**Special issue - Agribusiness in times of planetary collapse: critical approaches**
**Vol. 57, p. 135-159, jun. 2021. DOI: 10.5380/dma.v56i0.76158. e-ISSN 2176-9109**

UFPR

DeMA
DESENVOLVIMENTO
E MEIO AMBIENTE

BIBLIOTECA
DIGITAL
DE PERIÓDICOS
**BDP | UFPR**

*revistas.ufpr.br*

# Flexibilization of the pesticide regulatory policy as an opportunity for Brazilian (necro)politics: advances in agribusiness and setbacks for health and the environment

## *Flexibilização da regulação de agrotóxicos enquanto oportunidade para a (necro)política brasileira: avanços do agronegócio e retrocessos para a saúde e o ambiente*

Aline Monte GURGEL[1*], Clenio Azevedo GUEDES[2], Karen FRIEDRICH[3]

[1] Aggeu Magalhães Institute (IAM), Oswaldo Cruz Foundation (Fiocruz), Recife, PE, Brazil.

[2] Graduate Program in Development and Environment (Prodema), Federal University of Pernambuco (UFPE), Recife, PE, Brazil.

[3] Sergio Arouca National School of Public Health (ENSP), Oswaldo Cruz Foundation (Fiocruz), Rio de Janeiro, RJ, Brazil.

[*] E-mail of contact: aline.gurgel@fiocruz.br

Article received on February 1, 2021, final version accepted on June 14, 2021, published on June 30, 2021.

**ABSTRACT**: The chemical-dependent model imposed by agribusiness exposes Brazilian society to pesticides associated with dangerous effects on human health and the environment. The hastening of the neoliberal agenda in the government worsens the pesticide exposure due to policy dismantling that creates protective mechanisms. Thus, this article focuses on Brazilian pesticide regulatory policy dismantling from 2019 to 2020. This descriptive cross-sectional study analyzed statutes, court decisions, documents, and technical reports published between January 2019 and January 2021, but with legal effects until December 2020. We observed the release of an unprecedented number of pesticides and the easing of Brazilian regulatory statutes, whose impacts affect intensely vulnerable groups. It is pointed out that biopower practices mediate the association between agribusiness and deepening of vulnerabilities, which serve the interests of financial capital and determine who should bear the costs of the capitalist mode of production. The Covid-19 pandemic in Brazil worsens this situation, expressing the government necropolitics, which reveals itself as a strategy to eradicate traditional peoples and communities, blacks, poor and rural populations.

*Keywords*: pesticides; government regulation; biopower; necropolitics; poisoning.

**RESUMO**: O modelo químico-dependente imposto pelo agronegócio expõe a sociedade brasileira a agrotóxicos associados a graves danos à saúde humana e ao ambiente. O avanço da pauta neoliberal no governo agravou o cenário de exposição a essas substâncias em decorrência do desmonte das políticas públicas que criam mecanismos de proteção. Neste sentido, este artigo coloca em foco a flexibilização de regras e normas de regulação de agrotóxicos no Brasil entre os anos de 2019 e 2020. Trata-se de um estudo descritivo e transversal que analisou normas, decisões judiciais e relatórios técnicos publicados no âmbito da União entre janeiro de 2019 e janeiro de 2021, mas com efeitos jurídicos retroativos até dezembro de 2020. Observou-se a liberação de um número recorde de agrotóxicos e a flexibilização de normativas que regulam o registro e o uso dessas substâncias no país, cujos impactos costumam atingir mais intensamente grupos populacionais em situação de maior vulnerabilidade. Argumenta-se que a associação entre o agronegócio e o aprofundamento de vulnerabilidades tem sido mediada por práticas de *biopoder* voltadas para atender aos interesses do capital financeiro, que determinam sobre quem deve recair os custos do modo capitalista de produção. Este cenário foi agravado com o avanço da pandemia do Covid-19 no país, configurando a *necropolítica* governamental, que se traduz em uma estratégia de eliminação de povos e comunidades tradicionais, negros, pobres e campesinos.

*Palavras-chave:* agrotóxicos; regulamentação governamental; biopoder; necropolítica; intoxicações.

## *1. Introduction: flexibility of regulatory policy as an agribusiness strategy*

Lately, Brazil has established itself as one of the largest producers of agricultural commodities worldwide, supporting a production model based on the use of pesticides, transgenics and chemical fertilizers (Gurgel *et al*., 2017). The hegemony of this mode of production is the result of Brazilian State policy conduction, driven by economic neoliberalism and based on rights violation and in the conservative extreme based on short-term *profitability*. These practices underline the propensity of subordination and heteronomy that score the country's position in the geopolitical context (Paulani, 2013). The model centered on extractivism and the exploitation of workers is deepened on the neoliberal debate promoted by the heralds of globalized capitalism, with major consequences for society.

This mode of production is associated with inequities and injustices, the accumulation of financial and material losses, lack of autonomy, land concentration, expropriation of land and natural resources, removal and marginalization of the rural population, environmental contamination, and the growth of diseases and injuries (Carneiro *et al*., 2015; Gurgel *et al*., 2018; Fiocruz, 2019a). In this scenario, agribusiness uses political capital to express the consequences inherent in its production model to consumers, governments, agricultural workers, producers, and rural communities (Wallace, 2020), whose impacts affect more intensely the vulnerable population groups – such as peoples and traditional communities, rural populations, pregnant women, children, and older adults (Carneiro *et al*., 2015).

Capitalist relations of the agribusiness mode of production are advancing especially in countries with peripheral economies and characterize an "export neo-extractivism"[1], predominant in the Southern hemisphere (Bernardo, 2020). The growth of agribusiness companies in the Southern hemisphere

[1] *Neo-extractivism* may be described as "a development model focused on financial growth and based on the appropriation of natural resources, on poorly diversified productive networks and subordinate insertion in the new international division of labor. The phenomenon has been as-

is mainly intended at raising profits, as the region is characterized by a low-cost workforce and accumulating land (Wallace, 2020), besides fragile labor laws and environmental protection. Several changes made in environmental law, land regulation and agrarian reform (especially regarding indigenous and *quilombola* lands demarcation), protection of workers and peasants' rights, or even restructurings in curricular policies, have been sponsored by large corporations related to the growth of international financial capital (Gurgel *et al*., 2018). Labor, health, and environmental protection laws are seen as "barriers" to the implementation of this model, prevailing the fetish belief that everything that stands on the path of undefined financial growth represents an obstacle to be overcome (Harvey, 2013).

The growing pressure from economic conglomerates to produce agrochemicals has resulted in the suppression of the State's regulatory role to meet the demands of the agricultural commodities market (Pelaez *et al*., 2010; Gurgel *et al*., 2017; Friedrich *et al*., 2021). There is a rise in the tensions between the neo-developmentalist model – a myth of capitalist development that tries to reconcile growth with equity – and the rights to health and a balanced environment. However, the expansion of agribusiness necessarily depends on the intensive use of pesticides, exposing populations to compounds associated with severe acute poisoning and the manifestation of chronic conditions such as cancer, mutagenesis, teratogenesis, neurotoxic manifestations, and others, which may cause death (Gurgel *et al*., 2017; 2018).

If the advance of neoliberal policies, since the 1990s, supports the expansion of agribusiness and the consolidation of the Brazilian inclusion in the primary-export model, lately, the trend to intensify the neoliberal agenda in Brazil has admitted new parameters. As argued by Lobato *et al*. (2019), the unprecedented association between the extreme right parties and economic liberalism under the Bolsonaro government, with a conservative agenda supported by liberal proposals in the financial field, resulted in a wide reform of the State. Flexibility, reform, adjustment, and austerity became the motto of the current government, materializing in the dismantling of rights and achievements.

In this context, the issues associated with the mode of agribusiness production have been aggravated by the recent dismantling of public policies in the country and, since February 2020, due to the outbreak of the Covid-19 pandemic[2]. Furthermore, the health crisis has been understood as an "opportunity" for the implementation of other flexibility measures[3], leading to the loss of rights achieved over decades.

In Brazil – and especially in other countries with peripheral economies –, the effects of the

sociated with different conflicts, whether linked to long-term low financial growth or associated with varied social and environmental impacts" (Milanez & Santos, 2013, p. 119). The export profile might be explained by the fact that unprocessed or minimally processed products extracted from explored territories are mostly forwarded to the international market, meeting the demands of core economy countries (Bernardo, 2020).

[2] Covid-19 is a disease caused by a new coronavirus, accountable for the severe acute respiratory syndrome (SARS-CoV-2 or 2019-nCoV), which came up in December 2019 in Wuhan, China, and spread up quickly throughout the world. The disease was characterized by the World Health Organization as a pandemic on March 11th, 2020, being defined as a Public Health Emergency of International Concern (PAHO, 2020).

[3] During the "infamous" ministerial meeting held on April [22]nd, [2020], the Environment Minister, Ricardo Salles, considered that the government should take advantage of the moment when society and the media were focused on Covid-[19] to change regulatory policies linked to environmental

pandemic on health are aggravated by social inequalities, democratic weakness, setbacks in social and environmental policies, food, and nutrition insecurity, the presence of large population groups with comorbidities, and exposure to pesticides – among other vulnerabilities (Ortega & Orsini, 2020). Thus, poor, peripheral populations, traditional peoples and communities, blacks, and women are more severely affected (Reis-Filho & Quinto, 2020; Wang & Tang, 2020; Wenham *et al*., 2020).

