

Structural Vulnerability and Toxicity

Experiences in the Uruguayan Soybeanisation Process

Victoria Evia

Received: 28 February 2022; Accepted: 13 January 2023; Published: 30 June 2023

Abstract

Fuelled by agribusiness, transgenic soybean crops, genetically modified to withstand pesticide use, have increased in use during the last 20 years in the Southern Cone of Latin America. Plantations are understood as examples of ‘modular simplifications’ in ‘patchy Anthropocene’ landscapes (Tsing et al. 2019), where the attempt to reduce diversity may have social and ecological feral effects as diseases and toxins spread. In Uruguay, as an agro-exporter country, soybean expansionist processes correlate with an increased use of pesticides. Based on an ethnographic study (2016–2018) carried out in the main Uruguayan agricultural region, this Research Article seeks to analyse the experiences of toxicity among agricultural workers and rural inhabitants in the soybeanisation context. I propose that pesticide effects transcend biomedical diagnoses of ‘intoxication’. I also contend that the experience of toxicity can be understood as occurring along a continuum in the daily life of sufferers, which encompasses chemical and biological processes, their affects, intersectional conflicts, lay concepts of illnesses, informal self-care networks, and unequal access to health services. This ethnography demonstrates that the experience of toxic suffering embodies inequalities in environmental health in the time of the Anthropocene and is shaped by structural vulnerabilities and politics of exposure.

Keywords

Pesticides, Transgenic soybean, Latin America, Toxicity, Structural vulnerability.

Introduction

Saturation of the biosphere with toxic substances, such as industrial and nuclear waste, petrochemical pollution, and agrochemicals, could be considered ‘the most notable reminder of the lasting human impact on Earth’ (Nading 2020, 210). The proliferation of chemical manufacturing and synthesis has played a central role in the disruption of the Earth’s geological forces by industrialisation. Academic conversation around the Anthropocene and the disputed ways of conceptualising it (Tsing, Mathews, and Bubandt 2019; Haraway et al. 2016) challenges scholars to rethink the political and historical relationships between humans and non-humans. This discussion has also brought to the fore issues that have concerned scholars of critical medical anthropology (CMA) for many years in relation to environmental health (Singer 2016). Political ecology approaches to health understand health as a ‘biosocial process that reflects the interdependence of humanity and environment’ (Ibid, 2). This perspective also recognises that there is an ‘interconnection of social structure and environmentally mediated political economy on health production’ (Idem). Proponents of CMA have highlighted that the health/sickness/care process (Menéndez 2018) is connected to the access and control of resources that are life sustaining (Singer and Baer 2011), and that illnesses are embodied and enmeshed with social and material conditions (Das and Das 2007). In doing so, they are also raising concerns about ‘the uneven conditions of more-than-human livability’ in the Anthropocene epoch (Tsing, Mathews, and Bubandt 2019, 186).

Recent work in CMA has contributed to the understanding of how the Anthropocene epoch is linked to environmental, animal, and human health (Gamlin et al. 2021). The concept of the Anthropocene has come under criticism because of its homogenising and essentialising consequences when viewing ‘the planet’ as its unit of analysis, and ‘the anthropos’ as its sole imagined agent (Tsing, Mathews, and Bubandt 2019; Haraway et al. 2016). Tsing, Mathews, and Bubandt (2019) have proposed that, despite criticisms of the term, ‘Anthropocene’ will continue to inspire interdisciplinary conversation. It is their view, however, that anthropologists should focus on its ‘patchiness’. By paying attention to ‘patches’ they suggest that landscape structures, histories, and multi-species socialities will come to the fore and should be considered in forthcoming research. This is more important than ever in a time when contemporary forms of industrial simplification are reshaping human and non-human life in radical new ways and on a global scale. Plantations have been understood as one example of such simplification among ‘patchy’ Anthropocene landscapes (Tsing, Mathews, and Bubandt 2019): ‘Plantations attempt to reduce the number of living things in an area to just one kind; everything but that which is required for the reproduction of the economic product should be eliminated’ (Ibid, 189). The increased density of some kinds of individual crops in

plantations and the reduction of diversity as a result may stimulate feral effects, such as the spread of toxins and diseases. This Research Article proposes that Latin American transgenic soybean agribusiness scenarios and their toxic effects are fundamental landscapes and histories to which we should pay attention if we are interested in considering the uneven living conditions and the embodied inequalities of the ‘patchy Anthropocene’.

Latin America’s agribusiness follows the logic of global food chains and biofuel capitalist accumulation processes. Genetically modified to be resistant to pesticides such as glyphosates, transgenic soybean cultivation has expanded in the last 20 years in the Southern Cone of Latin America, fuelled by the agribusiness model and global market demand (Gras and Hernández 2013). Pesticides used in industrial agriculture are toxic substances that linger in natural systems and can have short and long-term impacts on human and environmental health (i.e., it can be broader and longer-lasting than acute intoxication). They have been found to contribute to the incidence of some types of cancer, respiratory health issues, mental and neurodegenerative disorders, and an increased risk of congenital malformations, among others (Prüss-Üstün et al. 2016). Pesticides affect racialised communities of the global south, migrants, Indigenous groups, workers, and inhabitants of agro-industrial enclaves to a greater extent than other populations (Nading 2020; Gamlin 2016; Holmes 2011). Yet, as Nading (2020) argues, toxicity is not only an empirical characteristic of one substance or another. It emerges in situated biologies, since the effects of chemicals on the body also depend on dosage, the presence of other substances, genetic and nutritional factors, among others (Ibid). In turn, these specifics are framed in global patterns of colonialism, racism, and economic exploitation, exposing some much more than others to toxic substances.

Structural vulnerability (Quesada, Hart, and Bourgois 2011; Holmes 2011) is defined as a positionality: ‘The vulnerability of an individual is produced by his or her location in a hierarchical social order and its diverse networks of power relationships and effects ... This includes the interface of their personal attributes—such as appearance, affect, and cognitive status—with cultural values and institutional structures’ (Quesada, Hart, and Bourgois 2011, 341). I propose that this concept allows for a deeper understanding of how experiences of pesticide toxicity and their embodied inequalities are shaped in Latin America’s plantation agribusiness scenarios.

Since the early 2000s, in the Southern Cone of Latin America, specific forms of embodied environmental inequalities have been shaped by the expansion of transgenic soybean plantations. This expansion has brought with it a massive increase in the use of glyphosates and other pesticides over large areas of land

(Arancibia, Motta, and Clausung 2020; Almeida et al. 2017; Cáceres 2018). Underdiagnosis and under-reporting of pesticide poisoning to public health officials is a common problem in the region (Bochner 2007). Nevertheless, an increase in the number of respiratory diseases, reproductive health problems, and teratogenic effects have been reported in agricultural areas of Argentina (Arancibia, Motta, and Clausung 2020; Ávila-Vázquez et al. 2018) and Brazil (Almeida et al. 2017). It is acknowledged that young male agriculture farmworkers and rural inhabitants—mainly women and children—make up the social groups most vulnerable to pesticide exposure and environmental pesticide drifts in Argentina, Brazil, Paraguay, and Uruguay (Almeida et al. 2017; Kunin and Lucero 2020; Kunin et al. 2019; Ávila-Vázquez et al. 2018; Lantieri et al. 2009; Abbate et al. 2017; Burger and Pose Román 2012; Berger and Ortega 2010).

The Uruguayan soybean socio-technical production process is very similar to what Cáceres (2018, 35) has described as the 'dominant industrial agriculture technological package' in Argentina. In other words, it is becoming structurally dependent on the use of transgenic seeds, direct seeding technology, and toxic chemical pesticides (because of the rise in glyphosate herbicide-resistant weeds). In Uruguay, transgenic soybean production prospered to the detriment of other kinds of agriculture, going from being an almost marginal crop at the beginning of the 2000s to occupying about 90% of the entire country's agricultural area in 2016 (Figueredo, Guibert, and Arbeletche 2019). This process was characterised as soybeanisation (Soutullo et al. 2013) and correlates with an exponential increase in the volumes of pesticides imported and used in the country (Narbondo and Oyhantcabal 2011; Galeano 2017). While in the year 2000 the area devoted to agricultural purposes was about 500,000 ha and pesticide importation barely reached 4,000 tons, by 2016 the area had increased to 1,800,000 ha and pesticide importation reached 17,000 tons (Galeano 2017). Pesticide residues have been found in soil, water, bees, and fish samples from agriculture basins (Soutullo et al. 2020; Ernst et al. 2018).

Although glyphosate herbicides have attracted negative public attention due to controversies surrounding their potential effects on human health and the environment, such as carcinogenicity, hormonal disruption, and residuality (Arancibia 2013; Paganelli et al. 2010), other herbicides, insecticides, and fungicides of concern are used throughout the soybean production cycle, such as 2,4-D herbicide, picloram herbicide, chlorpyrifos insecticide, among others (Narbondo and Oyhantcabal 2011; Galeano 2017).

