

Health surveillance and agribusiness: the impact of pesticides on health and the environment. Danger ahead!

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Abstract *Pesticides are abundantly used in agribusiness and can be damaging to health and the environment. Society in general and agricultural, environmental and health institutions in particular have a legal and statutory duty to supervise their use. To identify and analyze these actions, interviews were conducted with managers of the municipal offices and union leaders representing the workers and farmers. Managers and rural producers were of the opinion that pesticides are essential to productivity and do not generate any impact on health and the environment. No policies or institutional relations monitoring pesticide use were identified or being considered. Rural workers' unions do not take any political initiatives to benefit the health of the workers themselves, their families and that of society in general. The conclusion draws is the pressing need to develop a model for sustainable agriculture, healthy and free of pesticides and that organized society and responsible institutions must undertake actions that meet the needs of the people who working on the farms or consume the agricultural products harvested there, especially controlling risks and consequences that can and must be avoided.*

Key words *Pesticides, Health and epidemiological surveillance, Occupational health surveillance, Health policies*

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Introduction: Understanding the problem

The agriculture and cattle raising business is the most important economic activity in many Brazilian states, particularly those located in the Midwestern Region¹.

The predominant agricultural model in these regions is characterized by large land estates with heavy concentration of property, monoculture farming that is largely mechanized, lacking formal work relations, with extensive infrastructure for storage, commercialization and transportation of harvests and the inputs required by the activity, in addition to increased social and environmental risks².

This model, henceforth referred to as “agribusiness,” is based on the world policy of market globalization and is represented by the interests of multinational corporate conglomerates. In Brazil, agribusiness accounts for nearly one-third of the gross domestic product (GDP), employs 38% of labor and is responsible for 36% of Brazilian exports, and is considered by many as one of the most important sectors in the country’s economy³.

Dores and De-Lamônica-Freire⁴ point out that growth in the scale of agricultural production and policies to reduce losses from each harvest led to a giant leap in the consumption of pesticides. Crops became highly dependent on inputs such as pesticides, and Pignati *et al.*² use the pertinent term “pesticide dependent” to refer to this reality.

In 2008, sales of pesticides in Brazil came to US\$ 7,125 billion, making the country the world’s leading consumer of pesticides, surpassing the United States⁵⁻⁸.

This data is quite concerning, since, according to Oliveira⁹, there is a direct relation between growth curves of cases of pesticide poisoning and pesticide sales revenue.

Many studies showed that the use of pesticides may contaminate the environment and the toxic potential thereof may affect the health of urban and rural populations¹⁰⁻¹³, with carcinogenic, mutagenic, teratogenic and neuroendocrine effects^{14,15}, in addition to respiratory distress, memory problems and skin conditions, depression¹⁶, among others.

Faced with this situation, one may assume that cities that operate based on predominately agricultural economies and use pesticides in abundance must develop health policies with specific and situational focus on health problems resulting from these issues and their determi-

nants – meaning that actions and services should not be limited to those traditionally offered by healthcare units, thereby requiring additional efforts to mobilize and interrelate other governmental and non-governmental agencies and the involvement of workers, entrepreneurs and society at large. These entities must develop policies that break the paradigm of medicine-based provision of care by creating a model based on integrated health prevention, promotion and surveillance¹⁷.

Considering proposals prepared and presented by several segments of the federal government calling for decentralization of healthcare actions, including surveillance, this study sought to investigate whether health surveillance practices in cities that utilize large quantities of pesticides account for the health impacts thereof.

This study adopted a more expansive concept of Health Surveillance, understood as the integration of epidemiological, health, environmental and occupational health surveillance to be carried out by state (SES, acronym in Portuguese) and municipal health departments (SMS, acronym in Portuguese). This concept has yet to be consolidated by the Brazilian National Healthcare System (SUS, acronym in Portuguese) which is fraught with a dispute between the provision of care model based on hospitals and focused on disease, versus the model developed through special campaigns and programs. With this, the roles laid out for the three levels of public authority are fragmented from the holistic point of view desired by the National Healthcare System¹⁸⁻²⁰.