Furthermore, there is a feedback mechanism, in which the impacts of agribusiness are worsen by the pandemic crisis and may, simultaneously, be understood as generators of epidemics. According to Rob Wallace (2020, p. 527) "both cattle raising as [intensive] agriculture result in deforestation and enterprises that increase the rate and taxonomic reach of the spillover of pathogens: from wild animals to cattle and, from these, for agricultural workers". The author also highlights that the close relationship between the agribusiness mode of production and the emergence of new pandemics is due to genetic modifications and the use of pesticides, which can lead to the development of super-resistant pathogens; the loss of biodiversity and the proliferation of species that can cause disease; or even the way that animals are raised (in confined spaces and with homogenization of race, age and biological system), promoting the development of diseases and the spread of pathogens. Similarly, the delivery of goods in a context of globalization and commodity exports can easily and quickly spread pathogens that, in other scenarios, would remain confined.

Considering this scenario, this paper aimes to analyze the flexibility of regulations for controling pesticides in Brazil from 2019 to 2020.

## *2. Methodology*

This is a descriptive and cross-sectional study, with documentary research focused on the analysis of: (a) rules of an infra-legal legislation (such as decrees, laws, resolutions); (b) rules/acts issued by executive bodies such as the Ministry of Agriculture, Livestock and Supply (Ministério da Agricultura, Pecuária e Abastecimento - Mapa) or by federal authorities such as the National Health Surveillance Agency (Agência Nacional de Vigilância Sanitária - Anvisa) and the Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - Ibama) (such as regulating instructions, acts, resolutions, directors decisions); (c) court decisions of the Supreme Court (Supremo Tribunal Federal - STF) in judicial review; and (d) documents and technical reports produced by Mapa, Anvisa and Ibama.

Documents published between January 2019 and January 2021 were researched, but with legal effects until December 2020, referring to Federal pesticide regulations in Brazil. Data collection

protection and the agriculture field, avoiding congress approval and court proceedings (STF, [2020]). According to the minister: "The opportunity we have, which the press coverage is giving us some break on other issues, is to pass on the infra-legal legislation restructuring of deregulation, simplification, all the restructuring. So, for that we need to try here while we have been given some breathing room by the press because they only talk about Covid, and "run the cattle herd", changing all the rules and simplifying norms. (...) From the Ministry of Agriculture, from the Ministry of Environment".

was carried out between October 2020 and January 2021. The searches were conducted on the websites of the National Press (Imprensa Nacional)), where the Brazilian Federal Register (Diário Oficial da União - DOU) (https://www.in.gov.br) is available; STF (http://portal.stf.jus.br), Mapa (https://www.gov.br/agricultura/pt-br), Anvisa (https://www.gov.br/anvisa/pt-br) and Ibama (https://www.gov.br/ibama/pt-br). The keyword "agrochemical" was used as a search term. The available search tools were used on the STF and the National Press websites, including filters for the follow-up time and the types of documents searched. In the websites of regulatory agencies, the survey did not follow any defined standard, as there are no specific tools for searching the documents used in this study.

The documents found were organized using Microsoft Excel 2016, according to: source (government body), type of document, general message, summary, and reference. Afterward, the full reading of all documents was carried out, followed by the selection, systematization, and analysis of the research *corpus*.

## 3. Main changes in the regulation and release of pesticides imposed in Brazil in the first two years of the Bolsonaro government

From January 2019 to December 2020, several legal and infra-legal acts were approved dismantling the registration and use of pesticides in Brazil, as well as increasing the number of pesticides authorized in the country. Such measures seek to meet an agenda for strengthening agribusiness, based on the weakening of State control on pesticide regulation. Several measures have been implemented directly by the Executive branch to speed up the process by avoiding compliance with the legal measures required for the approval of laws with such changes, which would depend on the approval of the Legislative branch (Table 1).

In this time frame, we highlight, specifically, the release of the largest number of pesticides in Brazil compared to any other time frame, and the adoption of legal and infra-legal measures aimed at "simplifying" the rules that control the registration, commercialization, and the use of these substances in the country.

Although it was not the objective of this study to compare the first two years of the Bolsonaro administration with predecessor presidents, it is important to acknowledge that measures supporting the pesticide regulation dismantling were also reported in previous governments, as evidenced by Gurgel (2017) when analyzing pesticide laws between 1923 and 2016[4].

However, the measures that characterize the reduction of the State's power of action – and, hence, the weakening of measures to protect health and the environment– are concentrated in

[4] The reduction to zero taxes on imports and sales in the domestic market of fertilizers and pesticides, concerning the taxpaying rates for the Social Integration Program and to the Public Servants' Fund Financing Program (PIS/Pasep) and the Taxpaying to Social Security Financing (Cofins) on imports and gross revenue, for example, were instituted in 2004, after the publication of law no. 10,925. Another example is the publication of Decree no. 8133, of October 28th, 2013, which gave powers to the Mapa, alone, to authorize the import or consent to the import and to grant the emergency authorization of pesticides when a "phytosanitary or zoosanitary emergency" situation was declared, even if the substance is not authorized for use in Brazil.

TABLE 1 – Actions of the federal government in the Executive, Legislative and Judiciary, changing the regulation and use of pesticides, 2019-2020.

| Division | Act | Summary |
|---|---|---|
| Mapa | Act no. 1 of January 9th, 2019 | Releases 18 technical substances, 8 formulated substances, and 2 biological agents |
| Mapa | Act no. 4 of January 17 th, 2019 | Releases 9 technical substances, 1 formulated substance |
| Mapa | Act no. 7 of February 4 th, 2019 | Releases 6 technical substances, 13 formulated substances |
| Mapa | Act no. 10 of February 18th, 2019 | Releases 21 technical substances, 6 formulated substances, and 2 biological agents |
| Mapa | Act no. 17 of March 19th, 2019 | Releases 8 technical substances, 22 formulated substances, and 5 biological agents |
| Mapa | Act no. 24 of April 9th, 2019 | Releases 4 equivalent technical substances, 19 formulated substances, and 8 clone technical substances |
| Mapa | Act no. 29 of April 29th, 2019 | Releases 3 technical substances, 10 formulated substances, 1 biological agent |
| Mapa | Act no. 34 of May 16th, 2019 | Releases 29 technical substances and 2 formulated substances |
| Mapa | Act no. 42 of June 19th, 2019 | Releases 30 technical substances, 10 formulated substances, and 2 biological agents |
| Mapa | Act no. 48 of June 19th, 2019 | Releases 18 technical substances, 29 formulated substances, and 4 biological agents |
| Anvisa | RDC no. 294 of July 29th, 2019 | Criteria for toxicological evaluation and classification, prioritization of analysis, and comparison of the toxicological action of pesticides |
| Anvisa | RDC no. 295 of July 29th, 2019 | Criteria for evaluating dietary risk arising from human exposure to pesticide residues |
| Anvisa | RDC no. 296 of July 29th, 2019 | Regulates on toxicological information for pesticide labels and leaflets |
| Mapa | Act no. 62 of September 13th, 2019 | Releases 49 technical substances, 14 formulated substances |
| Mapa | Act no. 70 of October 2nd, 2019 | Releases 29 technical substances, 18 formulated products, and 10 biological agents |
| Mapa | Act no. 82 of November 25th, 2019 | Releases 36 technical substances, 9 formulated substances, and 12 biological agents |
| Anvisa | RDC no. 320 of November 28th, 2019 | Regulates on maintenance of the active substance Thiram in pesticides in the country, establishes measures to mitigate health risks and changes in the register resulting from its toxicological reevaluation |
| Anvisa | Report Publication | Program for Analysis of Pesticide Residues in Food. Results of samples collected between 2017 and 2018 |
| Presidency | Decree no. 10,178 of December 18th, 2019 | Regulates provisions of Law no. 13.874, of September 20th, 2019, to inform about the criteria and procedures for risk classification of commercial activity and to set the deadline for automatic approval of pesticides |
| Mapa | Act no. 91 of December 26th, 2019 | Releases 23 technical substances, 9 formulated substances, and 4 biological agents |
| Mapa | Act no. 12 of February 19th, 2020 | Releases 32 technical substances |