The acute pesticide intoxication rate in Uruguay reached 7.9 per 100,000 inhabitants in the period between 2002 and 2011 (Taran et al. 2018). However, toxicology experts warn that there is a lack of epidemiological knowledge regarding

the effects of chronic exposure to pesticides on population morbidity and mortality (Burger and Pose Román 2012). National studies point to the fact that waged agricultural workers in Uruguay are the most vulnerable to acute and chronic occupational exposure due to the ways in which they are involved with the crop production processes (Burger and Fernández 2004; Burger and Pose Román 2012; Nión and Pereyra 2018; Heinzen and Rodríguez 2016; Taran et al. 2018; Evia 2020). There is also evidence of risk of environmental exposure for people living in rural areas and towns linked to agribusiness in national studies (Burger and Fernández 2004; Burger and Pose Román 2012; Abbate et al. 2017; Taran et al. 2018; Evia 2018; Chiappe 2020).

In 2008, the national government established buffer zones for aerial and terrestrial spraying of crops from towns, rural schools, and watercourses (though, the bill excluded isolated rural homes) (Pérez and Medina 2015). National law also regulates how pesticides should be handled by workers, as well as employers' responsibilities. If reported, misuse of pesticides in agricultural production, in negatively effecting health and in damaging the environment, can lead to fines being imposed by a number of different national ministries. The Uruguayan Human Rights National Institution (*Institución Nacional de Derechos Humanos y Defensoría del Pueblo*, INDDHH) has recognised labour and environmental pesticide exposure as being a human rights concern (INDDHH 2014; 2015; 2018). Despite these advances in acknowledging pesticide exposure to be an issue, little is known about how the most vulnerable social groups experience pesticide toxicity in the Uruguayan soybean expansion context.

Eduardo Menéndez (2008, 2018) has proposed that all social groups have popular knowledge about the illnesses that affect their sociocultural reproduction in the health/sickness/care process. In their daily life, people employ lay criteria to assess risk, vulnerability, and causality in making decisions about how to attend to and prevent diseases and conditions that are identified as threatening (Menéndez 2008). Anthropological and other social studies undertaken within the context of industrial agriculture have highlighted the fact that knowledge about pesticides is mediated by the position of the actors in the production system, through shared socio-cultural representations, and gender relationships. Besides, these studies have shown that the experience of pesticide toxicity among vulnerable social groups is dominated by uncertainty about the potential damages these substances can cause to their bodies and to their environment. This could mean, for example, that those involved in crop production recognise acute signs and symptoms of pesticide toxicity, but often minimise or deny its chronic outcomes (Quandt et al. 1998; Menasche 2004; Gamlin 2016; Saxton 2015; Benson 2008). Ethnographic studies have demonstrated that lay and embodied knowledge is important in experiencing toxicity (Little 2012; Shapiro 2015; Singer 2011; 2016) and in

confronting the techno-scientific habit of asserting uncertainties about exposure (Murphy 2017).

Based on ethnographic research, this Research Article seeks to analyse the embodied experience of toxicity among Uruguayan agricultural workers and rural inhabitants exposed to agricultural pesticides in transgenic soybean production. Building on the approaches developed in Latin American CMA (e.g., Gamlin et al. 2020; Menéndez 2008, 2018), I will attempt to open up the discussion on the experience of toxicity and structural vulnerability, and demonstrate how embodied inequalities in the environmental health of the Anthropocene are shaped by the politics of exposure.

Embodied inequalities: The Latin American sociocultural epidemiology approach

I conducted a 12-month ethnographic study (between September 2016–July 2017 and December 2017–January 2018) in the heart of the agricultural region of the country. This research was inspired by the Latin American sociocultural epidemiology approach (Menéndez 2008; 2018) and combined qualitative and quantitative social science research techniques, with a predominance of ethnographic participant observation in agricultural farms, rural schools, and domestic spaces (Hammersley and Atkinson 1994; Emerson, Fretz, and Shaw 2011). The research questions that guided this study were: firstly, how do the most vulnerable social groups experience agricultural pesticide toxicity in the Uruguayan soybeanisation context? Second, what do they do to prevent and confront toxicity related illnesses and other forms of environmental social suffering? The study focused on pesticide toxicity experiences in two main social groups, waged agricultural workers and rural populations in agribusiness enclaves.

I moved to the city of Dolores, located in the Soriano department in Uruguay at the end of 2016. Soriano is the most agricultural-intensive province in the country (Soutullo et al. 2013; MGAP 2015) and acts as an agribusiness service-hub for large-scale agriculture. In 2011, it had 82,594 inhabitants in 2011, 92% of whom lived in cities, towns, and small villages (OPP 2018). The farming tradition in the region goes back to the early 1800s, when German and British capitalists founded the first ‘modern’ farms in the country with *criollos*¹ acting as labourers. During the late 19th and early 20th centuries, the Uruguayan state promoted immigration and land access policies in order to develop farming projects (Pi Hugarte and Vidart 1969). In the early 2000s, genetically modified soybean was rapidly adopted by farmers due to its high international market prices and demand (Figueredo, Guibert, and Arbeletche 2019). Today, Soriano department has one of the highest

1 A person born in Spanish America of European ancestry.

pesticide intoxication rates (14 per 100,000 inhabitants), almost double that of the national rate (Taran et al. 2018).

The city of Dolores, located along the shore of the San Salvador River (the main freshwater source in the area), has a population of around 20,000 inhabitants. Its landscape is characterised by large metallic grain silos, warehouses for agricultural machinery, and vast expanses of agricultural lands, with a few rural homes dotted in-between the fields of crops. There is a rumour shared by its citizens, from local grocers to doctors, about the city having one of the ‘highest cancer rates’ in the country. This claim is not supported by the official cancer statistical registers of 2007–2011 (Barrios et al. 2014). Nevertheless, people are worried about ‘contaminated products’ that end up in water sources due to agricultural processes (Alonso et al. 2020). Official evidence from water monitoring indicates the presence of substances such as glyphosate, AMPA, chlorpyrifos and atrazine (Cerveto 2016) in the San Salvador River.

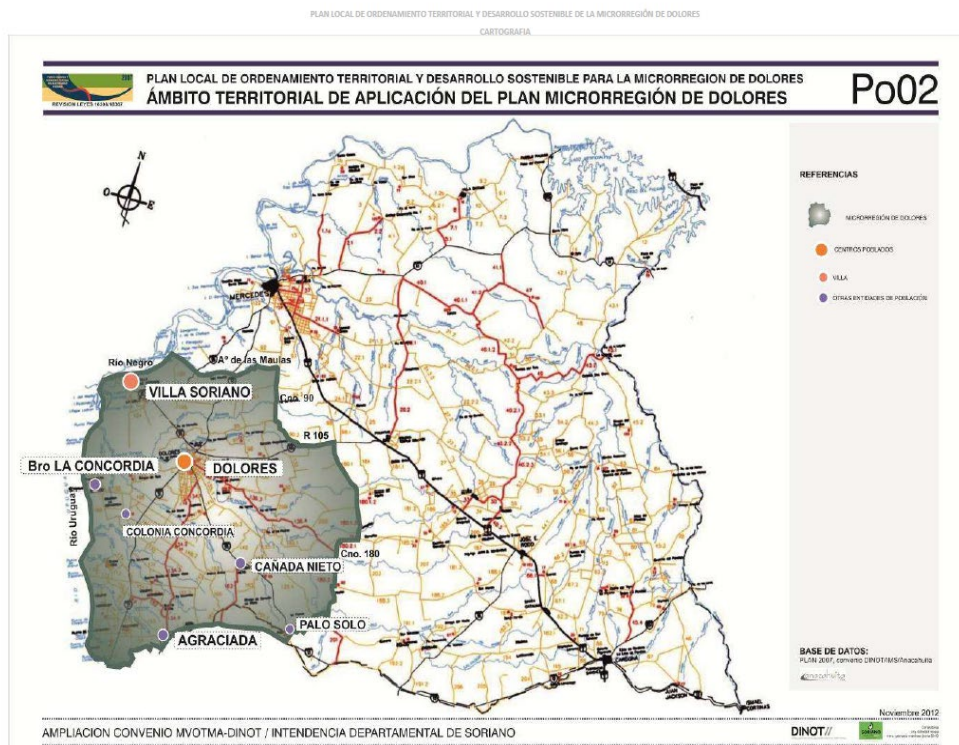


Figure 1: Dolores region, Uruguay. Image retrieved from the Intendencia de Soriano territorial development plan 2013, 58. See <https://www.soriano.gub.uy/ordenamientoTerritorial.html>.