Aware of the need for oversight and intervention in risks resulting from the sales, transportation, storage and application of pesticides – responsibility of the state, at the three levels of public administration – it is relevant to understand actions developed in health, agriculture, environmental and occupational areas, in addition to organized society, in an effort to eliminate or reduce the negative impacts of these practices, based on an empirical study of the main grain producing cities in Mato Grosso (MT)²¹, considering this situation as a paradigm in the country’s agribusiness.

One would suspect that there were no intra- and intersectoral surveillance actions to monitor the use of pesticides in an effort to prevent harm to health and the environment.

The study sought to evaluate, based on the perception of social and technical players and organizational managers, how intra- and intersectoral actions for surveillance and monitoring of

pesticide use are executed within the perspective of harm to health and the environment.

Methods

A qualitative study conducted via analysis of interviews with subjects representing organizations responsible for surveillance of the impact of pesticides on health and the environment in the cities and state of Mato Grosso (MT), involving oversight and control of the commercialization, storage, transportation, application and disposal of empty containers, as well as the participation of organized society.

In conducting the study, cities characterized by elevated levels of agricultural production were selected, as they in turn use elevated quantities of pesticides.

A total of 36 subjects were interviewed between November 2009 and February 2010, four of whom were heads of the Municipal Departments of Agriculture and Environment (SMAMA), four were state employees at the Mato Grosso Institute for the Defense of Agriculture and Cattle Raising (Indea/MT) and eight union leaders, divided equally among producers and laborers. Sixteen of those interviewed were managers and employees of Municipal Health Departments, four of which were heads of the Municipal Health Department (SMS) and the remainder being technicians responsible for health, epidemiological and environmental surveillance. On the state level, four subjects were interviewed at Regional Health Offices (ERS, acronym in Portuguese), two of whom managers and the remaining two technicians responsible for health surveillance.

Interviews were scheduled in advance and all subjects signed an Informed Consent and were informed of their right to secrecy and the privacy of their identities. The project behind this study was submitted and authorized by the Research Ethics Committee of the *Universidade Federal de São Paulo* on April 11, 2008.

Following a pre-established script with open questions, all interviews were conducted by the author of this study, recorded using a digital recorder and transferred to Windows Media Player, after which they were transcribed and typed in Microsoft Word.

Using these interviews, we sought to interpret, based on subjects' discourse, their perceptions and meanings that would allow for an analysis of actions developed by the institutions they represent.

According to Minayo²², the qualitative method is considered ideal for analyzing the social and political conditions of a given reality and is capable of providing important information for use in the production of knowledge regarding the reality in question, thereby allowing for the construction or reformulation of a theory.

Qualitative research *works with the universe of meanings, motives, aspirations, beliefs, values and attitudes, which correspond to a deeper space of relationships, processes and phenomena that cannot be reduced to the operationalization of variables*²³.

The following procedure was adopted to analyze the content collected in interviews. The first step consisted of a pre-analysis, reading the transcribed interviews. At this point, it is to be understood that what was said does not encompass everything – the analyst must seek out the effects of meaning. This procedure led to the interpretation of that which was said and a classification and ordering of the many elements considered as thematic axes. These axes were created based on pertinent “excerpts of discourse” anticipated in interview scripts or arising spontaneously during interviews. The theories presented in the results of this study were created based on the thematic axes laid out herein²⁴.

Analyzing interviews allowed for a survey of how the interviewed subjects perceived meaning in the different questions asked. As such, to achieve the objectives of this study, the following categories were established for presentation and discussion of results: a) Chemical-dependent production model: a 1) hegemonic position; a 2) counter-hegemonic position; b) risks of pesticides to health and the environment; c) the roles of municipal agencies in health surveillance, agriculture, environment, labor unions and rural producers and social control.

Results and discussion

Chemical-dependent production model

Hegemonic position

The majority of subjects interviewed, independent of whether they were managers, employees of municipal departments, union representatives – both of producers or laborers and other parties – understand that the economy of their region is completely dependent on agribusiness and recognize that their cities are host to highly-developed agriculture, using cutting-edge technology, and that to increase agricultural pro-

duction, maintain the region's productive cycle and generate employment, the use of pesticides is considered necessary, given their basic role in controlling crop pests. Representatives of producer unions, some laborer representatives and municipal managers, particularly those tied to agriculture and the environment, understand that food production is pegged to the use of pesticides and that there is no other way in which to produce food. They defend that rural producers offer healthy food in sufficient quantity to guarantee that the population has access to products at a low price. In their opinion, pesticides are used to treat diseases that are inherent to crops and they do not believe that food could be produced without the use thereof. One can clearly see the defense of agribusiness and the use of pesticides, followed by a discourse that seeks to minimize the impacts of this practice. In taking this position, these subjects therefore consider impacts on health and the environment to be quite limited, as pesticides are applied correctly and with the use of appropriate technology.