| | | |
|---|---|---|
| Mapa | Act no. 13 of February 19th, 2020 | Releases 14 formulated substances and 2 biological agents |
| Mapa | Ordinance no. 43 of February 21st, 2020 | Establishes deadlines for automatic approval of pesticides and other acts (denied) |
| Mapa | Act no. 20 of March 23rd, 2020 | Changes the toxicological classifications of formulated pesticide and related substances |
| Mapa | Act no. 22 of March 25th, 2020 | Releases 18 technical substances |
| Mapa | Act no. 26 of April 1st, 2020 | Releases 28 formulated substances and 18 biological agents |
| Mapa | Act no. 28 of April 22nd, 2020 | Releases 16 formulated substances |
| Mapa | Act no. 31 of May 4th, 2020 | Releases 19 formulated substances and 3 biological agents |
| Mapa | Normative Instruction no. 13, of April 8th, 2020 | Regulates for the use of fungicides and mineral oil using agricultural aircraft in banana crops |
| Mapa | Act no. 36 of June 5th, 2020 | Releases 23 formulated substances and 4 biological agents |
| STF | ADPF judgment 656 and 658 | Granting of precautionary measure to postpone deadlines for automatic release of pesticides after 60 days even without health and environmental studies, revoking provisions of Ordinance 43/2020 of MAPA |
| Mapa | Ordinance no. 208 of June 29th, 2020 | Establishes the guidelines for the preparation of the Suppression Plan and the emergency control measures to be used in case of outbreaks of *Schistocerca cancellata* in the States of Rio Grande do Sul and Santa Catarina |
| Mapa | Act no. 39 of July 6th, 2020 | Releases 21 technical substances |
| Mapa | Act no. 43 of July 27th, 2020 | Releases 26 formulated substances and 12 biological agents |
| Mapa | Act no. 46 of August 5th, 2020 | Releases 6 formulated substances |
| Mapa | Act no. 48 of August 17th, 2020 | Releases 18 formulated substances and 10 biological agents |
| Mapa | Act no. 51 of September 3rd, 2020 | Releases 14 formulated substances |
| Mapa | Act no. 55 of September 21st, 2020 | Releases 27 formulated substances and 4 biological agents |
| Conama | Conama/MMA Resolution no. 499 of October 6th, 2020 | Regulates for the licensing of the co-processing of wastes, including pesticides, in rotary kilns to produce clinker (cement) |
| Anvisa | RDC no. 428 of October 8th, 2020 | Changes RDC no. 177 of September 21st, 2017, which provides for the restriction of the active substance Paraquat in pesticides in the country and on transitional risk mitigation measures to address the use of supplies held by Brazilian farmers of products based on the active substance Paraquat |
| Mapa | Act no. 59 of October 19th, 2020 | Releases 12 formulated substances |
| Mapa | Act no. 60 of October 26th, 2020 | Releases 13 formulated substances and 3 biological agents |
| Mapa | Act no. 64 of November 18th, 2020 | Releases 21 formulated substances |
| Mapa | Act no. 65 of November 23rd, 2020 | Releases 31 formulated substances and 11 biological agents |

| | | |
|---|---|---|
| Anvisa | RDC no. 441 of December 2nd, 2020 | Regulates on maintenance of the active substance Glyphosate in pesticide in the country, establishes measures to mitigate health risks and changes in the registration resulting from its toxicological reevaluation |
| Anvisa | RDC no. 442 of December 2nd, 2020 | Regulates on maintenance of the active substance Abamectin in pesticide in the country, establishes measures to mitigate health risks and changes in the registration resulting from its toxicological reevaluation |
| Mapa | Act no. 70 of December 23rd, 2020 | Releases 37 technical substances and 19 biological agents |

SOURCE: Prepared by the authors.

Abbreviations: ADPF - Arguição de Descumprimento de Preceito Fundamental (Claim of Non-Compliance with a Fundamental Precept); Anvisa: Agência Nacional de Vigilância Sanitária (National Health Surveillance Agency); Conama: Conselho Nacional do Meio Ambiente (National Environmental Council); Mapa: Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock and Food Supply); MMA: Ministério do Meio Ambiente (Ministry of the Environment); RDC - Resolução da Diretoria Colegiada (Collegiate Board Resolution).

recent years, being particularly supported by the political-institutional situation established after the Brazilian President Dilma Rousseff was ousted in impeachment[5], in 2016.

The main changes in pesticides regulation in Brazil in the first two years of the Bolsonaro government identified in this study were systematized in thematic subsections as follows: (3.1) Release of pesticides; (3.2) Toxicological reevaluation of pesticides; (3.3) Changes in the procedures of toxicity and risk evaluation, and risk communication; (3.4) Automatic release of pesticides; (3.5) Flexibility of aerial spraying rules; (3.6) Release of the use of prohibited pesticides in Brazil in phytosanitary emergency situations; (3.7) Review of the Water Potability Ordinance; and (3.8) Authorization to burn pesticide residues in cement kilns.

### *3.1. Release of pesticides*

In the first two years of the Bolsonaro government, a total of 997 pesticides were released, which matches the sum of all active substances whose registrations were granted and were listed in the Acts of the Mapa published throughout that time. This record number corresponds to the release of 419 technical substances, 04 equivalent technical substances, 08 clone technical substances, 438 formulated substances, and 128 biological control agents. For comparison purposes, between 2010 and 2015 – a time frame three times longer –, 815 pesticides were registered, less than those approved only in the first half of the current administration.

It is emphasized that most substances are imported, with China being the main producer (61.28% of the substances) with the total number of approved pesticide registrations greater than the sum of all other countries, followed by Brazil (13.23%) and the USA (5.51%). Among the active substances (AS) or mixtures of active substances that are in the formulation of new substances – technical or formulated – approved at the time, at least 25% are banned in the countries that export them. We found that substances produced in China (35), India (11), Switzerland (2), France (3), and Germany (1) were approved in Brazil, even though they were not approved in these countries. The US database of approved active substances has not been accessed and therefore these numbers do not include substances produced in this country.

Regarding acute toxicity to humans, meaning the effects that may occur in the first hours after exposure, in 23.87% of the Acts published by Mapa this information was not clarified. Considering those that provided this information (n=759), most (40.97%) are categorized as slightly toxic or unlikely to cause acute harm (groups IV and V), and 8.43% of substances are categorized as not classified for acute toxicity. This means that, according to changes in regulations implemented in 2019 (Anvisa, 2019a), the label of these substances (49.40% of the total) does not have the skull and crossbones pictogram, a universal symbol to specify

[5] Several authors claim that the impeachment of the elected President Dilma Rousseff is a milestone in the Brazilian democratic rupture, closely related to the current setbacks ongoing in Brazil. This thesis is based, among other factors, on the premise that there was no typical situation for a crime of responsibility for the impeachment, that is, the legal and constitutional conditions for its use to be verified were not fulfilled (Koziki & Chueiri, 2019; Mustafá *et al*., 2018; Santos & Szwako, 2016).

hazardous substances. Despite this, these substances may be associated with chronic health problems, such as cancers, genetic damage, impairment to the reproductive system, fetal malformations, endocrine disruption, and other severe problems, meaning that regulatory changes disregard the risk for exposed populations. Moreover, 14.88% of the substances were classified as extremely toxic (group I) and 8.69% as highly toxic (group II), with a red tag on the label, warning for greater awareness, indicating substances with high toxicity, which can be lethal after exposure to very low doses. It is important to emphasize that the toxicological classification does not consider delayed chronic effects.

Considering the potential for environmental hazards, which identifies the ability to cause negative environmental impacts such as the species, water, and soil resources contamination, 48.14% of pesticides released are classified as highly hazardous for the environment (class II) and 34.10% as hazardous to the environment (class III) and 3.12% as extremely dangerous for the environment (class I), suggesting that 85.36% of approved substances represent a substantial level of threat to the environment. Only 14.64% of substances were categorized as slightly dangerous. These data indicate that the quick release of several substances with high environmental hazards characterizes a problem for different species and compromises the quality of water and soil. These substances may remain in the environment or in the organism of exposed animals for a long time, depending on the properties of the pesticides and the characteristics of the environment. There may be loss of biodiversity, illness of different species and environmental contamination, and human exposure through the consumption of water and food of animal and plant origin with pesticide residues, or through exposure to contaminated soil, air, and water.

### *3.2. Toxicological reevaluation of pesticides*

The reevaluation of pesticide registration is foreseen in the Brazilian law (Brasil, 1989; 2002) and comprises an administrative procedure performed when there are suggestions of risks that disapprove the use of registered substances or when the country is warned in this regard by international organizations responsible for health, food, or the environment, of which Brazil is a full member or signatory of agreements. Pesticides, their components, and similars that signals a decrease in their agronomic efficiency, alteration of risks to human health or the environment may be reevaluated at any time and have their registration mantained, altered, suspended, or canceled. If the decision of the process reveals that the substance is associated with at least one of the criteria indicating a prohibition of registration, the active substance is banned in the country.

According to the current law, the substance will be banned: (i) if there is evidence of carcinogenicity, teratogenicity, mutagenicity, endocrine disruption, and damage to the reproductive system; (ii) if the country does not have methods for neutralizing its components to prevent its remaining residues from causing a risk to the environment and public health; (iii) if there is no effective antidote or actual treatment in the country; (iv) if the pesticide proves to be more dangerous to humans than laboratory tests have been able to demonstrate; or (v) whose properties cause damage to the environment (Brasil, 1989; 2002).

In case of suspected adverse health effects, the substance is evaluated by the National Health Surveillance Agency (Anvisa), the regulatory body responsible for analyzing the impacts on human health. Between 2019 and 2020, Anvisa reevaluated five active substances of pesticides, including the two most used active substances in the country: glyphosate and 2,4-D, in addition to abamectin, thiram, and paraquat. Except for 2,4-D, all the reevaluation processes had been started over a decade ago, showing how slow the process is, which is often the result of litigation by those interested in its registration. Frequently, the pesticide industry tries to intervene with the regulatory body, making pressure to safeguard its financial advantages by interfering in the regulation process. To avoid health laws, industries question scientific evidence, negatively interfering with the regulatory process (Michaels, 2008) and dragging out the registration review process for several years.

In the case of the pesticides aforementioned, the interference of the pesticide industry is clearly observed. Besides litigation, in all cases, the industries created "Task Forces", which are groups composed by the enrolling companies to work with regulatory agencies in the regulatory processes of their substances (Friedrich *et al*., 2021). The Task Forces interfere in the State regulation process in many ways, highlighting the manufacture of information asserting the safety of their substances, the disprove of studies, researchers and institutions that produce evidence that demonstrates effects associated with them, and the relation and pressures to interfere directly in the public policy decisions, particularly in the legislative branch.