When visiting rural schools and rural healthcare centres in the Dolores region, I met women, children, and smallholder farmers who resided in close proximity to fields where crops had been sprayed with pesticides. In addition to informal visits to rural healthcare centre’ waiting rooms and school entrances, where I conducted informal interviews, I also led three workshops in rural and suburban primary

schools with the participation of teachers, students' mothers, school janitors, and children (Evia 2018). The workshops were inspired by collaborative anthropology (Mora Bayo 2011) and used popular education techniques (Cano 2012) to open up group conversations about their experience of pesticide exposure. Some of the topics discussed encompassed their daily experience of living in an agricultural enclave, including how they perceived production and environmental changes since the process of soybeanisation had begun. I also gauged popular knowledge about agricultural pesticides and their potential hazards. The workshops were attended by 13 rural women (between the ages of 31 and 62 years) and 19 children (between the ages of 5 and 12 years). During fieldwork, I also visited a fourth rural school that had been affected by a wind drift from crop spraying, where I conducted collective and individual interviews with students' parents and staff. These interviews explored social and production relations in the area, health-care trajectories developed to treat symptoms that were experienced after the drift, as well as interpersonal conflicts that emerged after the event.

To have a broader understanding of the soybean production and farm labour processes, I contacted local farmers and agricultural spraying contractors. With the assistance of some local agricultural engineers, I was able to visit some agricultural soybean crop fields and witness the complete production cycle, from sowing, harvesting, monitoring infestations, and pesticide preparation to crop spraying.

I also approached agricultural workers whose main duty was spraying crops. I spoke with 27 men, aged between 25 and 73 years who resided in popular neighbourhoods in the city of Dolores, or in small towns nearby. Open interviews were conducted while workers were engaged in agricultural activities on the land, or at their homes. Sometimes they were interviewed alone, and sometimes alongside their spouses or children, according to their preference. Some of the topics that were discussed during interviews included: labour trajectories, production and environmental changes since soybeanisation, experience of pesticide exposure during work, as well as exposure prevention. When participants mentioned illnesses related to pesticide exposure, the healthcare trajectory, including attention and self-attention practices (see Menéndez 2008), were explored.

The qualitative data produced through this research was complemented with extensive reading of official epidemiological and environmental data concerning intoxication, pesticide regulations, pesticides residues, and claims of pesticide misuse (see also Evia 2022). Other relevant sources such as press articles, local government dispositions, and the health registers of rural clinics were consulted.

Pesticide toxic vulnerability and embodied inequalities

Toxicity emerges in situated biologies and is framed by global and local social hierarchies. In this section, I intend to show how vulnerability to pesticide toxicity is structured in Uruguayan soybeanisation, causing agricultural workers involved in spraying, rural women, and children from agroindustrial enclaves to be most at risk.

Working and spraying in the soybean fields

It was a hot January summer morning when I arrived by truck with the owner of a local agriculture service company to a soybean field that was to be sprayed, located about 20 km from Dolores city. It was a huge expanse of land sown with soybean. I sensed a strong smell even before we got out of the truck. Two middle-aged men, Miguel and Alberto, were already working. Their boss introduced me as a student that ‘wanted to ask some questions’. He emphasised to them that they should pay attention to weather conditions such as wind direction and its speed in order to do a ‘good spraying’. And then, he left.

Miguel was loading water with a pump into a big tank (of around 2,000 litres) in his truck. It was going to be used to prepare the pesticide mixture. Alberto drove the crop sprayer machine known as ‘*mosquito*’, from which he would spray the crop a few metres from where we were standing. Once the water tank was filled, Miguel started to open and mix different pesticides in a smaller tank (of about 200 litres). He prepared this ‘product cocktail’ (including glyphosate, chlorpyrifos, triflumuron, and ammonium sulphate) without gloves, mask, or any other personal protective equipment, mixing it with a long wooden stick. As he poured the different products, he explained to me their functions and which ones he considered to be more dangerous and which ones were ‘innocuous’. While he recognised chlorpyrifos² to be a ‘strong’ and ‘smelly’ product, glyphosate, he believed, was ‘harmless’. Despite being aware of the protective equipment required for crop spraying as stipulated in national labour regulation in Uruguay (he kept some in the truck), he considered that this equipment was not useful during the summer heat. With temperatures rising up to 30–35 °C at midday, he asserted that, ‘Nobody can stand using them’. He added that protective equipment made him work more slowly and mentioned that this was an issue because the more the workers sprayed, the more they could earn. Instead, he preferred to adopt other preventive measures, such as ‘keeping an eye on the wind direction’ to avoid fumes and

2 An organophosphate insecticide. This group ranks first in severe acute poisoning in Uruguay (Taran et al. 2018).

splattering, or washing his hands with water and soap to ‘wash off’ the pesticides from his skin.

When the *mosquito* ran out of product to spray with, Alberto drove over to where Miguel and I were standing. He got out of the crop sprayer and Miguel started to fill up its tank again using the pump. Meanwhile, Alberto rested, smoking a cigarette. After his break, he invited me to join him in the crop sprayer to witness the process from inside the machine. I noticed that the cabin had a comfortable seat, a radio, air conditioner, and a small computer from where Alberto could control the spraying. When we were seated, he complained, ‘Poisons stink!’

At midday, we had lunch in the same field Alberto and I had just sprayed. Miguel prepared an *asado*³ and we ate standing by the fire. I sensed the smell of pesticide all around us. We chatted about what they liked and disliked about this job. They explained that some of the perks included not having the boss around all day, being involved in an outdoor activity, and good salaries. Handling ‘poisons’ was the worst part of the job, they added. They told me about someone they knew who had to stop crop spraying because he ‘got sick from working for such a long time with the poisons’. When I asked if they were not afraid of that happening to them, Alberto answered ‘We are all going to die of something’. Miguel, on the other hand, had been planning to take a break from working with ‘poisons’ for some time, he shared, in order to allow his body to ‘detoxify’.

Specialised spraying activities go hand-in-hand with the soybeanisation process. A growing number of companies were offering spraying services at the time of research, and large agricultural landowners invested in crop-spraying equipment. Both owners and companies contract local young and middle-aged working-class men with a low level of education for spraying tasks (Evia 2020).

The two main technologies used for spraying are aerial spraying and ground application. Aerial spraying carried out using small planes adapted (with a tank and spraying machine) to perform agricultural sprayings. Ground spraying is carried out with a large crop-sprayer machine commonly nicknamed ‘*mosquito*’, because of its shape—it has two long spray booms, reminiscent of the insect. Two main roles can be distinguished in spraying activities: the ‘*aguateros*’ (water carriers) and the ‘*mosquiteros*’ (drivers and operators) as they are colloquially known. The *aguateros* carry fresh water from creeks to mix and dilute the pesticide ‘recipe’ that will be sprayed in the fields. During this process, they are exposed to direct splatters and gaseous fumes. The *mosquiteros* are the *mosquito* drivers who

3 Uruguayan traditional dish, similar to roast beef.

are also responsible for ensuring quality in the spraying process. Although the machines are air-conditioned and have carbon filters, the *mosquiteros* are not free from environmental exposure during their work. They often have to step out the *mosquito* in the middle of a field that is in the process of being sprayed in order to repair something, and often sense the products' smell entering their cabin, as Alberto noticed on the day when we met.

Even though spraying is not a task that any of the men I spoke with would preferably choose, it is nevertheless seen as a good job opportunity. For symbolic and material reasons, agricultural work is seen as 'good work' for men. Agriculture is a traditional and socially valued activity and offers relatively 'good' pay. It is also a highly masculinised sector; men learn to farm from a very young age, going into the fields to 'help' close relatives such as fathers, brothers or uncles in their duties. Sowing and harvesting are the more prestigious duties, sometimes performed directly by farm owners or their relatives. Spraying tasks are seen as the least prestigious, and are usually delegated to waged workers or subcontracted to agriculture service companies. Because it is a less qualified task and they are more exposed to pesticides, the *aguateros* (water carriers) are at the base of this hierarchical pyramid. Working days are long and salaries usually have a productivity bonus that is measured in sprayed area (Evia 2020; Heinzein and Rodríguez 2016). Still, wages for spraying are higher⁴ than in other unqualified jobs available in the region for young and middle-aged working-class men.

'Nobody likes to work with poisons, but I'll do it for a short period while I'm single, to save money', Arturo, a 22-year-old *aguatero* told me during an interview at his home. Two years before we met, he had suffered a chemical burn to his face, as well as respiratory tract issues, while doing the same kind of work as Miguel. He minimised the intoxication event as an 'accident' and after receiving medical treatment, he continued working at the same farm with the expectation of being promoted to a better position.