Nonetheless, subjects recognize that laws are quite lax in Brazil and that certain products banned in Europe are freely used in the country.

Counter-hegemonic position

Other interviews gave a conflicting impression, particularly those of labor union representatives and municipal health department technicians, recognizing that the entire population, in addition to laborers that work directly with pesticides, is exposed to contamination risks, since crops in the cities being studied are mainly located in urban areas and aerial and land-based crop dusting increases exposure levels, as stated by Moreira et al.²⁵ and Pignati et al.². They recognized that pesticides are utilized in abundance and may be harmful to their health and that of their families and contaminate the environment in which they live. They understand pesticides to be risks that must be prevented.

Risks of pesticides to health and the environment

It is important to note that independent of education level, position held in municipal administration, age or gender, a number of striking testimonies were recorded - many with overtones of whistleblowing - regarding the severe, negative environmental impacts of the use of pesticides. Reports of papaya trees that are unable to produce papayas in the cities evaluated; reports of

contamination of water tables used to supply the region; reports of dead fish floating in rivers and identification of a decrease in the number of fish in rivers that bathe the regions surrounding arable land; destruction of fresh vegetables and disappearance of certain animals, such as the partridge, are proof of this reality, corroborating studies by some authors, including Moreira et al.²⁵; Silva et al.²⁶; Peres et al.¹⁰ and Silva¹¹, who already highlighted negative environmental effects, such as contamination of water tables and river and stream water that feeds these cities, affecting the biota, particularly fish and amphibians; the air and soil and fruit-bearing plants like the papaya trees that are rendered unable to bear fruit.

Given their work in the health sector, employees and managers from the municipal health departments provided reports associating the use of pesticides with some diseases, such as cancer, particularly in young people, an increasing mortality rate, congenital defects, miscarriages, depression, suicide attempts and others. They also identified the incidence of respiratory "problems" among the population, particularly during periods of pesticide application.

These opinions back studies by Armas et al.¹⁴, Carneiro et al.⁸, Augusto et al.¹³ and Grisólia¹⁵ showing that the chemical features of pesticides may lead to the development of several different diseases in humans.

The role of municipal institutions in surveillance of the use of pesticides

Health

Municipal health departments assume a lack of public interest in health surveillance actions in cities that make up the agribusiness productive chain, as local society recognizes this economic model as a job creator that provides income to the population, either directly or indirectly. Many report that they are unable to risk reducing annual agricultural production. Furthermore, the possibility of limiting the interest of economic groups in continued investment in the region serves as a disincentive against any institutional initiative, particularly those from the health sector, which seeks to evaluate the health effects of the use of pesticides. This action would lead to a challenge between rural producers and the municipal political oligarchy.

In addition to a lack of political interest in implementing health surveillance actions regarding the impacts of pesticide use, many allege a limited number of professionals in municipal

teams and lack of training to execute actions of this kind; uncertainty regarding the understanding of the technology necessary to comply with health surveillance duties, due to a lack of training in these activities, as no courses or specialized training are offered in the region, together with a lack of municipal legislation specific to the health sector's surveillance of pesticide use.

It is important to note that in truth, many seem to forget that the duties described in the Health Organic Act no. 8080/90 regarding health promotion, protection and recovery, together with the organization and functioning of health-care services and existing morbidity and mortality data (citation) call for the State, at the three levels of administration, to fulfill its role of protecting the health of the population at the municipal level, particularly that of those that use pesticides in excess to guarantee economic activities. Furthermore, the Ministry of Health (MS), State Health Departments (SES) and Municipal Health Departments (SMS) must assume their responsibility for guaranteeing holistic health-care assistance to the population through the National Healthcare System (SUS) and the entire health network responsible for care, surveillance and information for users directly or indirectly exposed to pesticides²⁷.