In the time frame considered in this analysis, the cases of pesticides that had their registration reevaluated clearly reveal this interference, as presented below.

- Glyphosate

Regarding glyphosate, the role of the Glyphosate Task Force was crucial for Anvisa's decisionmaking process, which reregistrates the substance. The Agency officially determined that glyphosate does not have mutagenic, teratogenic, and carcinogenic characteristics, is not an endocrine disruptor, and is not toxic for reproduction (Anvisa, 2019a).

However, there is powerful evidence that confirms the association between glyphosate and several health issues, including those considered prohibited for registration purposes (Abrasco, 2019). We highlight the classification of glyphosate as a probably carcinogenic to humans (group 2A) by International Agency for Research on Cancer (Iarc) (Iarc, 2015).

The association of glyphosate with cancer, especially Non-Hodgkin Lymphoma (NHL), was recognized by the US court, which was based on evidence from several scientific studies, resulting in the loss of billionaire lawsuits by Monsanto, its largest producer. In the lawsuit, it was found that this international corporation did not properly evaluate the real toxicity of its substances; held back studies with negative results for their maintenance; hired "ghostwriters"[6]; interfered in the peer review

[6] Well respected researchers who, although did not take part directly in industry-sponsored studies, signed their authorship to lend reliability to their publications.

process of articles submitted to scientific journals; influenced the creation of a fake academic web page to promote Monsanto's manufactures; and aggressively and systemically harassed independent institutions and researchers that published studies that threatened its interests (McHenry, 2018; Krimsky & Gilliam, 2018).

- 2,4-D

As the same as glyphosate, the 2,4-D Task Force was essential to maintain the registration of this substance. Anvisa concluded that there are no prohibited effects for registration purposes associated with 2,4-D according to Brazilian law, based on the technical opinion prepared by the Task Force, which systematically disproved the evidence on adverse health outcomes in humans associated with this herbicide (Anvisa 2015a).

The 2,4-D possibly causes cancer (group 2B) (International Agency for Research on Cancer - Iarc, 2017) and is related to the onset of NHL, sarcomas (Garabant & Philbert, 2002; Miligi *et al*., 2006), colon cancer, and leukemia (Yi *et al*., 2013), genotoxicity (Garaj-Vrhovac & Zeljezic, 2002). It may also modify sexual performance and fertility, have poisonous effects on the fetus and infants and affect motor, behavioral, intellectual, reproductive, endocrine, or immunological development, causing miscarriage or death in the first months of life (Friedrich, 2014). Another problem associated with 2,4-D is the possibility that dioxins are unintentionally produced, classified as persistent organic pollutants, known to cause cancer and other issues (Sears *et al*., 2006).

- Thiram

As for Thiram, the reevaluation process was also heavily influenced by the Task Force. Like with glyphosate and 2,4-D, the registration of the substance was maintained despite evidence of severe and potentially irreversible damage to human health. Even worse is that the Technical Reevaluation Opinion did not presented studies on acute, subacute, and chronic toxicity, required for the evaluation of potential damage to health and fulfilling the pesticide prohibition criteria. In the Anvisa document, the intervention of the Task Force to disprove and disregard independent studies of the reevaluation process was evident. There is evidence that Thiram is associated with effects on reproduction and endocrine function, cell toxicity, and oxidative stress in human erythrocytes (Salam *et al*., 2020).

At the conclusion of the process, Anvisa published an incomplete technical opinion, without providing studies of toxicokinetics, acute, subchronic, and chronic toxicity. Despite the lack of vital information for the toxicological reevaluation process, the Agency stated that, regarding reproductive toxicity, "because of the short time given in court, it was not possible to analyze all available studies" (Anvisa, 2015b, p. 29).

However, it is not technically recommended to indicate "to maintain the pesticides registration without reviews" without important aspects being evaluated, mainly because they are considered crucial for the protection of the population's health – a major function of an institution such as Anvisa.

The technical opinion also demonstrates that most of the studies published by independent groups were disregarded in the process, revealing that the decision was essentially based on studies presented by the industries Task Forces, whose results are not public (Friedrich *et al*., 2019).

- Paraquat

Paraquat was the only substance whose conclusion of the reevaluation, in September 2020, led to banning. In fact, Anvisa approved the ban issued by itself in 2017 (Anvisa, 2017), after great pressure from society and research and educational institutions. Although the decision to ban was taken in September 2020, the measure allowed the use of chemical supplies until 2021, meeting the demand of agribusiness Branches (Anvisa, 2020a). According to Anvisa's Legal Attorney's Office, it was not presented "the justifications and reasons by this Anvisa's administration that explain and support, with technical, scientific and sanitary basis, the feasibility and need to change the regulatory framework" (Anvisa, 2020b).

However, the lobby of the pesticide industry made pressure, especially through the Paraquat Task Force, for the substance not to be banned on the scheduled date. The Task Force conducted genotoxicity studies and "contracted" a study – which would compose the centerpiece for reversing its ban – from a researcher at a traditional Brazilian university. After criticizing this situation[7], the Public Health Department of the Faculdade de Ciências Médicas da Unicamp (Unicamp College of Medical Sciences) was "emphatically favorable of ban" of paraquat, acknowledging the existence of a "conflict of interests" in the study and considering the attempt to temporarily suspend the ban on the substance "untimely, vile and opportunistic" (Unicamp, 2020).

Besides high acute toxicity, paraquat has genotoxic potential (Garaj-Vrhovac & Zeljezic, 2002) is associated with the occurrence of cancers (Andreotti *et al*., 2020; Park *et al*., 2009) and neurodegenerative disorders such as parkinsonism (Tangamornsuksan *et al*., 2009). The decision to maintain its use allows population exposures to a substance considered by Anvisa as causing major damage to health (Anvisa, 2017).

- Abamectin

In December 2020, Anvisa decided to maintain the registration of the active substance abamectin. Repeating the *modus operandi* of the other reevaluation processes finalized in recent years, the role of the Task Force established by the industry was crucial for the Agency's stance. The decision was made even though the Oswaldo Cruz Foundation (Fiocruz) – an institution of the Ministry of Health and one of the most important and respected research centers in Latin America – had raised concerns about the high toxicity in humans and animals and about the potential association of abamectin with nervous, endocrine, and reproductive systems toxicity cases, besides affecting the development (Anvisa, 2015c).

Anvisa pointed to abamectin as suspected of causing reproductive toxicity in humans and

[7] In an article entitled "Lobby uses unfinished research to make pressure on Anvisa on prohibited pesticides", by Ana Aranha and Hélen Freitas, published by Repórter Brasil, on July 17th, 2020. Available from: <https://reporterbrasil.org.br/2020/07/lobby-usa-pesquisa-nao-concluida-para-pressionar-anvisa-sobre-agrotoxico-proibido/>.

additional suspicions of producing adverse effects on lactation. The Agency also recommended that the leaflets include warnings that the substance may cause harm to the fetus, leading to congenital malformations, and may be harmful to breastfed children (Anvisa, 2020c). Brazilian law, however, is very clear about the restriction of products associated with birth defects (Brasil, 1989; 2002), and in these cases, the adoption of warnings is not appropriate since the required measure is the ban.

Besides ignoring critical studies, another strategy worth to be mentioned concerns the embarrassment of the autonomy and academic freedom of researchers who produce scientific evidence demonstrating the occurrence of environmental and health damage resulting from exposure to pesticides. Companies holding the registration have often harassed independent scientists who publish information opposed to their interests. Other actions, such as proceedings, public threat campaigns, court interventions, restraining orders, demands for loss of accreditation, and other forms of pressure (including the direct threat to the lives of researchers who show the impacts of pesticides), have been reported (Acselrad, 2014; Bombardi, 2021; Fagan *et al*., 2015; McHenry, 2018). It is important to highlight that, according to Sanctis and Mendes (2020, n.p.), the "plan of the siege of scientific knowledge did not start with the inauguration of President Bolsonaro, but from then on it became more intense, in a remarkable way, as a government policy".

The financial interests of agrochemical industries work as real driving forces on regulatory bodies, despite the acknowledgment that pesticides compromise the health of exposed populations and the potential for the resilience of life support systems in the biosphere. As a result, the subordination of the State to private and market interests has been imposed over time, with the consequent weakening of the public interest (Friedrich *et al*., 2019).

### *3.3. Changes in toxicity, risk, and risk communication evaluation procedures*

The post-impeachment scenario opened opportunities for the implementation of old agendas of the Brazilian agribusiness. The main one deals with the simplification of rules and standards for the registration, evaluation, and use of pesticides in Brazil, materialized in the Bill of law no. 6.299/2002[8]. In 2018, the project by Blairo Maggi – a big Brazilian ruralist and one of the largest individual soy producers worldwide –, was proceeded in the House of Representatives. The Bill of law had its recommendation approved by the project creator, congressman Luiz Nishimori, who, in addition to being president of companies that sell pesticides and belong to members of his family, is part of the Frente Parlamentar da Agropecuária (FPA) (Agriculture Parliamentary Front), financed by the private branch and directly interested in the approval of the project.

[8] Bill of law no 6.299, known as "Package of Poison", is an emblematic example of the acceleration of the proceeding of this type of agenda in the Brazilian National Congress. This Project was created from tenths of Bill of laws prepared between 2000 and 2017 and which have in common the dismantling of the regulatory system for pesticides in Brazil.