For men like Miguel or Alberto, who are in their forties, married and with children, it is not that easy to step down from this kind of work. Even though they share a popular belief that working with poisons 'is not a long time gig' because 'in the end' exposure to these products 'can harm you', they still need to provide for their families. The increase in salary that goes hand-in-hand with the soybeanisation process has allowed them to gain access to recreational goods, to buy a car, or even, in some cases, purchase their own houses. Despite this, they said they would still prefer to work on other agricultural tasks rather than crop spraying. They told me they would continue as long 'as their bodies can take it'. This assertion

4 The monthly salary, including productivity bonuses, was around \$1,200 US dollars, in comparison to the national minimum wage, which is just under \$500 US dollars.

conforms with models of hegemonic masculinity in Latin America, which, as De Keijzer (2003) explains, dictate that men should be strong, endure, and provide. Kunin and Lucero's (2020) work on spray workers in Argentina also observed this to be the case. In the meantime, whilst still engaged in crop spraying, the men interviewed said they utilised some commonly adopted preventive measures to try to minimise their exposure without affecting their productivity bonus. These preventive measures are also influenced by how lay persons typically assess and classify the potential danger of different pesticides and their experience of embodied toxicity (Evia 2020), such as that described by Miguel.

These men are highly vulnerable to repeated pesticide exposure in both chronic and acute doses due to their work. Their earning power depends on their productivity and long working hours. They have little control over the production process and practically no control over the technical decisions that govern which chemical products or mixtures are applied. They are also highly dependent on variable conditions to be able to perform their duties. The cultural links between agricultural work and hegemonic masculinity models and how these intersect with working-class conditions also contribute to men such as Miguel and Alberto taking the exposure process for granted, shaping their experience of embodied toxicity.

Sprayings, an everyday matter for rural populations

When I first visited Dolores in 2016, a rural school had recently been affected by spraying and for a few days the incident caught the attention of the local and national press. The aerial drift of pesticide from a nearby crop spraying caused respiratory and skin symptoms among some school children and staff. The incident was reported to the Ministry of Livestock, Agriculture and Fisheries and to the public health services, with both parties intervening in the incident. When I started visiting the school and met the children's parents and school staff, they recounted the drift episode with lots of detail. But after that extraordinary event was recounted, the mothers called my attention to the conditions of daily life in the agricultural area they lived in. For these women, 'pesticide odours', 'drifts', and 'sprayings' were seen as ordinary occurrences now that soybean production had become popular in the region. They said that they 'felt the poisons in the air' when the *mosquitos* were at work in the surrounding fields. Most of the women I spoke to said they suspended outdoor activities and went inside their homes with their children in order to prevent pesticide exposure when this happened, but they had even felt the smell entering their closed homes, or sticking to the laundry that was drying outdoors. They also referred to other indicators of pesticide effects on nature and landscapes, such as the observation of orchards, fruit-trees or other plants turning yellow or brown, as if 'burned' by these products. They shared observations of dead small animals or fish after sprayings, and told me their

worries about the potential poisonous effects of pesticides in domestic water wells. Some women even sensed pesticide smells on their husband's bodies, they noted. 'Spraying and pesticide drifts are an everyday matter', agreed most of the women that I met at other rural schools' workshops and in rural health facilities. The truly extraordinary event, it would seem, was that the drift that affected the school had gained public attention at all.

Most of the people living in these rural areas are families of smallholder farmers or waged workers. While men work on the fields during the day, women and children spend most of the day in domestic and educational spaces. Women take care of the children, clean, cook, work in their orchards, and take care of farm animals. Some of them also have part-time waged labour as domestic workers in landowner's houses, or work at their own small family farms. They have neither the power to decide where soybean plantation crops are grown, nor what chemicals they are going to be sprayed with.

During the summer, when crop sprayings are more frequent, the inhabitants of rural and small villages become 'enveloped by the poison smell'. When the crops are being sprayed they have to lock themselves in their homes to prevent direct exposure to pesticide drift (Evia 2018). In addition to environmental drifts, the women I spoke to stated that pesticide residues could also remain in working men's clothes or even on their skin. As a young mother of two toddlers shared at one of the rural school workshops, her husband worked as a *mosquitero*, and despite showering before entering the house when he returned from work, she could smell the poison when they laid down to sleep. She said that she was worried, but that she could not do much about it.

At the same time, landowners often live far away in capital cities, or, if they do reside in the area, they can vacate the land for some days when the spraying takes place. As Maria, a 60-year-old woman who had worked as a maid in large farms told me, as if it was an indeputable fact, 'People are afraid and don't speak up because the *gringos*⁵ have money and power'. Chatting to me in her backyard, she might not have realised that she was explaining to a younger and city-dwelling anthropology student how a patriarchal agrarian society is structured.

As in other agrarian sectors beyond soybean production, the same families have owned the land and agribusiness companies for many years, predominantly led by men in control of the production process. Alongside this tangible ownership also comes the symbolic power of being able to offer or deny job opportunities or other forms of monetary 'help' (such as donations for maintenance of rural schools), depending on who is seen as supporting or working against their interests. Most

5 'Gringos' is a local way of referring to big farm owners.

people see soybean plantations in the region as a ‘good thing’, because of their direct or indirect relation with sources of employment and good salaries. But for those who are not so in favour of them, it is not easy to share this sentiment more widely. As an *aguatero* told me, despite the fact that he was not comfortable with his working conditions, he was not going to complain to his employer because he knew that ‘those who complain became marked’ and therefore lose employment at a later date. For rural women, it is even harder. In a highly masculinised environment, such as in the context of Uruguayan agriculture (Chiappe 2020, Nion and Pereyra 2018; Abbate et al. 2017), specialised technical knowledge is mainly attributed to men and carries with it prestige and authority. Gender prejudice caused by such assumptions affects the possibility for women to be heard, while embodied experiences communicated by these women about the effects of toxicity are often completely dismissed by society.

To sum up, class, gender, knowledge-power relations surrounding technology, the industrial agricultural productive process, as well as state regulations over urban and rural territories intersect in the production of structural pesticide toxic vulnerability in the studied case. The men who specialise in spraying activities (especially the *aguateros*) are the most vulnerable to direct exposure as a structural condition of the working process. It is an activity over which these men have very little control and one that is imbued with values according to gender norms. Working-class rural inhabitants and small-scale farmers, especially women and children, are most vulnerable to direct and indirect pesticide drifts, either at home or when attending class at rural schools. As I will expand upon in the next section, besides exposure per-se, vulnerability to toxic pesticides is also fed by inequalities in the possibilities available to expressing and attending to pesticide related illnesses.

More than ‘intoxication’: The experience of pesticide toxicity

The identification and diagnosis of pesticide toxicity is plagued by uncertainty because of what Singer (2016, 3) calls ‘the challenge of attribution’. Nevertheless, popular and embodied knowledge, as well as reliance on the senses and felt effects, are important to give meaning to experiences of toxicity that go beyond an expert’s knowledge (Quandt et al. 1998; Little 2012; Shapiro 2015; Singer 2011; 2016; Gamlin 2016; Larrea Killinger et al. 2017). In the studied case, embodied knowledge had a key role in experiences of pesticide toxicity. The senses of smell, taste, and touch were utilised to identify pesticide exposure when self-diagnosing or diagnosing others with illness, and used in lay criteria in regard to self-care and preventive measures.

For example, the intensity of odours serves as a popular classifier for people when attempting to gauge how dangerous a substance is, as the statements of Miguel and Alberto describing their work indicate. Pesticides with stronger smells (e.g., 2,4-D, chlorpyrifos) were believed to require more care in handling than the ones considered, usually with disdain, to be odourless, such as glyphosate (Evia 2020). The ‘poison fumes’ of pesticides known as ‘strong’ or ‘dangerous’ were thought by this group to cause ‘headaches’, ‘irritation’ in the respiratory tract and eyes, ‘allergies’, ‘coughs’ and even ‘dizziness’. Women also relied on their senses as a preventive measure, for example, when they reported that they locked themselves into their homes if they smelled the poisons. Nevertheless, if the symptoms remained within a range interpreted as ‘mild’, people did not seek specialised healthcare, and went on with their normal life with the assistance of self-care practices (Menéndez 2008, 2018).

As Das and Das state, ‘experiences of illness move between the ordinary and the extraordinary’ (Das and Das 2007, 70). This was also the case for the experience of pesticide toxicity for rural women and working men from Dolores. On one end of the spectrum, human and environmental exposure to pesticides was identified, but absorbed and endured as part of the normal flow of life in an agrarian region. On the other end, pesticide exposure and toxicity were recognised as a problem worthy of attention and care-seeking provision. In those cases, the consequences of pesticide exposure shifted from the realm of the ordinary and became extraordinary, showing the profound social conditions of illness and suffering (Das and Das 2007).

