the skin, or ocular exposure. The dosage at which a substance is capable of killing 50 percent of experimental test subjects is recorded as an LC50 or an LD50 value.⁵⁶

In 1995 the National Institute of Justice (NIJ) and the Department of Energy commissioned Sandia National Laboratories to evaluate the toxicity and potential hazards of oleoresin capsicum.

⁵³ Orrick, "Cloud Hangs over Cop Sprays" (cit. n. 51).

⁵⁴ One popular brand on the market today, Fox Labs's Five-Point-Three—"the hottest pepper spray ever made"—boasts a rating of 5,300,000 SHU.

⁵⁵ K. Anil and D. Roshan, *Pepper Spray Market by Product and Distribution Channel: Global Opportunity Analysis and Industry Forecast, 2021–2028* (New York: Allied Market Research, 2020).

⁵⁶ See E. O. Ehrhirie, C. P. Ihekwereme, and E. E. Iloigwe, "Advances in Acute Toxicity Testing: Strengths, Weaknesses, and Regulatory Acceptance," *Interdisciplinary Toxicology*, 2018, 11:5–12, <https://doi.org/10.2478/intox-2018-0001>. Many toxicologists prefer more conservative estimates of lethality and use LC10 and LD10 values, where 10 percent of test subjects perish after experimental exposure. See Natalie Cook, Aaron R. Hansen, Lillian L. Siu, and Albiruni R. Abdul Razak, "Early Phase Clinical Trials to Identify Optimal Dosing and Safety," *Molecular Oncology*, 2015, 9:997–1007, <https://doi.org/10.1016/j.molonc.2014.07.025>.

The report was released one year before the public disclosure of the FBI's involvement in a bribery scheme with commercial pepper spray manufacturers. This 1995 study, conducted for the National Institute of Justice's Less-Than-Lethal Force program, provided a review of existing literature on the dangers posed by OC. The report confirmed that OC could be lethal when metabolized through the skin and via oral ingestion. Mouse models confirmed that dermal contact with more than 512 mg/kg of OC would be necessary for killing more than 50 percent of test subjects. The report also confirmed LD50 values for oral ingestion between 1 and 16 ounces for a 70 kg person, while noting that the "cause of death following toxic oral exposure is respiratory paralysis."⁵⁷ Oral toxicity is particularly relevant given the fact that projectile OC canisters used to subdue a single subject often result in the chemical substance being ingested orally and metabolized through the skin on the face and upper body. The report did not share findings of LC50 values for inhalation of OC.

The 1995 NIJ report clearly established that contact with small to modest amounts of OC could be lethal. Based on its estimates, a person weighing 180 pounds would only need 1.46 fluid ounces of OC to be absorbed by the skin for that exposure to be lethal in 50 percent of cases. The same person would only need to swallow just over 1.2 fluid ounces (about 2.4 U.S. tablespoons) of OC for the substance to be lethal in 50 percent of cases. The 1995 NIJ report did not explicitly disclose the concentration of capsaicinoids in the OC products used to determine the LD50 values for dermal and oral exposure. This is an important detail, given that many OC products marketed to law enforcement and consumers feature piquancy levels measured by SHU values rather than spelling out percentage of OC per canister. Also, and perhaps most important, several brands have brought to market pepper spray solutions that contain both OC and CS gas, which have rarely been tested together.⁵⁸ Despite recording LD50 values for dermal and oral contact with OC, the authors of the NIJ study defaulted to justifications for why OC remained a safe and less-than-lethal product that clearly contradicted scientific studies demonstrating its toxicity and lethality. The authors claimed that "although few traditional toxicology studies exist on specific OC products, extensive experience with this product as a food ingredient or topical analgesic suggests limited systemic toxicity or long term target organ effects following exposure."⁵⁹

This rather anti-scientific reasoning about OC is not surprising given that by 1995 OC-based pepper spray was already in widespread use by police departments around the United States. It is also worth keeping in mind that at the time of the 1995 report the NIJ likely knew, but had not yet publicly disclosed, that its Less-Than-Lethal Weapons Program had been compromised a decade earlier by the manufacturers of OC who wanted the FBI and other state agencies to adopt the product.