In opposition to Bill of law no. 6,299/2002, progressive forces made pressure so Bill of law no. 6,670/2016, which establishes the National Policy for the Reduction of Pesticides (Pnara), could also be proceeded in the House. Pnara was a demand from civil society and proposes the expansion of public investments so that technical options to pesticides are disseminated and/or developed, contributing to meet the needs to increase the production of healthy and diversified foods, and that promote collective health and protect the environment (Abrasco & ABA, 2018).

Faced with the difficulties for the approval of Bill of law no. 6.299/2002, due to the opposing forces and the extensive agenda to make other norms flexible – especially labor and tax reforms – the government decided to make the changes predicted in the Bill of law without going through the legislative. Thus, the changes are being implemented by the executive, through infra-legal acts. The main measures carried out within the scope of Anvisa, during the first two years of government, were the Collegiate Board Resolution (Resolução da Diretoria Colegiada - RDC) no. 294, 295, and 296/2019 (Anvisa, 2019a; 2019b; 2019c), which established:

- Changes in the toxicological classification of pesticides

Acute effects – which appear a few hours after exposure to a pesticide – underwent a change in classification from the RDC no. 294. Before, the effects were classified into four groups (extremely, highly, moderately, and slightly toxic), according to the severity of acute effects from exposure. The new classification announced by Anvisa establishes that products must be classified as: Category 1: Extremely Toxic Substance – red tag; Category 2: Highly Toxic Substance – red tag; Category 3: Moderately Toxic Substance – yellow tag; Category 4: Low Toxic Substance – blue tag; Category 5: Substance Unlikely to Cause Acute Damage – blue tag; and Unclassified Substance – green tag.

Besides the inclusion of new categories, studies started to be analyzed considering only the immediate risk of death, and toxicological studies of skin and eye irritation were no longer used for toxicological classification purposes. Thus, even though pesticides can cause severe acute damage such as eye corrosion and blindness, these outcomes will not interfere with the toxicity classification (Gurgel & Friedrich, 2020).

- Non-specification of mandatory studies to be submitted for registration purposes

RDC no. 294 does not refer the studies that must be presented by private sector for registration or registration review, limiting itself to refer to only general aspects of the studies. In contrast, the previous ordinance, replaced by this regulation, defined mandatory studies, such as teratogenicity and carcinogenicity in at least two species of laboratory animals and mutation studies in genetic material (Gurgel & Friedrich, 2020).

The non-requirement to present studies creates a void that can exempt companies from giving the necessary data for an adequate evaluation of their potential damage to health.

- Change in criteria for dietary risk evaluation

Another important setback was the non-requirement to present studies used to calculate the intake doses, necessary to evaluate the dietary risk from human exposure to pesticide residues, as provided for in RDC no. 295 (Anvisa, 2019b). By not specifying the necessary studies to calculate the doses that a person could theoretically be exposed to without having acute and chronic effects, the defined values may not reflect the harm potential related to the substances evaluated (Gurgel & Friedrich, 2020).

Although this calculation has several limitations – which goes from the existence of an "acceptable intake dose" (scientifically and ethically unacceptable considering exposure to harmful agents), to neglecting additive, synergistic effects, and exposure through multiple pathways –, its definition should minimally be based on studies defined by the Regulatory Agency, and not be at the decision of the pesticide industry.

- Change in the risk communication strategy

With the excuse of adapting to the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), Anvisa decided to remove the skull and crossbones pictogram, traditionally used to identify "poison" from the labels of products of classes 4 and 5. Considering the conditions of use of pesticides in the country, where a significant number of workers who use these products have a low level of education and difficulty in properly reading and interpreting simple texts, removing the pictogram hides essential information for understanding the degree of threat to health. This shows that, although the entire population is at risk, the greatest burden of damage is concentrated on the most vulnerable population groups, such as workers, rural population, indigenous people, *quilombolas*, riverines, and others (Gurgel & Friedrich, 2020).

### *3.4. Automatic release of pesticides*

Ordinance no. 43, of February 2020 (Mapa, 2020a), established a maximum time frame of 60 days to grant or deny public acts for the release of pesticides under the responsibility of the Ministry. If the registration request is not analyzed within this period, the pesticide is released without going through any analysis procedure by the agency. The measure places Mapa as the maximum body for inspection and regulation of pesticides in Brazil while weakening the regulatory process. By not providing adequate structure and time for the evaluation of claims, it transforms the agency into a mere chancellor, reducing its role as an inductor and promoter of national agricultural planning (Souza *et al*., 2020). However, the STF challenged the ordinance, preventing indiscriminate release from being instituted by means of a normative act.

### *3.5. Flexibility of aerial spraying rules*

In Brazil, the rules that control the aerial spraying of pesticides determine a minimum safety distance that prohibits the operation of agricultural aircraft within 500 meters of the population (towns, cities, villages, neighborhoods) and 250 meters from water sources. But this distance is not enough to prevent the spread of pesticides beyond "the target crops", occurring both accidental and technical spray drift cases (dispersion that occurs even when all safety measures provided for in current regulations are adopted). Drift indicates that aerial

spraying is a proven method of low efficacy since a significant percentage of the applied pesticides do not reach the plants. Studies carried out in Brazil and worldwide show losses ranging between 34.5% and 82% (Fiocruz, 2019b).

In April 2020, Mapa published a regulation lowering the minimum safety distance from 500 to 250 meters for aerial spraying of agricultural fungicides and mineral oil on banana crops (Mapa, 2020b). The change took place without any scientific explanation that would indicate the safety of this cut in spray distance.

There is a suspicion that this change was motivated to benefit rural producers in the banana agribusiness in Vale do Ribeira, in São Paulo state, a traditional electoral stronghold of Bolsonaro and the place of residence of some of his family members. As for the dozens of *quilombola* communities living in the area, the measure implies an escalation in vulnerabilities. As it is an environmental preservation region of the Atlantic Forest, the measure also threatens the biome (Souza *et al*., 2020).

In the European Union, "Member States ensure that the aerial spraying of pesticides is prohibited", considering it "likely to significantly harm human health and the environment, especially because of the spray drift" (Parlamento Europeu, 2009).

The continuation of this practice is associated with damage to health and the environment, broadly criticized in scientific studies and technical documents produced by health entities and institutions such as Abrasco and Fiocruz (Carneiro *et al*., 2015; Abrasco, 2016; Gurgel *et al*., 2015; 2018).

### *3.6. Release of the use of pesticides prohibited in Brazil phytosanitary emergency situations*

In Brazil, only pesticides previously approved in the registration process can be used, whose toxicological, environmental, and agronomic efficiency analysis was carried out respectively by Anvisa, Brazilian Institute for the Environment and the Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis), and the Ministry of Agriculture, Livestock and Food Supply (Ministério da Agricultura, Pecuária e Abastecimento) (Brasil, 1989; 2002).

However, since 2013, in "phytosanitary or zoosanitary emergency situations", the agricultural authority is allowed to import and grant temporary emergency authorization for the production, distribution, sale, and use of pesticides and alike substances with unauthorized use in the country. This release takes place without the need of informing potential damage to health and impacts on the environment, which brings risks to public health. This measure is part of the dismantling process pesticide laws (Gurgel *et al*., 2017), strengthened after 2016.

With this legal provision as a prerogative, in June 2020, the Mapa declared a "phytosanitary emergency situation" in Rio Grande do Sul and Santa Catarina states because of the risk of an outbreak in these two producing areas, due to the approach of a locust swarm (*Schistocerca cancellata*), from Argentina (Mapa, 2020c). Although the measure predates the current administration, the decision is seen with concern, as it represents, in a context of the faster release of new pesticides in Brazil, the possibility of authorizing the use of poisons associated with serious damage to human health, as well as for the environment.

### *3.7. Review of the Water Potability Ordinance*

In 2020, the Ministry of Health published the summary of the new memorandum of the water potability ordinance for human consumption, which includes the definition of parameters for monitoring the presence of pesticides in water (MS, 2020). The document released, although it brings some advances compared to the previous regulation, has important limitations that compromise the safety of exposed populations (Rosa *et al*., 2020). In May 2021, ordinance No. 888 was finally published, consolidating the proposed changes (Brasil, 2021).

The ordinance provides for the monitoring of only 40 pesticides, although there are more than 500 active substances with authorized use in Brazil. Even worse is the fact that 2,4-D, one of the most used pesticides in the country, is not among those monitored, although there is evidence of its association with extremely severe outcomes.

Another issue is that the document establishes the maximum concentration level (MCL) of each substance per sample, neglecting the possibility of a sample have more than one chemical, whose combination can produce synergistic effects. The cumulative effect is not considered and there is no definition of threshold or concentration of substances per sample. Calculation of MCL must also be carefully analyzed, acknowledging that, even if the identified substances are below the determined maximum threshold, the minimal presence of a pesticide already indicates water contamination, since the expected concentration of these chemicals in water is zero. For many of the problems associated with exposure to pesticides, any dose other than zero is sufficient to cause harm, which implies that there is no safe level of exposure (Rosa *et al*., 2020).

The differential risk according to the exposed group was also not considered. For instance, children are more vulnerable, as they weigh half of an adult and the calculation of the average MCL neglects that, defining similar exposure levels for children and adults. The maximum level allowed should be more protective for children, as at this stage of development the damage can be more severe and even potentially irreversible (Rosa *et al*., 2020).

The ordinance also does not specify what to do in case of non-compliance of the sample, particularly regarding the actions to be carried out by the concessionaires and by health surveillance (Rosa *et al*., 2020).