In this section, I argue that from the perspective of sociocultural epidemiology (Menéndez 2008), experiences of pesticide toxicity transcend the biomedical diagnosis of intoxication and include a continuum of illnesses and environmental toxic harm. Depending on how these experiences are popularly classified, they may be endured and normalised, or recognised as a problem worthy of attention. In each case, different healthcare trajectories may be sought after and adopted, depending on the point in said continuum.

Endured and normalised illnesses

As discussed above, acute and chronic occupational exposure to pesticides such as spills, splats, and toxic fumes are normalised by the people I spoke with as inherent components of working conditions associated with crop spraying. Workers employed to spray crops recognise that, ‘All day long you work among the poison’. In addition, working long hours outdoors in tasks that require physical effort make it more difficult to distinguish the causes of symptoms like ‘losing strength’, ‘muscle cramps’ or ‘body pain’, at the end of the working day. The normalisation of certain conditions in the face of occupational exposure to

agricultural pesticides in other monocultures in Latin American contexts has also been reported (Calvario 2007; Gamlin 2016; Kunin and Lucero 2020; Nión and Pereyra 2018).

In addition to this, pesticides odours are perceived as ordinary events for rural populations, and the most frequently adopted measure taken by the people I spoke to was to go inside their homes to prevent direct exposure. Despite women feeling some symptoms, they did not pay much attention to themselves, prioritising their domestic and caring responsibilities. As a small-scale family farmer and mother of two told me, ‘sometimes I have headaches from smelling the poisons, but I don’t pay attention to them. I don’t have time to be ill’.

Latin American medical anthropologist Eduardo Menéndez (2018) suggested in connection with the henequen industry in Yucatan (Mexico), that the naturalisation of illnesses can be understood as a strategy of self-exploitation developed by people to endure working conditions, operating in a context of strong economic and social dependence on a monoculture or plantation production model. The same conclusion can be drawn in the context of the soybeanisation process. As other sociocultural epidemiology studies have shown, for people to endure these conditions, women have a key role in the self-care processes (Gamlin et al. 2020; Menéndez 2018). For example, most of the workers I spoke with reported that when they returned home from work and felt ‘tired’, their spouses or mothers would take care of them, preparing them food, washing their clothes, giving them painkillers, and taking care of the children while they rested.

For Latin America’s rural working classes, self-care and endurance is part of a long-lasting history of subaltern resistance to colonial and extractivist relations in their territories. Endurance and self-care are fundamental for social reproduction. Paradoxically, they are also forms of self-exploitation that enable the perpetuation of the dominant agribusiness extractivist model, and rural women seem to be bearing most of its burden.

Illnesses worthy of attention

Although most of the experiences of exposure were naturalised and endured as part of ordinary life, some became extraordinary and were told to me in a special way, with more time and detail. I learned to distinguish between different types of conditions or events. This was informed by the stories that people drew my attention to, related to pesticide exposure. Particularly instructive were the stories that they dedicated more effort to tell, in which exposure had led them to healthcare trajectories that demanded more than self-care measures. These helped me identify three main types that were popularly considered illnesses worthy of attention. Those are: first, acute and severe pesticide intoxications; second,

emergent illnesses that were interpreted as the result of chronic and cumulative poisoning, and; thirdly, conflicts caused by environmental and toxic suffering.

The decision of when, how, and whom to look to for help was generally made by women, who have a key role along the healthcare seeking trajectory. In assessing which professional care, treatment or alternative forms of aid to seek, women considered the following: firstly, they gauged the severity, intensity, and duration of symptoms or moral damage incurred and secondly, they undertook a social assessment of the affected vulnerability. For example, children are socially considered to be more vulnerable to illnesses than men. Therefore, if a man has a headache this symptom would probably be considered irrelevant. But if a child has it, it may activate a healthcare seeking trajectory.

Episodes of acute pesticide exposure that lead to symptoms considered severe, such as vomiting, severe skin burns or shortness of breath were commonly known as 'intoxications'. When it was decided to seek professional treatment, local private and public biomedical care services were consulted. There was a popular consensus that biomedicine was suitable for the treatment of these conditions. Rural health services⁶ were visited for non-urgent ailments, but in cases of severe symptoms, people went directly to the emergency room located at Dolores private or public hospital (20 to 30 minutes away by car from most rural areas in the region). The availability of time, money, and transport determined access to healthcare services, especially considering how scarce public transport is.

Take the example of Arturo. A few hours after suffering a chemical burn to his face and respiratory tract, he consulted the emergency department at the Dolores private hospital. He had arrived home after being in the fields all day preparing the pesticide mix and was feeling hot and tired. He attributed these symptoms to a long day working outdoors in the heat of the sun. But when the itching on his skin became unbearable, his mother recommended that he go to the hospital, and his father drove him there. He received ambulatory medical attention, was prescribed medicine and two days of sick leave, after which he returned to the same task as before. Although he received a 'chemical burn' diagnosis, he didn't know if the incident was reported to the National Intoxication Centre (CIAT). The CIAT reports that 35.9% of pesticide acute intoxication cases between the period of 2002 and 2011 are a consequence of exposure during work (Taran et al. 2018). But when

6 In Uruguay, 97.5% of the population has health coverage through the National Healthcare Integrated System (INE 2011). In the Dolores region, while the main biomedical health services are located in the city of Dolores proper, there are also rural health services (MSP 2017) in minor towns with a nurse and a general physician available on a reduced schedule.

speaking with workers and visiting rural healthcare services I became aware that many intoxication events remain unreported.

As disclosed in the conversation with Miguel and Alberto I described earlier, there is a popular consensus among those who participated in this study that certain illnesses are a consequence of long-term exposure to pesticides at work. In conversation with research participants, problems such as 'getting intoxicated on the inside' or 'having the bones affected by poison', were associated with men 'who worked with poisons for a long time'. This also correlates with shared knowledge about preventive health measures I came across. During conversations and workshops, people recounted many stories to me about men falling ill because they had worked for a long period of time with poisons. I personally knew of five men that were in this situation, which gave me the opportunity to reconstruct their healthcare trajectory with them and their families. Due to the scope of this paper, I am unable to present each one here in full, but I will share the common findings among them.

According to the people I spoke to for my research, pesticides are commonly thought to enter the body mainly by the respiratory tract, by 'breathing the gas' or inhaling the 'poison smell', and by absorption through the skin, where the pesticide 'penetrates through the pores'. Loss of strength, tiredness, cramps, weight loss, and weakness were interpreted as warning signs of chronic and cumulative pesticide poisoning, which was described as 'being intoxicated on the inside' and attributed as a cause of cancer. It is believed that poison entering the body starts to 'consume' it, or 'dry it out' in a slow process of deterioration, which reaches its maximum level when 'the bones are affected' by the poison. When the poison 'gets to the bones', it is often assumed to be cancer. Biomedical assistance is only sought after some of these severe symptoms present themselves and have been identified as a warning sign.

Cancer and chronic poisoning healthcare seeking trajectories usually involve the patient consulting different medical specialists and undergoing lab tests (some which involve visits to Montevideo, the capital city of Uruguay). This requires costs in terms of time and money for those affected. Biomedical diagnosis does not typically search for associations between the symptoms presented and pesticide exposure in work environments. Associating pesticides with illness is known to be an epistemic challenge in the field of environmental health because a clear causal link is hard to determine (Singer 2016; Nading 2020; Stein and Luna 2021). Nevertheless, patients and their families interpreted negative health outcomes as consequences of chronic pesticide exposure at work. The metaphors used by the people I spoke with of penetration and concentration of poisons in the body, in the blood or even in the bones denote lay knowledge about the chronic and cumulative

damages of pesticides. Popular knowledge about these consequences may be surprising considering that most of the literature argues that social groups exposed to pesticides tend to recognise acute symptoms, but have little knowledge of the exposure's potential chronic damage (Quandt et al. 1998; Menasche 2004; Gamlin 2016; Saxton 2015; Benson 2008).

In addition to stories about acute and chronic poisoning, other conflicts caused by environmental pesticides exposure were also recounted in a special way. Rural inhabitants often confided in me about the anger and sadness they felt when their gardens or crops were burned because of herbicide drift, and showed concern for the potential health effects of children's pesticide exposure. They also shared feelings of frustration and helplessness about repeated spraying drifts nearby rural homes or schools. Little (2012, 432) proposes that living in a toxic environment entangles contamination, ecology, emotion, and affects. In my view, the interpersonal conflicts triggered by the pesticide contamination in the locality and the bodily and emotional affliction it causes can be understood as a form of environmental and toxic suffering (Singer 2011; Renfrew 2017).