The discourses show non-compliance with basic aspects of the Act no. 8080/90, for the duties of health surveillance teams include controlling the storage and transportation of pesticide containers; monitoring pesticide application in rural areas, together with laborers; evaluating the working conditions and equipment used by aerial crop dusting companies; understanding the quantity and types of pesticides utilized in the region; the health effects caused by the main active ingredients in these products; evaluating the quality of foodstuffs consumed in the city and study the incidence of pesticide residue found in *in natura* products.

The study showed that depending on the city in question, both Health Surveillance (HS) and Environmental Surveillance (ES) conduct the *Vigi-água* environmental program, which works to monitor water quality, including the identification of pesticide residues. It is common knowledge however, that from a methodological point of view, heavy metals and certain active ingredients found in pesticides can only be analyzed using technology that neither the cities studied nor the state of Mato Grosso possess. Another important characteristic of this water control action is related to the outsourcing of this activity

by a portion of the cities in question. In some cities, third-party companies supply water and are contractually responsible for analysis, delivering results to Municipal Health Department. It is important to note that municipal health surveillance is responsible for caring for the quality of food and water to be consumed by the population, in accordance with SUS legislation, also known as Act no. 8080/90 – article 6, item VIII.

Furthermore, the main actions conducted by Environmental Surveillance are vector control procedures, mainly for dengue, malaria and leishmaniasis and, to a varying degree among the cities studied, the *Vigi-água* and *Vigi-ar* programs are executed without the chemical and laboratory analysis appropriate for pesticides.

Actions commonly executed by Epidemiological Surveillance in cities include notification of cases of swine flu, dengue, leprosy and tuberculosis, as well as campaigns to control sexually transmitted diseases. Similar to other surveillance initiatives, the Epidemiological Surveillance only complies with federal and state legislation, skirting issues of pesticide use.

SMS and ERS employees, particularly those responsible for Epidemiological Surveillance, recognize instances of underreporting of acute intoxication, providing a number of justifications: the fact that healthcare teams confuse certain symptoms with allergic reactions, fevers, etc.; and even in the case of acute intoxication, many poisoned laborers are afraid of losing their jobs for seeking out healthcare services. Many stated that there are no notifications of pesticide intoxication, nor records of hospitalizations, deaths and related occupational accidents.

Interviews also found that there are no Health Surveillance teams at the SMS locations studied. According to testimony, other surveillance is deployed as a result of complaints that could be associated with Health Surveillance. The subjects, technicians and managers of SMS and ERS, when questioned on this theme, considered Health Surveillance actions to be too complex and SMS employee teams too limited and underqualified to conduct such actions.

State level management actions

On the statewide level in MT, directors and technicians at Regional Health Offices (ERS) responsible for micro regions declared that all surveillance is in place, excluding Occupational Health Surveillance, with municipal and ERS surveillance complying with their historical and routine duties, while not undertaking any actions

to control the use of pesticides or interrelating with other institutions.

According to state managers, difficulties in developing surveillance actions on the use of pesticides stem from the fact that municipal managers and society at large do not consider pesticide exposure risk as a public health risk. As such, there is no interest among municipal managers in adopting control measures, many technicians lack the scientific knowledge to recognize health risks to laborers and society when exposed to pesticides, and many teams lack training.

For these managers, SMS offices do not have records of companies that sell these products nor the farms that use them, there is no monitoring of activities related to the use of pesticides in the micro region and water, soil and air analyses do not identify pesticide residue. They recognize that the Epidemiological Surveillance is unable to work with municipal health teams to develop strategies to solve the issue of underreporting of intoxication, particularly chronic cases, in addition to an inability to establish casual links between notified health issues and exposure to pesticides.

Agricultural sector and the environment

The municipal departments evaluated in this sector all share a common trait: all cover both agricultural and environmental sectors and, when the heads of the departments were questioned about this relation, stated that it was ideal for the development of agribusiness in the region.

Within the Municipal Agriculture and Environment Departments (SMAMA, acronym in Portuguese) the respective managers confirmed having received no political guidelines or action strategies regarding control of pesticide use. During routine work, technicians from these municipal departments did not conduct surveillance or control of pesticide use.