The trio of companies that marketed Cap-Stun during the 1980s and 1990s succeeded in developing and popularizing pepper spray in general; they also managed to carve out a public/private market niche in the United States that operated in a near-total regulatory vacuum. For the consumer market, many states have laws that determine who can purchase pepper spray, where one can acquire the product, and whether licensing is necessary for usage, which in all states is restricted to self-defense. Some states have specific regulations on the size and capacity of pepper spray containers that can be purchased on the consumer market. California, for example, limits the net weight for a consumer-use pepper spray canister to 2.5 ounces, or 70 grams of OC, CS, or CN.

⁵⁷ Melecita M. Archuleta, "Oleoresin Capsicum: Toxicology Evaluation and Hazard Review for the National Institute of Justice Less-Than-Lethal-Force Program," Report: Sandia National Laboratories, 1995, pp. 1–18, on p. 10.

⁵⁸ One such product is the "DEEP FREEZE High Volume Tactical Sprays" produced by Aerko International, <https://aerko.com/deep-freeze> (accessed 1 Nov. 2022).

⁵⁹ Archuleta, "Oleoresin Capsicum" (cit. n. 57), p. 12.

California state law does not place explicit limits on the net weight for police-grade pepper spray canisters. In Maryland, civilians may use pepper spray for self-defense; law enforcement officers are also allowed to use the product.⁶⁰ However, Maryland state law does not limit the net weight of consumer- or police-grade OC products. Currently there are no federal standards that limit the percentage of OC used in consumer- or police-grade canisters across the fifty states. Neither could we find state laws that prohibit combining OC with other chemical compounds such as CN or CS. Pepper spray, then, is not a stable object, like a baton, but a highly variable weapon whose unique chemical composition varies given who is manufacturing this instrument of punishment and which state is adopting it for use.

To this day, the absence of consistent regulatory standards for chemical composition, volume, application, and methods for postexposure decontamination facilitates willful confusion about the potentially lethal effects of pepper spray as a police munition. Furthermore, the regulations that do exist are overwhelmingly oriented toward the protection of consumers who may be exposed to OC through their own actions or through the actions of other market actors—not at the hands of police. This incoherent regulatory landscape evinces a deep-seated prejudice embedded in the law. Since at least the mid-twentieth century, U.S. government actors have consistently demonstrated an investment in safeguarding the interests of American consumers, a process that has led to the erosion of robust rights and protections of Americans as citizens subjected to the weapons of law enforcement.⁶¹ By imposing largely consumer-oriented protections that apply primarily to commercially available pepper spray products, the current regulatory landscape implicitly endorses this consumer-first model of governmental obligation, while ignoring the reality that residents of the United States are far more likely to come into contact with pepper spray as a result of police encounters than in any other context.

THE RETROACTIVE CONSTRUCTION OF NONLETHALITY

Observing the proliferation of pepper sprays, electroshock devices, and other newfangled police technologies in the early 2000s, the science studies scholar Brian Rappert has argued that the very category of “non-lethal weapons” is necessarily “bound up with efforts to negotiate the respectability of the use of force.” As such, he urged scholars to “view accounts of non-lethal weapons as attempts to both inform and persuade audiences about the moral standing of technology and those who utilize it.”⁶²

To rehabilitate the moral standing of pepper spray and the agencies that use it, munitions manufacturers, law enforcement advocates, and police-aligned civilian scientists consistently appeal to the expert consensus that OC is fundamentally nonlethal. However, the studies that purportedly validated this consensus never accomplished a substantive evaluation of the real-world health and safety implications of law enforcement OC usage prior to its widespread adoption by U.S. police departments.

European chemists, pharmacologists, and physicians began studying the effects of capsaicin on humans in the 1980s, well after the munition had been devised and to an extent adopted by U.S. law enforcement.⁶³ These studies were conducted by European scientists with no explicit ties to American law enforcement, medicolegal death investigation, or ammunition manufacturers. In

⁶⁰ CA Penal Code § 22810 (2022); and MD Criminal Law Code Ann. § 4-101 (2021).

⁶¹ Lizabeth Cohen, “A Consumers’ Republic: The Politics of Mass Consumption in Postwar America,” *Journal of Consumer Research*, 2004, 31:236–239.

⁶² Brian Rappert, *Non-Lethal Weapons as Legitimising Forces? Technology, Politics, and the Management of Conflict* (London: Routledge, 2003), p. 4.