Most of the time, the local population endured the suffering caused by exposure to harmful pesticides without resorting to action. But when harm was perceived to be severe or exceeding the local moral criteria of acceptable damage, some forms of social action took place. In the case of the school exposed to pesticide drift mentioned earlier, an official complaint was raised with the Ministry of Agriculture, which regulates pesticide usage. Even though pesticides sprayings are 'an everyday matter' in the region, as I was told, the fact that the incident took place at a rural school made a moral and legal difference in the decision to raise a complaint. Spraying distances from rural schools are regulated by law, and the community identifies schools as places that should be protected, as children spend a significant part of the day there.

After the complaint was lodged, almost half of the children were diagnosed by the local public health services with a 'mild intoxication'. An official inspection by staff from the Ministry of Agriculture confirmed through laboratory testing of soil and plant samples that a chemical drift had occurred. As a consequence of this, the farmers involved had to pay a fine. Nevertheless, denials continued to be issued by the actors working in the interests of agribusiness, such as agricultural engineers. In addition, directives from the main regional farm association continued to deny the drift and spread rumours that food poisoning was, in fact, the cause of illness at the school. Local big farmers also slandered school staff and parents, accusing them of 'exaggerating'. The crop-spraying company's owner even put out a statement in a national newspaper in which the school teacher who raised the complaint was labelled as 'crazy' (Gyurkovits 2016). Some local farm

owners also suspended regular ‘collaborations’ with the school and donations for school maintenance.

Talking with an affected student’s mother a year after the incident, she expressed doubts about formal complaints being a good strategy. ‘After everything that happened, they continued spraying and everything stayed the same, except for losing their donations’, she told me. Presenting an official complaint had meant breaking with the local hegemonic agribusiness status quo that normalises the socio-environmental impacts of the dominant agriculture technological package. Those who complained became marked as going against the interests of agribusiness. In a context where the local economy depends on this model of production for survival, this also symbolises going against their own community.

Conclusion

By analysing the experience of pesticide toxicity in Uruguayan transgenic soybean plantations, this Research Article contributes to existing scholarship that has elaborated on how toxicity emerges in situated socialities, landscapes, and socio-technical relations of the ‘patchy’ and ‘chemical’ Anthropocene. For understanding the particularities of how inequalities of the Anthropocene shape toxicity experiences in plantation soybean agribusiness scenarios, I put into dialogue the concept of structural vulnerability (Quesada, Hart, and Bourgois 2011) with Nading’s (2020) conceptualisation of toxicity and Latin American sociocultural epidemiological methodology (Menéndez 2008, 2018).

The transgenic soybean agribusiness and its toxic effects have repercussions for both human and non-human inhabitants and forms of life. It is therefore shaping embodied inequalities of health in the Anthropocene, particularly in the Southern Cone of Latin America. In this Research Article, I have demonstrated how toxic vulnerability to pesticides is structured in the studied case. In a region such as Dolores, which is dependent on soybean agribusiness, toxic vulnerability is structurally imposed by a dominant industrial agriculture technological package (Cáceres 2018) as well as by the social hierarchies and economic relations that sustain such modes of production. Class, gender, and knowledge-power relations surrounding agricultural technology, as well as state regulations over urban and rural territories as well as land use, intersect in the creation of systemic vulnerability to pesticide exposure. Pesticide vulnerability goes beyond exposure vulnerability and is also fed by inequalities that shape the possibility of people perceiving and enunciating pesticide-related illnesses and articulating their concerns accordingly. Agricultural workers employed in crop spraying and rural inhabitants (especially women and children) from agro-industrial enclaves are suffering most of the burden.

Following Latin American sociocultural epidemiology approaches, particularly the work of Eduardo Menéndez (2008, 2018), this research has collected data on popular and embodied knowledge regarding pesticides, senses, and affects and has analysed the experiences of toxicity of members of some of the most vulnerable social groups in the region of Dolores. I have demonstrated that the embodied experience of pesticide toxicity transcends the biomedical diagnoses of 'intoxication', and encompasses the deterioration of the environments in which daily life develops, interpersonal conflicts, challenging conditions that are normalised and endured as part of daily life, as well as chronic health problems. Environmental health and toxic suffering can be understood as part of a continuum in which daily life goes on with the help of informal self-care networks and strategies of endurance that are commonly employed by individuals. In this study, I have shown that preventive and self-help practices were being used within subaltern groups, and that they were popularly acknowledged as a means to 'endure' the problems they faced in pesticide exposure. Asymmetric relations, however, between the hegemonic local agribusiness concerns and subaltern social groups perpetuate the situation in which these problems are normalised and silenced on a local and national level, as well as in public debate.

By analysing toxic vulnerability, experiences of embodied toxicity, and popular sociocultural knowledge regarding pesticides from a Latin American Critical Medical Anthropology perspective, this Research Article intends to call attention to the effects of the soybeanisation process on collective environmental health. It is also intended to contribute to public discussion, by speaking out against the prevalent politics of normalising pesticide exposure, and make visible the concerns of intoxication processes brought about by the dominant industrial model of agriculture.

Authorship statement

Victoria Evia is the sole author of the article.

Ethics statement

This study received approval from the Ethics Committee from the Faculty of Humanities and Educational Sciences at the University of the Republic of Uruguay. There is no conflict of interest involved in the research conducted. All names used in the article are pseudonyms.

Acknowledgements

I would like to thank to agricultural workers and rural women who kindly took the time to reflect on their experiences and share their views. I would also like to thank to the members of the CIESAS Anthropology of Health and Illness specialisation line for their valuable insights during research, especially to Professor Lina Berrio who supervised this work. The research conducted for this article was possible thanks to the support of a doctoral grant from the Mexican National Science and Technology Council. Further reflections were possible thanks to the Uruguayan National Research System and the University of the Republic of Uruguay support. Finally, I would like to thank the MAT editors and the three anonymous reviewers for their helpful remarks and suggestions.

About the author

Victoria Evia holds a PhD in Anthropology from the Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS, Mexico), where she specialised in Anthropology of Health and Illness. She is an Assistant Professor at the Institute of Anthropological Sciences of the Faculty of Humanities and Educational Sciences at the University of the Republic of Uruguay, where she teaches undergraduate and postgraduate courses and conducts research.

References

- Abbate, Silvana, Horacio Heinzen, Nicolás Rodríguez, Andrés Villar, Andrés Fonsalía, Jimena Heinzen, Marcos Colazzo, Silvina Niell, and Lucia Pareja. 2017. *Agroquímicos, salud laboral y ambiental: diálogo de saberes y búsqueda de alternativas en una comunidad urbana del litoral del país*. Montevideo: Universidad de la República, CSIC Ediciones Universitarias.
- Almeida, Vicente Eduardo Soares de, Karen Friedrich, Alan Freihof Tygel, Leonardo Melgarejo, and Fernando Ferreira Carneiro. 2017. 'Use of Genetically Modified Crops and Pesticides in Brazil: Growing Hazards'. *Ciência & Saúde Coletiva* 22 (10): 3333–39. <https://doi.org/10.1590/1413-812320172210.17112017>.
- Alonso, Jimena, Federico Quintans, Javier Taks, Daniel Conde, Guillermo Chalar, Silvia Bonilla, Rafael Arocena, and Signe Haakonsson. 2020. 'Calidad del agua en Uruguay: Actualidad y desafíos'. In *Water Quality in the Americas: Risks and Opportunities*, edited by Katherine Vammen, Heny Vaux, and Adriana de la Cruz Molina, 561–97. Mexico: Interamerican Network of National Academies of Sciences-IANAS/UNESCO.

<https://ianas.org/wp-content/uploads/2021/09/Water-quality-in-the-Americas-A-survey.pdf>.