### *3.8. Authorization for the burning of pesticide residues in cement kilns*

In October 2020, the National Environmental Council (Conselho Nacional do Meio Ambiente - Conama) approved the co-processing activity of waste in rotary kilns to produce clinker, including pesticides (Conama, 2020). The document even authorizes the burning of organochlorine pesticides, almost banned worldwide due to their high bioaccumulation capacity in living organisms and persistence in the environment for long periods, and many of these are associated with problems such as cancer and endocrine disruption (Iarc, 2020). The resolution establishes a maximum limit for these compounds, ignoring that for genotoxic carcinogens and endocrine disruptors (as is the case for several organochlorines listed in the document), there is no safe level of exposure (Friedrich *et al*., 2021).

## *4. How to conclude: flexibility of regulations and neoliberal necropolitical rationality*

### *as results of the logic of biopower and the driving force of environmental racism*

From 2019 to 2020 there was an increase of dismantling in the regulation of both registration and use of pesticides in Brazil, with negative consequences for the environment and human health. The unprecedented release of 997 pesticides in just two years, the setbacks in regulation imposed directly by the executive, and the political interference of the pesticide industry with Anvisa show how biopower practices have dictated the direction of measures aimed at protecting health and life. These measures resulted, for example, in the maintenance of substances associated with extremely severe and potentially irreversible damage (such as glyphosate, 2,4-D, abamectin, thiram) or resulted in a long phase-out process to ban the substance (such as paraquat) from the market, prolonging human exposure to these toxic agents.

An association between agribusiness and the violation of fundamental human rights is observed, such as the right to health, a balanced environment, water, and the human right to adequate food and food sovereignty (Souza *et al*., 2020).

The understanding of the liberal State policy adopted by the Brazilian government and its influence and power to decide the adoption of actions that flexibilizes the use of pesticides, despite their impacts on health and the environment, can be understood from the perspective of *biopower* discussed by Michel Foucault. The interference of private sector in the State represents a major strategy for the consolidation of biopower practices aimed at meeting the interests of financial capital, manipulating science and laws to adopt measures that often result in loss to health and the environment (Friedrich *et al*., 2021). Different from the sovereign power "to make die and to let live", biopower brought the right to "to make live and to let die" (Foucault, 1999).

It is crucial for capitalism to control bodies and their inclusion in the financial branch, extracting its strength, making it grow in utility and gentleness to include it in control and financial systems, in a strategy that reaches its suppression and control of populations (Foucault, 1979). However, the system is not equal: there are those who overpower and those who are overpowered. Thus, factors of apartheid and social hierarchy also operate, assuring relations of domination. The power that represses, legitimizes, and enables the management of bodies predicts and defines what can put lives at risk. Most importantly, it defines the lives of those who can be put at risk. Thus, precariousness and vulnerability are conditions produced by biopolitics (Foucault, 2007). This distinction between citizens establishes who should bear the costs of the development model in the capitalist mode of production. This *racism* is useful to capital, comprising a way of defining what should live and what should die, fragmenting society (Foucault, 1999).

Racism goes beyond racial and ethnic issues, involving injustices, prejudices, and inequalities. In its environmental aspect, it suggests that the impacts resulting from economical growth mainly affect some populations and groups in a greater vulnerability. Environmental racism supposes that social injustice and environmental degradation have the same source, where the unequal distribution of power over natural resources passes on the environmental costs of development to the less fortunate, who are more deeply exposed to risk situations (Acselrad, 2010). Thus, the biggest burden of environmental damage

caused by this development model falls on low--income populations, discriminated racial groups, traditional peoples and communities, working-class neighborhoods, marginalized and vulnerable populations (Acselrad *et al*., 2004).

According to Foucault, racism is basically a technology designed to allow the exercise of biopower, "this old sovereign right to kill", having the purpose of regulating the distribution of death and enabling the murderous roles of the State, being "the condition to accept people dying" (Mbembe, 2018, p. 18). The ultimate expression of sovereignty is, to a large extent, in power and the ability to dictate to kill and let live. The neoliberal necropolitical thinking current in the organization of society and the State reflects the paradigm of the detachment between social branches, which regulates – and normalizes – the power of managing life and dictates who to kill and let live to ensure the functioning of capitalism (Agostini & Castro, 2019). Death policies are engendered both by the absence of the State and by its role as a regulating power for the preservation of life and death, materialized in necropolitics (Mbembe, 2018).

The Covid-19 pandemic and its association with agribusiness bring important elements to the understanding of necropolitics. For example, while agribusiness exports are expected to break records and surpass the US$ 100 billion tops for the second time in history, earning big profits for ruralists who produce commodities (Batista, 2021), family farmers in Brazil face an unprecedented crisis and are unable to sell their goods. Still, a large portion of the Brazilian population has seen family income drop and is unable to access essential items (Gurgel *et al*., 2020). Thus, the health crisis increases the income of a small, privileged group, leading some authors to claim that "the pandemic may have beneficial effects and increase the production offer and the international inclusion of agribusiness in Brazil" (Schneider *et al*., 2020, p. 187). In contrast, the number of people suffering from chronic hunger can increase dramatically, resulting in increased food and nutrition insecurity due to the inability of the government's ultra-neoliberal project to respond adequately to the crisis (Gurgel *et al*., 2020).

Considering the impact of pesticides on society, environmental racism and necropolitical power are therefore evident, establishing a great burden of harmfulness to populations in a greater situation of vulnerability. Actions that flexibilize laws, which reduce or even get rid of social, health and environmental protection measures enhance situations of danger and risk by intensifying exposure to pesticides and weakening individual and collective protection mechanisms.

Once the State were taken over by the interests of capitalist corporations, it is up to society to defy and fight for the transformation of current power structures (Marques, 2018).

## *References*

Abrasco - Associação Brasileira de Saúde Coletiva. *Nota contra pulverização aérea de inseticidas para controle de vetores*. Rio de Janeiro: Abrasco, 2016. Disponível em: <https://tinyurl.com/y6lkhvy4>. Acesso em: set. 2020.

Abrasco - Associação Brasileira de Saúde Coletiva. *Parecer Técnico* sobre processo de reavaliação do ingrediente ativo de agrotóxico glifosato utilizado na agricultura e como produto domissanitário. Rio de Janeiro: Abrasco, 2019. Disponível em: <https://tinyurl.com/y64pfjvw>. Acesso em: out. 2020.

Abrasco - Associação Brasileira de Saúde Coletiva; ABA -

Associação Brasileira de Agroecologia. *Dossiê científico e técnico contra o Projeto de Lei do Veneno (PL 6.299/2002) e a favor do Projeto de Lei que institui a Política Nacional de Redução de Agrotóxicos (Pnara)*. Friedrich, K.; Souza, M. M. O.; Carneiro, F. F. Rio de Janeiro: Abrasco/ABA, 2018. Disponível em: <https://tinyurl.com/y5c92ck8>. Acesso em: set. 2020.

Acselrad, H. A crítica do "ambiente" e o ambiente da crítica. *Revista Antropolítica*, 36, 27-47, 2014. doi: 10.22409/antropolitica2014.0i36

Acselrad, H. Ambientação das lutas sociais: o caso do movimento por justiça ambiental. *Estudos Avançados*, 24, 68, 103-119, 2010. doi: 10.1590/S0103-40142010000100010

Acselrad, H.; Herculano, S.; Pádua, J. A. A justiça ambiental e a dinâmica das lutas socioambientais no Brasil - uma introdução. *In*: Acselrad, H.; Herculano, S.; Pádua, J. A. (Orgs.). *Justiça ambiental e cidadania*. Rio de Janeiro: Editora Relume-Dumará; 2004.

Agostini, R.; Castro, A.M. O que pode o Sistema Único de Saúde em tempos de necropolítica neoliberal? *Saúde Debate*, 43(8), 175-188, 2019. doi: 10.1590/0103-11042019s813

Andreotti, G.; Freeman, L.E.B.; Shearer, J.J. *et al*. Occupational pesticide use and risk of renal cell carcinoma in the agricultural health study. *Environmental Health Perspectives*, 128(6), 067011-1-067011-10, 2020. doi: 10.1289/EHP6334

Anvisa - Agência Nacional de Vigilância Sanitária. *Nota Técnica nº 23/2018/Sei/Creav /Gemar/Ggtox/Dire3/Anvisa*. Processo no 25351.056754/2013-17 (glifosato). Brasília: Anvisa, 2019a. Disponível em: <https://tinyurl.com/y2pmcbk8>. Acesso em: nov. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Parecer n° 125/2020/SECONS/PFANVISA/PGF/AGU*. Brasília: Anvisa, 2020b.