⁶³ Jan M. Lundberg, Claes-Roland Martling, and Alois Saria, “Substance P and Capsaicin-Induced Contraction of Human Bronchi,” *Acta Physiologica*, 1983, 119:49–53.

this sense they were impartial investigations uninterested in the lethality of the munition. Instead, these scientists wanted to determine how capsaicin triggered physiological responses in the human bronchial system and which capsaicin-sensitive nerve terminals induced pain, the sensation of heat, and coughing after exposure to OC. These initial studies were also investigations into the specific biological pathways that produced and alleviated pain associated with airborne OC exposure. The studies were conducted by clinical pharmacologists and physicians with academic appointments in medical hospitals throughout London. Moreover, they took place in highly controlled laboratory environments, evaluated a small number of subjects, and involved time-dependent exposure of OC using aerosol spray or vapor mist.⁶⁴ These studies did not test for dermal or oral exposure of OC in human subjects.

When American scientists began to produce studies on pepper spray in the middle of the 1990s, they adopted the methods used earlier by European investigators.⁶⁵ However, unlike those researchers, the American clinicians and scientists interested in the effects of OC on humans conducted their investigations at the request of law enforcement or some other state entity invested in criminal justice. This detail is important because, from the beginning, American institutions with a vested interest in less-than-lethal weapons helped support and initiate empirical studies on OC and its effects. For example, one of the earliest recorded American studies of OC on humans was published in 1989 by W. Weaver and M. B. Jett for the firearms training unit for the FBI academy.⁶⁶ The goal of this study was to assure state and military institutions already using OC of its safety.

Working within the parameters of preexisting methods, law enforcement-aligned studies of OC conducted in the United States during the 1990s attempted to reproduce its real-world application. They did this by placing human subjects—who were often volunteers from either police or military academies—into restraint positions following OC exposure. Despite these efforts, testing conditions remained hampered by the limits of the laboratory environment, much like the London studies from the 1980s.⁶⁷ The real-world use of OC in the United States takes place in highly volatile situations; pepper spray is typically deployed by more than one police officer at varying degrees of distance, and OC is metabolized through oral, dermal, respiratory, and ocular exposure and over durations that are rarely accurately reported. Additionally, the use of OC in the United States is almost always accompanied by other use of force techniques to restrain or detain subjects who may be overpoliced, racially diverse, suffering from mental illness, and possibly under the influence

⁶⁴ J. G. Collier and R. W. Fuller, "Capsaicin Inhalation in Man and the Effects of Sodium Cromoglycate," *British Journal of Pharmacology*, 1984, 81:113–117, <https://doi.org/10.1111/j.1476-5381.1984.tb10750.x>; Fuller, C. M. Dixon, and P. J. Barnes, "Bronchoconstrictor Response to Inhaled Capsaicin in Humans," *Journal of Applied Physiology*, 1985, 58:1080–1084, <https://doi.org/10.1152/jappl.1985.58.4.1080>; and D. L. Maxwell, Fuller, and Dixon, "Ventilatory Effects of Inhaled Capsaicin in Man," *European Journal of Clinical Pharmacology*, 1987, 31:715–717, <https://doi.org/10.1007/BF00541301>.

⁶⁵ T. C. Chan, G. M. Vilke, J. Clausen, R. F. Clark, P. Schmidt, T. Snowden, and T. Neuman, "The Effect of Oleoresin Capsicum 'Pepper' Spray Inhalation on Respiratory Function," *Journal of Forensic Sciences*, 2002, 47:299–304; and C. H. Steffee, P. E. Lantz, L. M. Flannagan, R. L. Thompson, and D. R. Jason, "Oleoresin Capsicum (Pepper) Spray and 'In-Custody' Deaths," *American Journal of Forensic Medicine and Pathology*, 1995, 16:185–192, <https://doi.org/10.1097/00000433-199509000-00001>.

⁶⁶ W. Weaver and M. B. Jett, *Oleoresin Capsicum (OC) Training and Use* (FBI Academy Firearms Training Unit, 1989).