- Arancibia, Florencia. 2013. 'Challenging the Bioeconomy: The Dynamics of Collective Action in Argentina'. *Technology in Society* 35 (2): 79–92. <https://doi.org/10.1016/j.techsoc.2013.01.008>.
- Arancibia, Florencia, Renata Campos Motta, and Peter Clausing. 2020. 'The Neglected Burden of Agricultural Intensification: A Contribution to The Debate on Land-use Change'. *Journal of Land Use Science* 15 (2–3): 235–51. <https://doi.org/10.1080/1747423X.2019.1659431>.
- Avila-Vazquez, Medardo, Flavia S. Difilippo, Bryan Mac Lean, Eduardo Maturano and Agustina Etchegoyen. 2018. 'Environmental Exposure to Glyphosate and Reproductive Health Impacts in Agricultural Population of Argentina'. *Journal of Environmental Protection* 9 (3): 241. <http://doi.org/10.4236/jep.2018.93016>.
- Barrios, Enrique, Mariela Garau, R. Alonso, and C. Musetti. 2014. *IV Atlas de Incidencia del cáncer en el Uruguay 2007–2011*. Montevideo: Comisión Honoraria de Lucha Contra el Cáncer.
- Benson, Peter. 2008. 'El campo: Faciality and Structural Violence in Farm Labor Camps'. *Cultural Anthropology* 23 (4): 589–629. <https://doi.org/10.1111/j.1548-1360.2008.00020.x>.
- Berger, Mauricio and Francisco Ortega. 2010. 'Populations Exposed to Agrotoxics: Citizens' Self-organization in the Defense of Life and Health, Córdoba City, Argentina'. *Physis: Revista de Saúde Coletiva* 20 (1): 119–43. <https://doi.org/10.1590/S0103-73312010000100008>.
- Bochner, Rosany. 2007. 'Sistema Nacional de Informações Tóxico-Farmacológicas SINITOX e as intoxicações humanas por agrotóxicos no Brasil'. *Ciência & Saúde Coletiva* 12: 73–89 <http://doi.org/10.1590/S1413-81232007000100012>.
- Burger, Mabel and Salomé Fernández. 2004. 'Exposición al herbicida glifosato: aspectos clínicos toxicológicos'. *Revista Médica del Uruguay* 20 (3): 202–7.
- Burger, Mabel and Darío Pose Román, eds. 2012. *Plaguicidas salud y ambiente: experiencia en Uruguay*. Montevideo: Universidad de la República.
- Cáceres, Daniel M. 2018. 'Biotecnología y poder. ¿Usan los cultivos transgénicos menos agroquímicos?' *Revista Interdisciplinaria de Estudios Agrarios* 48: 29–56. <http://www.ciea.com.ar/revista-interdisciplinaria-de-estudios-agrarios/revista-n>.
- Calvario, José Eduardo. 2007. 'Masculinidad, riesgos y padecimientos laborales: Jornaleros agrícolas del poblado Miguel Alemán, Sonora'. *Región y sociedad* 19 (40): 39–72.
- Cano, Agustín. 2012. 'La metodología de taller en los procesos de educación popular'. *Revista latinoamericana de Metodología de las Ciencias Sociales* 2 (2): 22–51. http://www.memoria.fahce.unlp.edu.ar/art_revistas/pr.5653/pr.5653.pdf.

- Cerveto, Guillermo. 2016. 'Plan de Monitoreo río San Salvador. Informe de actividades y presentación de resultados. 2015'. Montevideo: Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente.
- Chiappe, Marta. 2020. 'Conflictos por uso de agroquímicos: el papel de las mujeres rurales en Uruguay'. *Agrociencia Uruguay* 24 (1): 1–15. <https://doi.org/10.31285/agro.24.352>.
- Das, Veena and Ranendra K. Das. 2007. 'How the Body Speaks: Illness and the Lifeworld Among the Urban Poor'. In *Subjectivity: Ethnographic Investigations*, edited by Joao Biehl, Biron Good, and Arthur Kleinman, 66–97. Oakland: University of California.
- De Keijzer, Benno. 2003. 'Hasta donde el cuerpo aguante: género, cuerpo y salud masculina'. En *La salud como derecho ciudadano: perspectivas y propuestas desde América Latina*, edited by Carlos Cáceres, Marcos Cueto, Miguel Ramon, and Sandra Vallenias, 137–52. Lima: Universidad Peruana Cayetano Heredia.
- Emerson, Robert M., Rachel I. Fretz and Linda L. Shaw. 2011. *Writing Ethnographic Fieldnotes*. Second Edition. Chicago, IL: University of Chicago Press.
- Ernst, Federico, Beatriz Alonso, Marcos Colazzo, Lucia Pareja, Verónica Cesio, Alfredo Pereira, Alejandro Márquez, et al. 2018. 'Occurrence of Pesticide Residues in Fish from South American Rainfed Agroecosystems'. *Science of the Total Environment* 631–632: 169–79. <https://doi.org/10.1016/j.scitotenv.2018.02.320>.
- Evia, Victoria. 2018. 'Saberes y experiencias sobre la exposición a plaguicidas entre mujeres que residen en contextos agrícolas en Soriano, Uruguay'. *Revista Trama* (9): 13–35.
- Evia, Victoria. 2020. 'Venenos, curas y matayuyos. Trabajadores agrícolas y saberes sobre plaguicidas en Uruguay'. *Revista de Ciencias Sociales* 34 (48): 67–92. <https://doi.org/10.26489/rvs.v34i48.3>.
- Evia, Victoria. 2022. 'Entre denunciar y aguantar. Sojización, plaguicidas y participación en salud ambiental en Uruguay'. *Saúde em Debate* 46 (2): 62–74. <https://doi.org/10.1590/0103-11042022E204>.
- Figueredo, Soledad, Martine Guibert, and Pedro Arbeletche. 2019. 'Ciclo sojero y estrategias de los actores de la producción agropecuaria en el litoral uruguayo'. *Eutopía. Revista de Desarrollo Económico Territorial* 16: 99–118. <https://doi.org/10.17141/eutopia.16.2019.4103>.
- Galeano, Pablo. 2017. *20 años de cultivos transgénicos en Uruguay*. Montevideo: REDES AT.
- Gamlin, Jennie, Jean Segata, Lina Berrio, Sahra Gibbon, and Francisco Ortega. 2021. 'Centring a Critical Medical Anthropology of COVID-19 in Global Health Discourse'. *BMJ Global Health* 6 (6): 1–5. <http://doi.org/10.1136/bmjgh-2021-006132>.

- Gamlin, Jennie, Sahra Gibbon, Paola Sesia, and Lina Berrio, eds. 2020. *Critical Medical Anthropology in Latin America: Trends, Contributions, Possibilities*. London: UCL Press.
- Gamlin, Jennie. 2016. 'Huichol Migrant Laborers and Pesticides: Structural Violence and Cultural Confounders'. *Medical Anthropology Quarterly* 30 (3): 303–20. <https://doi.org/10.1111/maq.12249>.
- Gras, Carla and Valeria Hernández. 2013. *El agro como negocio. Producción, sociedad y territorios en la globalización*. Buenos Aires: Biblos.
- Gyurkovits, Federico. 2016. 'La mala educación'. *Brecha*, October 7, 2016. <https://brecha.com.uy/la-mala-educacion/>.
- Hammersley, Martyn and Paul Atkinson. 1994. *Etnografía: métodos de investigación*. Barcelona: Paidós.
- Haraway, Donna, Noboru Ishikawa, Scott F. Gilbert, Kenneth Olwig, Anna L. Tsing, and Nils Bubandt. 2016. 'Anthropologists Are Talking – About the Anthropocene'. *Ethnos* 81 (3): 535–64. <https://doi.org/10.1080/00141844.2015.1105838>.
- Heinzen, Jimena and Nicolás Rodríguez. 2016. 'Procesos destructores para la salud vinculados a la manipulación de agroquímicos en trabajadores agrícolas de Young, Uruguay'. *Ciencia & trabajo* 18 (56): 117–23. <http://dx.doi.org/10.4067/S0718-24492016000200007>.
- Holmes, Seth M. 2011. 'Structural Vulnerability and Hierarchies of Ethnicity and Citizenship on the Farm'. *Medical Anthropology* 30 (4): 425–49. <https://doi.org/10.1080/01459740.2011.576728>.
- INDDHH. 2014. 'Uso de agroquímicos en Uruguay y políticas públicas: un espacio de intercambio entre el Estado y la sociedad civil'. Guichón, Paysandú: INDDHH. <https://www.gub.uy/institucion-nacional-derechos-humanos-uruguay/comunicacion/publicaciones/uso-agroquimicos-uruguay-politicas-publicas-espacio-intercambio-entre>.
- INDDHH. 2015. 'Resolución de la Institución Nacional de Derechos Humanos y Defensoría del Pueblo (INDDHH) sobre uso de agroquímicos 327–2015'.
- INDDHH. 2018. 'Resolución de la Institución Nacional de Derechos Humanos y Defensoría del Pueblo (INDDHH) sobre medio ambiente y salud laboral en el departamento de Treinta y Tres. Resolución 627/018'. <https://www.gub.uy/institucion-nacional-derechos-humanos-uruguay/institucional/informacion-gestion/resoluciones/resolucion-n-627018-recomendaciones>.
- INE. 2011. 'Principales resultados de la Encuesta Continua de Hogares 2011'. Montevideo: Instituto Nacional de Estadística.
- Intendencia de Soriano. 2013. *Plan local de ordenamiento territorial y desarrollo sostenible de la Microrregión de Dolores*. <https://www.soriano.gub.uy/ordenamientoTerritorial.html>.