Within the state of MT there is an institution, known as the *Instituto de Defesa Agropecuária* (Indea) [Institute for the Defense of Agriculture and Livestock] which is tied to the State Department of Agriculture and should play a strategic role in health promotion and prevention policies. According to the employees interviewed, in order to comply with the terms of State Act no. 8588/06, the Indea is required to register companies that sell pesticides, provide services such as aerial crop dusting and act as centers for empty container collection²⁸. Furthermore they must control the issuance of agronomic prescriptions up to the disposal of the empty container. Their

employees oversee and inspect rural properties, urban resellers and aerial crop dusting companies to verify expiration dates on pesticides, full and empty container storage, triple washing protocols, laborer use of Personal Protective Equipment (PPEs), proof of delivery of empty containers, in addition to conducting lectures and other health education activities. Employees fill out a term of inspection and, if irregularities are identified, may notify the establishment's owners of their obligation to carry out improvements required by the law or, particularly in the case of recurring violations, issue fines. Those interviewed stated that the issuance of notifications and fines is limited. The subjects interviewed expressed their doubt as to the efficiency and rigor of control over appropriate acquisition of pesticides and disposal of containers within deadlines established by law. The multiple uses for application and nearly continual harvests make control difficult, considering that producers have a period of 180 months to return containers, utilized or not.

The subjects stated that there are strong marketing actions regarding the collection of empty containers, however they are concerned with full containers, as they are unable to control the appropriate transportation, storage and use thereof when dealing with used, registered pesticides that have yet to expire. It is not rare to find pesticides stored inappropriately on rural properties, instances of burning of containers or the disposal thereof on the side of highways or in rivers.

Many of those interviewed also expressed the fragility of control over agronomic prescriptions. According to reports from technicians, many resellers often issue receipts without the slightest levels of control. Producers apply these products as they see fit, as it is very difficult to monitor all uses on all properties within the scope of a regional Indea office. Technicians also stated that they face logistical difficulties (vehicles and employees) given the vast geographic distribution and number of properties to be overseen within the vast scope of each regional office.

Indea does not conduct integrated actions with other municipal institutions, nor with state administration. All municipal managers in the health, agricultural and environmental sectors stated that they were unaware of the quantity and type of pesticides applied in their cities. They stated they had never received reports from Indea, nor from any other agency. Indea technicians confirmed that they do not provide reports to cities. All data from regional Indea units is sent

to central headquarters in the city of Cuiabá, and data is not available online.

The role of unions and social control in surveillance of pesticide use

Rural laborer's union

The heads of Rural Laborers' Unions (STR, acronym in Portuguese) interviewed during this study, for their part, pointed out labor and pension actions conducted via legal assistance and the defense of family agriculture, while not assuming any actions to face issues stemming from pesticides. Interviews of many STR heads included testimony regarding health care, proof of defense of the provision of care model, not based on the SUS network for union members and their families. According to these subjects, the main actions stemming from labor complaints are as follows: labor, pension plan, credit and credit development issues.

With regards to questions involving pesticides, STR heads showed significant disagreement in their opinions of the impact on health and the environment. Some defended the use of pesticides and showed they were unaware of the risks of indiscriminate use, accepting and associating themselves with the agribusiness economic model, while working in an integrated fashion with pesticide manufacturers and companies that exploit this economic business model.

In comparison, other heads were against the indiscriminate use of pesticides and the agribusiness model and defended family agriculture. These heads were often more vocal in the social control of health councils, while lacking qualified discourse that shows a capacity to change the welfare healthcare models in their cities.

Rural producers' union

As was expected, heads of Rural Producers' Unions (SPR, acronym in Portuguese) presented a uniform front in defense of the use of pesticides, defended the agribusiness model, considered pesticides as "medicine" to care for plant health and, in the logic of their discourse, essential to providing quality food to the population in a social role, despite prioritizing exports. Furthermore, SPR heads denied the impacts of pesticide use on health and explicitly affirmed their defense of the category's interests with regards to the agribusiness productive cycle at all levels of government.