Anvisa - Agência Nacional de Vigilância Sanitária. *Parecer técnico de reavaliação nº 07, de 2015/GGTOX/Anvisa - 2,4-D*. Brasília: Anvisa, 2015a. Disponível em: <https://tinyurl.com/y26h7pqh>. Acesso em: set. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Parecer técnico de reavaliação n° 05 de 2015/GGTOX/Anvisa - Tiram*. Brasília: Anvisa, 2015b. Disponível em: <https://tinyurl.com/y2dnv4wr>. Acesso em: set. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Relatório de análise de contribuições em consulta pública - Abamectina*. Brasília: Anvisa, 2015c. Disponível em: <https://tinyurl.com/yyjvp8zu>. Acesso em: set. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Resolução de Diretoria Colegiada (RDC) nº 177, de 21 de setembro de 2017*. Brasília: DOU de 22/09/2017, 2017. Disponível em: <https://tinyurl.com/y5xk4rvd>. Acesso em: out. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Resolução de Diretoria Colegiada (RDC) nº 294, de 29 de julho de 2019*. Brasília: DOU de 31/07/2019, 2019a. Disponível em: <https://tinyurl.com/y28en3oq>. Acesso em: ago. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Resolução de Diretoria Colegiada (RDC) nº 295, de 29 de julho de 2019*. Brasília: DOU de 31/07/2019, 2019b. Disponível em: <https://tinyurl.com/yylestp>. Acesso em: out. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Resolução de Diretoria Colegiada (RDC) nº 296, de 29 de julho de 2019*. Brasília: DOU de 31/07/2019, 2019c. Disponível em: <https://tinyurl.com/y27umeaf>. Acesso em: ago. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Resolução de Diretoria Colegiada (RDC) nº 428, de 7 de outubro de 2020*. Brasília: DOU de 08/10/2020, 2020a. Disponível em: <https://tinyurl.com/y6fdqfvq>. Acesso em: dez. 2020.

Anvisa - Agência Nacional de Vigilância Sanitária. *Resolução de Diretoria Colegiada (RDC) nº 442, de 2 de dezembro de 2020*. Brasília, DOU de 09/12/2020, 2020c. Disponível em: <https://tinyurl.com/y25muerw>. Acesso em: jan. 2020.

Batista, H.G. Exportações do agronegócio devem bater recorde e superar a barreira dos US$ 100 bi pela 2ª vez na história. *O Globo*, Caderno de Economia [Internet], 04 jan. 2021. Disponível em: <https://tinyurl.com/y9ofnl53>. Acesso em: jan. 2021.

Bernardo, R.G. Internacionalización y la cuestión agraria. Un análisis de las teorías en las sobre internacionalización en el agro mundial y su impacto estructuras de clase nacionales. *Trabajo y Sociedad*, 21(34), 201-210, 2020. Disponível em: <https://tinyurl.com/y6nfar8b>

Brasil. *Decreto n. 4.074, de 4 de janeiro de 2002*. Brasília:

DOU de 2002.

Brasil. *Lei nº 7.802, de 11 de julho de 1989*. Brasília: DOU de 1989.

Brasil. Portaria GM/MS nº 888, de 4 de maio de 2021. Brasília: DOU de 2021.

Bombardi, L.M. *Carta aberta aos colegas do DG (Departamento de Geografia)*. São Paulo, 03 mar. 2021.

Carneiro, F.F.; Rigotto, R.M.; Augusto, L.G.S.; Friedrich, K.; Búrigo, A.C. (Eds.). *Dossiê Abrasco*: um alerta sobre os impactos dos agrotóxicos na saúde. Rio de Janeiro: Escola Politécnica de Saúde Joaquim Venâncio; São Paulo: Expressão Popular, 2015.

Conama - Conselho Nacional do Meio Ambiente. *Resolução Conama/MMA nº 499, de 6 de outubro de 2020*. Brasília: DOU de 09/10/2020, 2020. Disponível em: <https://tinyurl.com/y672qyh9>. Acesso em: dez. 2020.

Fagan, J.; Traavik, T.; Bøhn, T. The Seralini affair: degeneration of Science to Re-Science? *Environmental Sciences Europe*, 27(19), 2015. doi: 10.1186/s12302-015-0049-2

Friedrich. K. *Avaliação dos efeitos tóxicos sobre o sistema reprodutivo, hormonal e câncer para seres humanos após o uso do herbicida 2,4-D*. Rio de Janeiro: Fiocruz, 2014. Disponível em: <https://tinyurl.com/y3e7278r>. Acesso em: dez. 2020.

Friedrich, K.; Gurgel, A. M.; Augusto, L. G. S.; Sarpa, M.; Bedor, C. N. G.; Gurgel, I. G. D.; Siqueira, M. T. Toxicologia crítica aplicada aos agrotóxicos - perspectivas em defesa da vida. *Saúde Debate*, 2021. [No prelo.]

Friedrich, K.; Gurgel, A. M.; Sarpa, M.; Almeida, V. E. S.; Gurgel, I. G. D.; Augusto, L. G. S. Registro de agrotóxicos no brasil: um processo enviesado. *In*: Gurgel, A. M.; Santos, M. O. S.; Gurgel, I. G. D. *Saúde do campo e agrotóxicos:* vulnerabilidades socioambientais, político-institucionais e teórico-metodológicas. Recife: Ed. Universitária da UFPE, p. 77-107, 2019.

Fiocruz - Fundação Oswaldo Cruz. *Fact Sheet nº 2.* Isenções e reduções fiscais na comercialização, industrialização e uso de agrotóxicos no Brasil. GT de Agrotóxicos. Rio de Janeiro: Fiocruz, 2019a. Disponível em: <https://tinyurl.com/y66apoaj>. Acesso em: dez. 2020.

Fiocruz - Fundação Oswaldo Cruz. *Nota técnica sobre a proibição da pulverização aérea de agrotóxicos no Ceará*. GT de Agrotóxicos. Rio de Janeiro: Fiocruz, 2019b. Disponível em: <https://tinyurl.com/yxggs52y>. Acesso em: dez. 2020.

Foucault, M. *As palavras e as coisas*: Uma arqueologia das ciências humanas (9a ed.). São Paulo: Martins Fontes, 2007.

Foucault, M. *Em defesa da sociedade*: Curso no Collège de France (1975-1976). São Paulo: Martins Fontes, 1999.

Foucault, M. *Microfísica do Poder*. Rio de Janeiro: Ed. Graal, 1979.

Garabant, D.H.; Philbert, M.A. Review of 2,4-dichlorophenoxyacetic acid (2,4-D) epidemiology and toxicology. *Critical Reviews in Toxicology*, 32(4), 233-57, 2002. doi: 10.3109/10408444.2012.710576

Garaj-Vrhovac, V.; Zeljezic, D. Assessment of genome damage in a population of croatian workers employed in pesticide production by chromosomal aberration analysis, micronucleus assay and comet assay. *Journal of Applied Toxicology,* 22(4), 249-255, 2002. doi: 10.1002/jat.855

Gurgel, A. M. *Neurotoxicidade dos agrotóxicos organofosforados e regulação estatal*: da indústria da dúvida científica à ocultação de perigo para a saúde humana. Recife, Tese (Doutorado em Saúde Pública) - Centro de Pesquisas Aggeu Magalhães/ Fundação Oswaldo Cruz, 2017.

Gurgel, A. M.; Búrigo, A. C.; Friedrich, K.; Augusto, L. G. S. *Agrotóxicos e Saúde*. Rio de Janeiro: Fiocruz, 2018.

Gurgel, A. M.; Friedrich, K. *Fach Sheet 1:* Mudanças na rotulagem e bulas de agrotóxicos e nas diretrizes para classificação, avaliação toxicológica e avaliação de risco dietético. GT de Agrotóxicos da Fiocruz, Rio de Janeiro: Fiocruz, 2020. Disponível em: <https://tinyurl.com/y259y4sj>. Acesso em: dez. 2020.

Gurgel, A. M.; Guedes, C. A.; Gurgel, I. G. D.; Augusto, L. G. S. Reflexos da perda do controle estatal sobre os agrotóxicos no Brasil e sua regulação pelo mercado. *Reciis*, 11(3), 1-16, 2017. doi: 10.29397/reciis.v11i3.1252

Gurgel, A. M.; Santos, C. C. S.; Alves, K. P. S.; Araújo, J. M.; Leal, V. S. Estratégias governamentais para a garantia do direito humano à alimentação adequada e saudável

no enfrentamento à pandemia de Covid-19 no Brasil. *Ciência & saúde coletiva*, 25(12), 4945-4956, 2020. doi: 10.1590/1413-812320202512.33912020

Gurgel, A. M.; Teixeira, A. C. A.; Carneiro, F. F. *Nota Técnica Fiocruz Ceará* [Agrotóxicos]. Fortaleza: Fiocruz, 2015. Disponível em: <https://tinyurl.com/y3m83noh>. Acesso em: out. 2020.

Harvey, D. *Para entender o capital*: livro 1. São Paulo: Boitempo Editorial, 2013.

Iarc - Agência Internacional de Pesquisa em Câncer. *Agents Classifed by the IARC Monographs*, Volumes 1–128. Lyon: Iarc, 2020. Disponível em: <https://tinyurl.com/y4wbckun>. Acesso em: dez. 2020.

Iarc - Agência Internacional de Pesquisa em Câncer. *Glyphosate monograps*. Lyon: Iarc, 2015. Disponível em: <https://tinyurl.com/y3ucw959>. Acesso em: ago. 2020.

Iarc - Agência Internacional de Pesquisa em Câncer. *Monographs on the evaluation of carcinogenic risks to humans.* DDT, Lindane and 2,4-D. Lyon: Iarc, 113, 2017. Disponível em: <https://tinyurl.com/yyvl5oqo>. Acesso em: nov. 2020.