- Kunin, Johana, and Paula Aldana Lucero. 2020. 'Percepción social del riesgo y dinámicas de género en la producción agrícola basada en plaguicidas en la pampa húmeda Argentina'. *Sexualidad, Salud y Sociedad* 35: 58–81. <https://doi.org/10.1590/1984-6487.sess.2020.35.04.a>.
- Kunin, Johana, Fátima Pérez, Mariana Pieroni, Guillermo Hough, and Damián Verzeñassi. 2019. 'Desigualdad medioambiental en la pampa húmeda argentina: metodologías cualitativa y cuantitativa para evaluar la exposición a pesticidas de estudiantes de una escuela rural'. *L'Ordinaire des Amériques* 225. <https://doi.org/10.4000/orda.5351>.
- Lantieri, María Josefina, Roberto Meyer Paz, Mariana Butinof, Ricardo Fernández, María Inés Stimolo, and María del Pilar Díaz. 2009. 'Exposición a plaguicidas en agroaplicadores terrestres de la provincia de Córdoba, Argentina: factores condicionantes'. *Agriscientia* 26 (2): 43–54. <https://revistas.unc.edu.ar/index.php/agris/article/view/2753/2181>.
- Larrea-Killinger, Cristina, Araceli Muñoz, Jaume Mascaró, Eva Zafra, and Miquel Porta. 2017. 'Discourses On the Toxic Effects of Internal Chemical Contamination in Catalonia, Spain'. *Medical Anthropology* 36 (2): 125–40. <https://doi.org/10.1080/01459740.2016.1182999>.
- Little, Peter C. 2012. 'Another Angle on Pollution Experience: Toward an Anthropology of the Emotional Ecology of Risk Mitigation'. *Ethos* 40 (4): 431–52. <https://doi.org/10.1111/j.1548-1352.2012.01269.x>.
- Menasche, Renata. 2004. 'Capinar: verbo conjugado no feminino? Notas de pesquisa sobre gênero e percepções de risco na agricultura familiar'. *Cuadernos de desarrollo rural* 1 (53): 25–36.
- Menéndez, Eduardo L. 2008. 'Epidemiología sociocultural: propuestas y posibilidades'. *Región y sociedad* 20 (2): 1–49.
- Menéndez, Eduardo L. 2018. *Poder, Estratificación Social y Salud. Análisis de las Condiciones Sociales y Económicas de la Enfermedad en Yucatán*. Tarragona: URV Publicacions.
- MGAP. 2015. *Regiones agropecuarias del Uruguay*. Montevideo: Estadísticas Agropecuarias DIEA.
- Mora Bayo, Mariana. 2011. 'Producción de conocimientos en el terreno de la autonomía. La investigación como tema de debate político'. In *Luchas 'muy otras'*, edited by Bruno Baronnet, Mariana Mora Bayo, and Richard Stahler-Sholk, 79–110. Ciudad de México: UAM, CIESAS. <https://zapatismoyautonomia.files.wordpress.com/2013/12/luchas-muy-otras-2011.pdf>
- MSP. 2017. 'Infosalud Soriano. Principales indicadores demográficos, socioeconómicos, epidemiológicos y de producción asistencial'. Ministerio de Salud Pública. <https://www.gub.uy/ministerio-salud-publica/comunicacion/publicaciones/boletin-informativo-soriano>.

- Murphy, Michelle. 2017. 'Alterlife and Decolonial Chemical Relations'. *Cultural Anthropology* 32 (4): 494–503. <https://doi.org/10.14506/ca32.4.02>.
- Nading, Alex M. 2020. 'Living in a Toxic World'. *Annual Review of Anthropology* 49 (1): 209–24. <https://doi.org/10.1146/annurev-anthro-010220-074557>.
- Narbondó, Ignacio and Gabriel Oyhanncabal. 2011. *Radiografía del agronegocio sojero: descripción de los principales actores y de los impactos socio-económicos en Uruguay*. Montevideo: REDES AT.
- Ni6n, Soledad and Valentina Pereyra. 2018. 'Construcci6n social del riesgo en el agro uruguayo: desafíos a la actividad sindical'. *Salud Colectiva* 14 (4): 743–55. <https://doi.org/10.18294/sc.2018.1385>.
- Paganelli, Alejandra, Victoria Gnazzo, Helena Acosta, Silvia L. L6pez, and Andr6s E. Carrasco. 2010. 'Glyphosate-based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling'. *Chemical Research in Toxicology* 23 (10): 1586–95. <https://doi.org/10.1021/tx1001749>.
- P6rez, Milka and Rosana Medina. 2015. 'Derechos humanos y uso de agroquímicos en Uruguay: articulaci6n entre el Estado y la Sociedad Civil'. Paper presented at XIV Encuentro Internacional de Derecho Ambiental, Buenos Aires, September 30, 2015.
- Pi Hugarte, Renzo and Daniel Vidart. 1969. *El legado de los inmigrantes I*. Montevideo: Nuestra Tierra.
- Prüss-Üstün, Annette, J. Wolf, Carlos F. Corvalán, Robert Bos and Maria Neira. 2016. *Preventing Disease through Healthy Environments: A Global Assessment of the Burden of Disease from Environmental Risks*. 2nd edition. Geneva, Switzerland: World Health Organization.
- Quandt, Sara A., Thomas A. Arcury, Colin K. Austin, and Rosa M. Saavedra. 1998. 'Farmworker and farmer perceptions of farmworker agricultural chemical exposure in North Carolina'. *Human Organization* 57 (3): 359–68.
- Quesada, James, Laurie Kain Hart, and Philippe Bourgois. 2011 'Structural Vulnerability and Health: Latino Migrant Laborers in the United States'. *Medical Anthropology* 30 (4): 339–62. <https://doi.org/10.1080/01459740.2011.576725>.
- Renfrew, Daniel. 2017 'Spectral Science: Tracing the Conflict Zones of Uruguayan Lead Poisoning'. *Culture, Theory and Critique* 58 (4): 375–90. <https://doi.org/10.1080/14735784.2017.1356739>.
- Saxton, Dvera I. 2015. 'Ethnographic Movement Methods: Anthropology Takes on the Pesticide Industry'. *Journal of Political Ecology* 22 (1): 368–88. <https://doi.org/10.2458/v22i1.21114>.
- Shapiro, Nicholas. 2015. 'Attuning to the Chemosphere: Domestic Formaldehyde, Bodily Reasoning, and the Chemical Sublime'. *Cultural Anthropology* 30 (3): 368–93. <https://doi.org/10.14506/ca30.3.02>.

- Singer, Merrill. 2011. 'Down Cancer Alley: The Lived Experience of Health and Environmental Suffering in Louisiana's Chemical Corridor'. *Medical Anthropology Quarterly* 25 (2): 141–63. <https://doi.org/10.1111/j.1548-1387.2011.01154.x>.
- Singer, Merrill. 2016. 'Introduction'. In *A Companion to the Anthropology of Environmental Health*, edited by Merrill Singer, 1–17. Malden, MA: Wiley-Blackwell.
- Soutullo, Alvaro, Gabriel Oyhantcabal, Carlos Santos, Mariana Nin, Pedro Arbeletche, Marcel Achkar, Carolina Faccio, and Alejandro Brazeiro. 2013. 'Impactos socioambientales de la expansión agrícola en Uruguay: una mirada interdisciplinaria al proceso de "sojización"'. In *Evaluación de los cambios de estado en ecosistemas degradados de Iberoamérica*, edited by Lucas Fernández Reyes y Alejandra Vanina Volpedo, 73–90. Buenos Aires: CYTED.
- Soutullo, Alvaro, Mariana Ríos, Natalia Zaldúa, and Franco Teixeira-de-Mello. 2020. 'Soybean Expansion and the Challenge of the Coexistence of Agribusiness with Local Production and Conservation Initiatives: Pesticides in a Ramsar Site in Uruguay'. *Environmental Conservation* 47 (2): 97–103. <https://doi.org/10.1017/S0376892920000089>.
- Stein, Serena and Jessie Luna. 2021. 'Toxic Sensorium: Agrochemicals in the African Anthropocene'. *Environment and Society* 12 (1): 87–107. <https://doi.org/10.3167/ares.2021.120106>.
- Taran, Laura, Carlos Ortega, Raquel González, Darío Pose, Alba Negrín, Raquel De Souza, Silvana Couto, María José Moll, and Adriana Sosa. 2018. 'Casuística del CIAT. Intoxicaciones por plaguicidas agrícolas y veterinarios 2002-2011'. In *Plaguicidas: toxicología clínica, laboral y ambiental. Departamento de toxicología. Facultad de Medicina. Universidad de la República*, edited by Amalia Laborde, 228–55. Montevideo: Universidad de la República.
- Tsing, Anna Lowenhaupt, Andrew S. Mathews, and Nils Bubandt. 2019. 'Patchy Anthropocene: Landscape Structure, Multispecies History, and the Retooling of Anthropology: An Introduction to Supplement 20'. *Current Anthropology* 60 (S20): S186–S197. <https://doi.org/10.1086/703391>.