⁶⁷ J. Onnen, *Oleoresin Capsicum* (Alexandria, Va.: International Association of Chiefs of Police Executive Briefs, 1993); D. E. Lundgren, *Oleoresin Capsicum (OC) Usage Reports: Summary Information* (Sacramento: California State Attorney General, 1996); T. C. Chan, G. M. Vilke, J. Clausen, R. F. Clark, P. Schmidt, T. Snowden, and T. Neuman, *The Impact of Oleoresin Capsicum Spray in Human Subjects in the Sitting and Prone Maximal Restraint Positions*, Report No. 182433, prepared for U.S. Department of Justice, National Institute of Justice, Office of Justice Programs (Rockville, Md.: National Criminal Justice Reference Service, 2002); and L. Haber, P. Nance, A. Maier, P. Price, E. Olajos, L. Bickford, M. McConnell, and J. Klauenberg, *Human Effectiveness and Risk Characterization of Oleoresin Capsicum (OC) and Pelargonic Acid Vanillylamide (PAVA or NONIVAMIDE) Hand-Held Devices*, Report No. AFRL-RH-BR-TR-2008-0002, prepared for the Air Force Research Laboratory (Brooks City-Base, Tex.: United States Air Force, 2007).

of drugs and alcohol.⁶⁸ These mediating structural conditions make Americans who are typically subjugated by OC quite unlike the test subjects used in the London studies of the 1980s. American investigators aligned with law enforcement failed to resolve this fundamental incompatibility while conducting research on OC. It was advantageous for them to do this for three reasons.

First, the European studies of the 1980s, which did not result in loss of life, were interpreted as providing indirect evidence for the nonlethality of OC. In fact, given the ethical constraints of human subject research following the Nuremberg Codes of 1947 and, later, the Belmont Report of 1978, it is universally recognized as unscrupulous to test the lethality of any chemical weapon in humans directly. Awareness of this limit prompted American scientists to conduct secondary autopsy analysis of law enforcement encounters using OC.⁶⁹ Yet the conclusions from such analysis were predetermined by the belief that OC had already been proven nonlethal—not only by the London studies of the 1980s, but also through the long-documented use and consumption of capsaicin fruits by various cultures since the novel peppers were first introduced into the European diet in the late fifteenth century.

Second, by mimicking the impartial methods of the London studies that took place within medical clinical facilities, police-aligned scientists and physicians in the United States could produce data that appeared to be linked to a series of investigations that were all interested in proving OC's nonlethality—despite the fact that those earlier studies were in fact interested in the biological pathways that produced discomfort and inflammation following OC exposure. This suggestive agglomeration allowed the prestige of apparent scientific validation to accrue to the law enforcement-aligned nonlethality consensus, marking it as worthy of appearing in studies commissioned by the DOJ or other state agencies and in publications read largely by forensic scientists working closely with police.⁷⁰

Third, police-aligned scientists in the United States had no incentive to design trials that approximated real-world conditions because police in the United States had already begun to use the chemical munition by the 1980s. This adoption was part of reform efforts designed to assuage public outcry against police violence while also defending the morality of using force against American subjects. In this political context, where pepper spray was already ubiquitous, American investigators could examine the effects of OC on idealized captives—that is, compliant Americans (police and military recruits) who respected legal and scientific authority—while anticipating results that, by design, could not unsettle the nonlethality consensus.

By the end of the 1990s, American scientists succeeded in generating a body of technical literature that retroactively legitimized the nonlethality of OC by selectively conducting studies intended to demonstrate the safety and efficacy of the chemical munition to police departments and federal agencies such as the FBI and the DOJ. In turn, law enforcement relied on this body of literature to justify their operational practices and standards, even as those practices swelled to

⁶⁸ Justin Nix, “On the Challenges Associated with the Study of Police Use of Deadly Force in the United States: A Response to Schwartz and Jahn,” *PLOS One*, 2020, 15(7):e0236158, <https://doi.org/10.1371/journal.pone.0236158>; and Michael R. Smith, “Reimagining the Use of Force by Police in a Post-Floyd Nation,” *Police Quarterly*, 2022, 25:228–251, <https://doi.org/10.1177/10986111211049372>.

⁶⁹ Andrés Constantin, “Human Subject Research: International and Regional Human Rights Standards,” *Health and Human Rights*, 2018, 20(2):137–148; Onnen, *Oleoresin Capsicum* (cit. n. 67); Charles S. Petty, *Deaths in Police Confrontations When Oleoresin Capsicum Is Used*, Document No. 204029, research report submitted to the U.S. Department of Justice, Feb. 2004 (the report has not been published by the DOJ); and Steffee *et al.*, “Oleoresin Capsicum (Pepper) Spray and ‘In-Custody’ Deaths” (cit. n. 65).