Kozicki, K.; Chueiri, V. K. Impeachment: a arma nuclear constitucional. *Lua Nova*, 108, 157-176, 2019. doi: 10.1590/0102-157176/108

Krimsky, S.; Gillam, C. Roundup litigation discovery documents: implications for public health and journal ethics. *Journal of Public Health Policy*. 39(3), 318-26, 2018. doi: 10.1057/s41271-018-0134-z

Lobato, L.V.C.; Costa, A.M.; Rizzotto, M.L.F. Reforma da previdência: o golpe fatal na seguridade social brasileira. *Saúde Debate*, 43(120), 5-14, 2019. doi:10.1590/0103-1104201912000

Mapa - Ministério da Agricultura, Pecuária e Abastecimento. *Instrução Normativa nº 13, de 8 de abril de 2020*. Brasília: DOU de 09/04/2020. 2020b. Disponível em: <https://tinyurl.com/y472zn95>. Acesso em: nov. 2020.

Mapa - Ministério da Agricultura, Pecuária e Abastecimento. *Portaria n° 43, de 27 de fevereiro de 2020*. Brasília: DOU de 27/02/2020. 2020a. Disponível em: <https://tinyurl.com/y2eph5s9>. Acesso em: nov. 2020.

Mapa - Ministério da Agricultura, Pecuária e Abastecimento. Portaria nº 201, de 24 de junho de 2020. Brasília: DOU de 25/06/2020. 2020c. Disponível em: <https://tinyurl.com/y3a57nkw>. Acesso em: out. 2020.

Marques, L. *Capitalismo e colapso ambiental*. 3 ed. São Paulo: Ed. Unicamp, 2018.

Mbembe, A. *Necropolítica*: biopoder, soberania, estado de exceção, política da morte. São Paulo: N-1 edições, 2018.

McHenry, L.B. The Monsanto Papers: Poisoning the scientific well. *International Journal of Risk & Safety in Medicine*, 29(3-4), 193-205, 2018. doi: 10.3233/JRS-180028

Michaels, D. *Doubt is their product:* how industry's assault on science threatens your health. New York: Oxford University Press, 2008.

Miligi, L.; Constantini, A.S.; Veraldi, A. *et al.* Cancer and pesticides: an overview and some results of the Italian multicenter case-control study on hematolymphopoietic malignancies. *Annals of the New York Academy of Sciences*, 1076, 366-377, 2006. doi: 10.1196/annals.1371.036

MS - Ministério da Saúde. *Revisão do Anexo XX da Portaria de Consolidação nº 5, de 28 de setembro de 2017 do Ministério da Saúde (antiga Portaria MS No 2914/2011),* Tema II - Padrão de Potabilidade e Planos de Amostragem, Substâncias Químicas – Agrotóxicos, Substâncias não contempladas na PRC no 5/2017 e selecionadas para avaliação - Parte I e Parte II, Subsídios para Discussão e Orientações para Revisão. Brasília: Ministério da Saúde, 2020.

Mustafá, M.A.S.M; Anselmo, G.C.R.; Silva, S.S. Democracia e justiça social em tempos de golpe sob a égide do neoliberalismo. *Revista Katálysis*, 21(2):416-426, 2018. doi: 10.1590/1982-02592018v21n2p416

OPAS - Organização Pan-Americana de Saúde. *Folha informativa* – COVID-19 (doença causada pelo novo coronavírus), 2020. Disponível em: <https://tinyurl.com/rz9mdv6>. Acesso em: dez. 2020

Ortega, F.; Orsini, M. Governing Covid-19 without government in Brazil: Ignorance, neoliberal authoritarianism, and the collapse of public health leadership. *Global Public Health*, 15(9), 1257-1277, 2020. doi:10.1080/17441692.2020.1795223

Park, S.K.; Kang, D.; Beane-Freeman, L. *et al.* Cancer incidence among paraquat exposed applicators in the agricultural health study: prospective cohort study. *International Archives of Occupational and Environmental Health*, 15(3), 274-81, 2009. doi: 10.1179/oeh.2009.15.3.274

Parlamento Europeu. *Directiva 2009/128/CE* do Parlamento Europeu e do Conselho, de 21 de outubro de 2009, que estabelece um quadro de acção a nível comunitário para uma utilização sustentável dos pesticidas. *Jornal Oficial da União Europeia*, 309, 71-86, 2009. Disponível em: <https://tinyurl.com/y6z8uxnf>. Acesso em: out. 2020

Paulani, L. Acumulação sistêmica, poupança externa e rentismo: observações sobre o caso brasileiro. *Estudos Avançados*, 27(77), 237-264, 2013. doi: 10.1590/S0103-40142013000100018

Pelaez, V.; Terra, F.H.B.; Silva, L.R.A regulamentação dos agrotóxicos no Brasil: entre o poder de mercado e a defesa da saúde e do meio ambiente. *Revista de Economia*, v. 36, n. 1, 2010. Disponível em: <https://revistas.ufpr.br/economia/article/download/20523/13714>. Acesso em: mai. 2021.

Reis-Filho, J.A.; Quinto, D. Covid-19, Afastamento social, pesca artesanal e segurança alimentar: como esses temas estão relacionados e quão importante é a soberania dos trabalhadores da pesca diante do cenário distópico. *SciELO 2020* [preprint]. doi: 10.1590/SciELOPreprints.54

Rosa, A.C.S.; Gurgel, A.M.; Friedrich, K. *Presença de agrotóxicos em água potável no Brasil:* Parecer técnico do GT de Agrotóxicos da Fiocruz para a Revisão do Anexo XX da Portaria de Consolidação nº 05, de 28 de setembro de 2017 do Ministério da Saúde, para o parâmetro "agrotóxicos". Rio de Janeiro: Fiocruz, 2020.

Salam, S.; Arif, A.; Mahmood, R. Thiram-induced cytotoxicity and oxidative stress in human erythrocytes: an in vitro study. *Pesticide Biochemistry and Physiology,* 164, 14-25, 2020. doi: 10.1016/j.pestbp.2019.12.003

Milanez, B.; Santos, R.S.P. Neoextrativismo no Brasil? Uma análise da proposta do novo marco legal da mineração. *Revista Pós Ciências Sociais*, v. 10, p. 119-148, 2013. Disponível em: <https://www.ufjf.br/poemas/files/2014/07/Milanez-2013-Neoextrativismo-no-Brasil.pdf>. Acesso em: mai. 2021.

Sanctis, A.; Mendes, C.H. O ataque à liberdade acadêmica no Brasil. *Quatro Cinco um*, 01 jun. 2020. Disponível em: <https://www.quatrocincoum.com.br/br/artigos/l/o-ataque-a-liberdade-academica-no-brasil>. Acesso em: dez. 2021.

Santos, F.; Szwako, J. Da ruptura à reconstrução democrática no Brasil. *Saúde Debate*, 40(spe), 114-121, 2016. doi: 10.1590/0103-11042016S10

Schneider, S.; Cassol, A.; Leonardi, A.; Marinho, M. M. Os efeitos da pandemia da Covid-19 sobre o agronegócio e a alimentação. *Revista Estudos Avançados*, 34(100), 167-188, 2020. doi: 10.1590/s0103-4014.2020.34100.011

Sears, M.; Walker, C.R.; Van der Jagt, R.H.C.; Claman, P. Pesticide assessment: Protecting public health on the home turf. *Paediatrics and Child Health*, 11(4), 229-234, 2006. Disponível em: <https://tinyurl.com/y7tlmuse>. Acesso em: mai. 2021.

Souza, M.; Gurgel, A.M.; Fernandes, G.; Melgarejo, L.; Bittencourt, N.; Friedrich, K. Agrotóxicos e transgênicos: retrocessos socioambientais e avanços conservadores no Governo Bolsonaro. *Revista da Anpege,* 16(29), 319-352, 2020. doi: 10.5418/ra2020.v16i29.12561

STF - Supremo Tribunal Federal. *Inquérito 4831*. Número Único 0024271-86.2020.1.00.0000. Origem: DF - Distrito Federal; Relator: Ministro Celso de Mello; Autor: Ministério Público Federal; Investigado: Jair Messias Bolsonaro. Brasília: STF, 2020.

Tangamornsuksan, W; Lohitnavy, O.; Sruamsiri, R. *et al*. Paraquat exposure and Parkinson's disease: A systematic review and meta-analysis. *Archives of Environmental & Occupational Health*, 74(5), 225-238, 2019. doi: 10.1080/19338244.2018.1492894

Unicamp - Universidade Estadual de Campinas. *Posicionamento Público do Departamento de Saúde Coletiva (DSC) da Faculdade de Ciências Médicas (FCM) da Universidade Estadual de Campinas (Unicamp) sobre matéria divulgada pela ONG Repórter Brasil em 15/07/2020 "Lobby usa pesquisa não concluída para pressionar Anvisa sobre agrotóxico proibido"*. Campinas: Unicamp, 2020. Disponível em: <https://tinyurl.com/y5cusfaw>. Acesso em: dez. 2020.

Wallace, R. *Pandemia e agronegócio*: doenças infecciosas, capitalismo e ciências. São Paulo: Editora Elefante, 2020.

Wang, Z.; Tang, K. Combating Covid-19: health equity matters. *Nature*, 26, 458, 2020. doi: 10.1038/s41591-020-0823-6

Wenham, C.; Smith, J.; Morgan, R. Covid-19: the gendered impacts of the outbreak. *Lancet*, 395, 846-8, 2020. doi: 10.1016/S0140-6736(20)30526-2

Yi, S.-W.; Ohrr, H.; Hong, J.-S.; Yi, J.-J. Agent Orange exposure and prevalence of self-reported diseases in Korean Vietnam veterans. *Journal of Preventive Medicine and Public Health*, 46(5)213-25, 2013. doi: 10.3961/jpmph.2013.46.5.213