Municipal health council actions

All subjects in the health sector were questioned regarding their participation in their respective Municipal Health Councils (CMS, acronym in Portuguese) and the existence, within in CMS, of proposals to create and conduct policies for health surveillance regarding pesticides. Among the thirteen subjects interviewed, five stated they actively participated and alleged that the CMS's did not develop municipal health policies, much less policies for pesticide surveillance. According to reports, the theme pesticide surveillance has never been included on CMS meeting agendas.

Meetings are held on a monthly basis and mainly touch on subjects related to hospital care network and Primary Care Units, such as user complaints regarding services rendered by healthcare professionals or other technicians and complaints regarding lack of medication.

Final consideration

Given these results and aware of the relation between the abundant use of pesticides and risks that this practice represents to the environment and human health, it has become quite clear that the state is not playing its role, nor is society as a whole, in surveillance of the use of pesticides to evaluate, measure and reduce the impacts thereof^{8,13}.

This is obviously a very complex theme, as it involves actions from the health, agriculture, environmental, occupational, social security, educational and justice sectors, among others, at all three levels of government, in addition to social engagement and interests of economic power and state politics in Brazil and abroad.

The impact of pesticide use on the population and the environment in the cities studied and the role of this use as an economic driver in the region only exacerbates the need for an inter-institutional policy for integration, thereby not justifying fragmented actions from institutes involved, as seen herein. The reality seen in public administration in the cities studied is varied and is characterized by different models for organization, activities, resource availability and management training, which necessarily leads one to look to new management models²⁹.

Given that agribusiness is now considered one of the most important sectors in Brazil's economy, working under a model characterized by large land estates, single crop, mechanization

using cutting-edge technology and intensive use of pesticides, this theme requires urgent attention from academics.

It is important to note that a significant portion of society supports this economic model. A number of interviews, particularly of agricultural producers and municipal managers, show a belief in the fact that food production is tied to the use of pesticides and that there is no other way to produce food, without, as agribusiness does, prioritizing the use of pesticides as an essential condition to guarantee large-scale agricultural production. This condition becomes clear by associating the celebrated and recurring national records in Brazilian grain production, particularly in central Brazil, with the unabated increase in the sales of pesticides that recently made Brazil the largest global consumer of these products.

One recognizes that this practice is backed by significant amounts of money, public managers, politicians and entrepreneurs that represent the region's oligarchy, exercising pressure to guarantee the continuity thereof, with no interest whatsoever in changing the *status quo*. As such, organized society has little ability to face this issue.

This situation is backed by testimony that, while defending the use of pesticides, also minimized impacts, flying in the face of reality that has been proven time and again by academic research and ecological disasters covered by the press³⁰.

One can then state that the urban and rural population, when eating or living and working in environments that are in contact with these products, is suffering direct or indirect contamination and is at risk of chronic or acute intoxication.

Having exposed the grave reality of precarious control of pesticide use, it is important to note that other forms of agriculture do in fact exist, as presented in a report entitled Natural Defense, published on September 14, 2011 and signed by Elton Alisson at the Agência FAPESP, that shows that Brazil has already been working to develop its own technology for biological control of agricultural pests on a large scale. According to the report, insects created in laboratories may be used to combat plant predators and the area is already capable of applying biological controls to pests in corn, cotton, eucalyptus, sorghum, vegetables and soybean³¹.

To back this possibility, it is essential to cite Salomão³² in a report to *Época* magazine, in which a sustainable agriculture experiment integrated with the environment generated dividends, thereby rebuffing the arguments of agribusiness's staunchest defenders.

What is left is hope that recent strategies, such as the "Integrated Plan for MS Health Surveillance among Populations Exposed to Pesticides", be able to definitively establish integrated actions among several different areas and public institutions to thereby create oversight of risks and effects, preventive measures and control over the use of pesticides³³.

In conclusion, we defend the search for a new agricultural model that is sustainable, healthy and free of pesticides. Furthermore, we hope that the states of Brazil, through their power and driven by organized society represented by councils, labor unions and other engaged entities, work to create actions for the greater good of the population that works in the field or eats the fruits of these fields by controlling risks and repercussions that can and should be prevented.

Collaborations

E Nasralla Neto, FAC Lacaz e WA Pignati participated equally in all stages of preparation of the article.

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