⁷⁰ For studies commissioned by the DOJ or other state agencies see Chan *et al.*, *The Impact of Oleoresin Capsicum Spray in Human Subjects* (cit. n. 67); Haber *et al.*, *Human Effectiveness and Risk Characterization* (cit. n. 67); Lundgren, *Oleoresin Capsicum (OC) Usage Reports* (cit. n. 67); Onnen, *Oleoresin Capsicum*; and Petty, *Deaths in Police Confrontations*. For work in publications read largely by forensic scientists working closely with police see Chan *et al.*, “Effect of Oleoresin Capsicum ‘Pepper’ Spray Inhalation on Respiratory Function” (cit. n. 65); and Steffee *et al.*, “Oleoresin Capsicum (Pepper Spray) and ‘In-Custody’ Deaths.”

accommodate real-world situations that far exceeded the artificial scenarios on which supposedly research-informed guidelines were based. Through this recursive and self-referential process, public, private, and academic proponents of pepper spray have established a durable consensus that consistently deflects criticism by appealing to an impartial evidence-based standard that has never existed.

MAKING OC NONLETHAL DURING DEATH INVESTIGATION

As mass protests in defense of Black life periodically focus national attention on police violence, a series of deaths apparently attributable to OC have recently sparked discussion in the United States. Among these are the stories of forty-four-year-old Tyrone West, an African-American man from Baltimore, and Juan Correa, Jr., a thirty-one-year-old Latino man from Los Angeles. Each of these stories offers troubling examples of how the law enforcement-aligned consensus of OC's nonlethality has obstructed justice and accountability.

On 18 July 2013, Tyrone West died in the streets of Baltimore City shortly after a traffic stop. A forensic investigator working for the Office of the Chief Medical Examiner for the State of Maryland reported in West's autopsy that law enforcement asked him to exit his car. He complied and sat on the curb of the street. Officers claim that West then instigated an attack, to which Baltimore Police Department officers responded by spraying him with "mace." West's autopsy report notes that an unknown number of officers subsequently arrived on the scene, where they attempted to subdue West with handcuffs and baton strikes before he suddenly became unresponsive. Investigative reporting later revealed that in fact West was sprayed with OC, not Mace; the interchangeability of Mace and pepper spray in the minds of forensic investigators is a testament not only to Mace's durable success in the law enforcement market but also to its imaginary status as a similarly "less-than-lethal" cognate to OC. The autopsy report did not record if West was sprayed with projectile OC or with an aerosol canister, nor did it document the concentration of the OC involved, the duration of his exposure, or where on his body contact was made by the chemical weapon. Media reports later revealed that as many as twelve police officers, including at least two with a well-documented pattern of brutalizing Black men during traffic stops, together chased and restrained West. What's more, they apparently discharged so much pepper spray that several of the officers were incapacitated by the exposure and had to retreat to decontaminate themselves.⁷¹

None of this potentially suggestive information made it into the autopsy report. The medical examiner instead declared that, while West had several external injuries from his confrontation with police, "abnormalities found in Mr. West's heart and signs of dehydration are certainly causes for sudden cardiac death." The autopsy claimed that West's heart was predisposed to cardiac arrhythmia, which, when coupled with high environmental temperatures, significant output of adrenaline, and increased use of oxygen, resulted in his death. Forensic investigators did not cite OC as a factor. Instead, they declared that the manner of death "could not be determined" given that postmortem observation could not decipher the "relative contribution" of the preexisting heart condition, heat, adrenaline, and elevated oxygen use in the loss of West's life. No officers were charged for killing West. In their efforts to hold the Baltimore Police Department accountable, West's family later solicited two independent forensic evaluations of the autopsy; each of the independent examiners determined that West's death had in fact been a homicide due to

⁷¹ Justin Fenton, "Tyrone West Files Show Passenger's Account of Death in Police Custody," *Baltimore (MD) Sun*, 2014, <https://www.baltimoresun.com/news/crime/bs-xpm-2014-01-23-bs-md-ci-tyrone-west-witness-20140122-story.html> (police chase and restraint); and Mike Halgren, "Key Interviews Released in Controversial Baltimore City Death-in-Custody Case," *CBS Baltimore*, 2014, <https://www.cbsnews.com/baltimore/news/baltimores-top-prosecutors-releases-interviews-in-controversial-death-in-custody-case/> (officers needing decontamination).

positional asphyxia.⁷² But even after the police murder of Freddie Gray prompted a city- and nationwide uprising two years later, Baltimore and Maryland authorities still would not acknowledge the officers' assault against Tyrone West as criminal, nor would they concede that pepper spray played a decisive role in the forty-four-year-old's death.⁷³ In 2016, three years after the death of Tyrone West and just one year after the in-custody death of Freddie Gray, the Department of Justice released a 163-page investigative report confirming that the Baltimore Police Department was guilty of widespread constitutional violations, excessive use of force, discriminatory targeting of African Americans, and a culture of retaliation against community members who filed complaints against the department.⁷⁴

On 26 September 2017, Juan Correa, Jr., died in Men's Central Jail in downtown Los Angeles. According to his autopsy, at around 2:00 p.m. Correa was involved in a fight with another prisoner inside a two-man cell. Sheriff's deputies attempted to subdue both men by spraying them twice with OC through the bars of their cell.⁷⁵ As in the Tyrone West case, the medical examiner did not record the concentration of the OC used, where Correa had been sprayed, the duration of his exposure, or the specific delivery method involved. Correa was handcuffed, removed from his cell, and placed in the shower after communicating that he was unwell from the OC's effects. Correa collapsed in the shower and became unresponsive approximately forty-eight minutes after his initial exposure to OC. Paramedics declared him dead at 3:15 p.m. The medical examiner who conducted the autopsy claimed that Correa died not from the actions of law enforcement but from natural causes associated with dilated cardiomyopathy—a condition in which the chambers of the heart expand, making it difficult for it to circulate blood in the body—and obesity. When District Attorney Jackie Lacey investigated Correa's death in 2019, the medical examiner testified that there was no known mechanism in OC that could cause death in people. The medical examiner also claimed that if OC were lethal Correa would have died immediately after exposure, and so the forty-eight-minute delay until his death proved that Correa's preexisting health conditions were to blame. Lacey ruled that "since Correa's death was not caused by the O.C. spray utilized on him, we cannot prove beyond a reasonable doubt that the deputies are responsible for his death."⁷⁶ Sheriff's deputies were determined to have acted lawfully.

The cases of West and Correa reveal the tragic culmination of oleoresin capsicum's racial-political history. In both cases we see the work of the nonlethality consensus in producing autopsies that fail to document the concentration, duration, delivery method, and location of the exposure to this chemical weapon. We also see how the nonlethality consensus results in natural death determinations that completely absolve law enforcement of responsibility for the loss of life.

⁷² Luke Broadwater, "\$1M Settlement Planned for Family of Tyrone West," *Baltimore (MD) Sun*, 2014, <https://www.baltimoresun.com/maryland/baltimore-city/bs-md-ci-west-settlement-20170726-story.html>; Juliet Lindeman, "Report: Heart Condition Didn't Cause Tyrone West's Death in Custody," *ibid.*, <https://www.baltimoresun.com/maryland/bs-md-custody-death-20160430-story.html>; and "New Autopsy on Tyrone West Finds He Died of Asphyxiation While Restrained," *Associated Press*, 14 Dec. 2016.

⁷³ Ultimately, in 2017, Baltimore and the State of Maryland did agree to pay a million-dollar wrongful death settlement to Tyrone West's children.

⁷⁴ U.S. Department of Justice, Civil Rights Division, "Investigation of the Baltimore City Police Department," 10 Aug. 2016, <https://www.justice.gov/crt/file/883296/download>.

⁷⁵ On the basis of our review of the Los Angeles Sheriff's Department Operational Guidelines, which contain descriptions of weapons issued to sheriff's deputies, we note that it is possible that Juan Correa was in fact exposed to a "blended aerosol agent" containing a mixture of both OC and CS (likely the "Clearout" or "Freeze+P" products marketed by Aerko Industries).

⁷⁶ Jackie Lacey, "In Custody Death of Juan Correa: J.S.I.D. File #17-0467," report prepared for the Justice System Integrity Division, District Attorney of the County of Los Angeles, 2019. A screenshot of jail surveillance video footage provided in this report suggests that Correa and his cellmate were sprayed from a projectile OC canister and possibly also an aerosol sprayer. This detail was not made explicit in the DA report.

A medicinal plant and food source that was once cultivated by pre-Columbian Mesoamericans and then traded by Europeans along with enslaved Africans has now become a weapon used against the descendants of those very people by law enforcement officers looking to maintain public trust in the wake of their violent terror during the Civil Rights movement. Just as European ideas about racialized susceptibility to the pepper's piquancy legitimated its use in disciplining and seasoning captive bodies during slavery, so too did the twentieth-century permutations of these ideas allow idealized defenders of public order to justify their use of pepper spray as a humane alternative to beating. In fact, it was in large part through pepper spray that police and their private collaborators attempted to subdue a distinctly twentieth-century instantiation of the captive subject, one located not on the plantation but in the desegregated city, without surrendering the moral and epistemological superiority on which police practice and racial science both depend.

Compounding the historical tragedy of capsicum is the fact that the twenty-first-century forensic scientists who investigate the deaths of Black and Brown bodies after exposure to this weaponized pepper now blame the victims for their own demise. Medicolegal death examinations have cleansed the stains of pepper spray's lethality by attributing mortality not to OC exposure but to the decedents' aberrant biology. Medical examiners and coroners thus fulfill a key epistemological function by insulating the hegemonic consensus of OC's nonlethality from criticism and obscuring its contradictions.

CONCLUSION

Oleoresin capsicum is extracted from fruits of the capsicum pepper and contains capsaicin, a unique crystalline substance that can produce a range of potentially debilitating physiological symptoms. The major nonculinary application of OC is in the manufacture of chemical munitions, colloquially known as pepper sprays, which are today marketed to and used by law enforcement officials to subdue persons they encounter on the street or hold in penal custody.

Today's expert consensus that OC is nonlethal has its roots in the racial science produced by Europeans in the midst of their disorienting encounter with the chili pepper, when ideas about capsicum became thickly entangled in early modern discourses of race, geography, and climate. Colonists and merchants noted the capacity of Indigenous Americans and enslaved Africans to draw medicinal and nutritional properties from a fruit that was to Europeans a harsh and unfamiliar marvel. But the practical and epistemic routines of enslavement and racism metabolized this recognition by weaponizing the pepper itself, transforming it into an instrument for containing and regulating the same racialized subjects that had earlier introduced capsicum to the European imagination. Agents of law and order cunningly exploited this capacity during both nineteenth-century chattel slavery and twentieth-century desegregation.

OC-based chemical munitions were first innovated in the late twentieth century, then marketed to police and civilian consumers, and only later validated through applied research purporting to demonstrate the substance's fundamental nonlethality. As we have shown, nonlethality became the key criterion on which pepper spray's suitability for police applications was assessed; this was because scientist-entrepreneurs and police experts each presented the product as a technical fix not only to the widely acknowledged social problem of excessive use of force by police but also to the declining legitimacy of Mace (which fell out of favor precisely because it came to be perceived as potentially lethal). Crucially, these research activities were decisive not only for validating claims of nonlethality but also for integrating pepper spray products into the arsenals of municipal police departments throughout the United States.

Law enforcement use of OC was popularized in the 1980s and 1990s by a cohort of federal agencies, commercial chemical manufacturers, and law enforcement-aligned civilian scientists. The nonlethality of OC was predetermined by the entities advocating its adoption; as such, state- and law enforcement-aligned scientists failed to assess OC's lethality meaningfully and instead

merely generated a justification for the product's widespread use. Claims of OC's nonlethality cannot be supported by the existing scientific literature.

Confronted with the remains of those who have died from this medicinal-food-source-turned-munition, forensic scientists and coroners now seek in the arteries, alleles, and cerebra of the deceased a key to the paradox of death by a nonlethal weapon. However, it is not the supposedly peculiar biology of those killed by OC that warrants scrutiny but, rather, the parochial expertise of colonial science and police power. These commercial, political, and technical forces have transformed capsicum fruit into a novel, even magical, instrument of racial domination, one that experts agree is intrinsically incapable of causing the dominated to die.