

Agrochemicals and human health: contributions of healthcare professionals*

AGROTÓXICOS E SAÚDE HUMANA: CONTRIBUIÇÃO DOS PROFISSIONAIS DO CAMPO DA SAÚDE

AGROTÓXICOS Y SALUD HUMANA: CONTRIBUCIÓN DE LOS PROFESIONALES DE LA SALUD

Soraia Lemos de Siqueira¹, Maria Henriqueta Luce Kruse²

ABSTRACT

This paper focuses on the scientific production of health professionals, especially nurses, about agrochemicals and human health. The essay combines and presents information by means of literature review, with a view to acknowledge the contribution of each author and their use for the human health field. Thirty-two research articles, published in Brazilian journals, were located. The analysis of these articles highlights that healthcare professionals' contributions focus on human health, especially, workers' health and food quality. With a view to minimize the effects from agrochemicals on human and environmental health, the authors exposes action suggestions both for health professionals and for the institutions associated.

KEY WORDS

Health personnel.
Pesticides.
Agriculture.
Rural workers.
Occupational health.
Rural health.

RESUMO

Focaliza a produção científica dos profissionais da saúde, em especial das enfermeiras, sobre o tema agrotóxico e saúde humana. O ensaio reúne e apresenta informações por meio de pesquisa bibliográfica, procurando reconhecer a contribuição de cada autor e sua utilidade para o campo da saúde humana. Foram localizados 32 artigos de pesquisa publicados em periódicos brasileiros. A análise dos artigos destaca que a contribuição dos profissionais de saúde é focada na saúde humana – especialmente na saúde do trabalhador e na qualidade dos alimentos. No intuito de minimizar os efeitos dos agrotóxicos para a saúde ambiental e humana, os autores expõem sugestões de ação, tanto para os profissionais da saúde como para os órgãos competentes.

DESCRIPTORIOS

Pessoal de saúde.
Praguicidas.
Agricultura.
Trabalhadores rurais.
Saúde do trabalhador.
Saúde da população rural.

RESUMEN

Enfocase la producción científica de los profesionales de la salud, en especial de las enfermeras, sobre el tema agrotóxico y salud humana. El ensayo agrupa y muestra informaciones a través de la investigación bibliográfica, con el objetivo de reconocer la contribución de cada autor y la utilidad para el campo de la salud humana. Fueron encontrados 32 artículos de investigación, publicados en periódicos brasileños. El análisis destaca que la contribución de los profesionales de salud es dirigida a la salud humana, específicamente en las áreas de salud del trabajador y calidad de los alimentos. Los autores brindan recomendaciones tanto para los profesionales de la salud, como para los organismos competentes con la finalidad de disminuir los efectos de los agrotóxicos para la salud ambiental y humana.

DESCRIPTORES

Personal de salud.
Plaguicidas.
Agricultura.
Trabajadores rurales.
Salud laboral.
Salud rural.

* Extracted from the term paper "Agrotóxicos e Saúde Humana: contribuições dos profissionais do campo da saúde", School of Nursing, Federal University of Rio Grande do Sul, 2007. ¹ Nurse. Resident in the Multi-professional Health Residency Program of Pontifical Catholic University of Rio Grande do Sul (PUCRS), Porto Alegre, RS, Brazil. soraialemos@gmail.com ² Doctor in Education. Associated professor of the School of Nursing, Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil. kruse@uol.com.br

INTRODUCTION

The term *agrochemical*, instead of *agriculture defensive*, was first used in Brazil to name agricultural poisons, after a great mobilization from the organized civil society. More than a simple change in terminology, this term makes evident the toxicity of these products for the environment and human health. They are also generically named pesticides and insecticides. Due to a legal determination, these products should present, in their labels, a colored band indicating its toxicological class. Class I Extremely toxic – Red label; Class II Highly toxic – Yellow label; Class III Quite toxic – Blue label; Class IV Slightly toxic – Green label. This classification is also related to the group's action and to the chemical group they belong.

The insecticides provide anti-insects, larvae and an action, belonging to distinct chemical groups, where organophosphoric and organochlorides are featured. Herbicides are used against weeds. For the last two decades, this group has been increasingly used in agriculture. The organochlorides were highly used in agriculture as insecticides; however their employment has been progressively restrained or even prohibited, since they provide an extensive residual spectrum, also presenting a highly cumulative power⁽¹⁾. The use of agrochemicals in agriculture causes direct or indirect human contact with these materials. Directly, because of the contact of these substances and/or products in a contaminated environment. And, indirectly, through the contamination of the biota in locations close to agriculture crops, which provoke imbalances in local ecosystems, resulting in a series of damages to the inhabitants of a region. The ways of exposition responsible by the impact of these agents on humans are reasonably well-known. The process in which the human population is exposed, however constitute true mysteries due to the multiplicity of factors involved⁽²⁾.

The harmful effects on human health from the use of agrochemicals have been the aim of various studies developed by healthcare professionals, who have presented evidences of these substances in human blood samples, breast milk and food residues consumed by the general population, pointing at the possibility of occurrence of congenital anomalies, cancer, mental disease and human reproductive malfunctions related to the use of agrochemicals. The use of agrochemicals in the Brazilian rural environment has brought a series of consequences, both for the environment and for the health of rural workers. Generally, these consequences are conditioned by the intrinsically related facts as: the inadequate use of these substances, the pressure exercised by the industry and commerce for this use, the high toxicity of certain products, and the precarious vigilance mechanisms⁽³⁾. On the other hand, information about health and safety of these prod-

ucts are observed to be difficult to access by those who use them, because the technical language used is very difficult for these people to understand.

Exposition to agrochemicals is most common in the sectors of: agriculture and animal husbandry, public health, insect combat companies, transportation, and agrochemicals commerce and production. Also, food and environmental poisoning sets population groups at risk. People contamination, most probably, may happen due to how they identify and position themselves facing the risks of which they are exposed to, either individually or collectively. Therefore, knowledge about such risks is fundamental to build an intervention strategy that will decrease inadequate use effects, providing a great challenge for healthcare workers that provide assistance to rural population⁽³⁾.

Generally, the rural workers' occupational exposition occurs due to lack of information or resources. As such, the individual protection equipment (IPE's) tend not to be used while preparing and using agrochemicals, mostly because

The harmful effects on human health from the use of agrochemicals have been the aim of various studies developed by healthcare professionals, who have presented evidences of these substances in human blood samples, breast milk

they are not always adequate for the reality of the Brazilian climate. Disregard for risk cannot be taken literally, as if the worker did not completely know the inherent risks to the activity. Most likely the opposite, this strategy evokes full knowledge of the danger, where the worker adds his own risk to the inherent risk during the work process, in a way to minimize or simply deny the other, in a defensive ideological strategy. The main function of this defensive ideology would be to propitiate survival to the worker in a harmful working environment/process, by a symbolic constitution of values, where the worker dominates danger, and not the opposite way⁽⁴⁾.

Notification and investigation of agrochemical intoxications are even more precarious in our country. Difficulties for rural workers to access health centers and incorrect diagnoses are some of the factors that influence the sub-record. Apart from that, in most Brazilian States and cities, notifications of such grievances to the epidemiology and/or sanitary vigilance systems are not compulsory⁽²⁾.

My motivation for this research arose from having spent my childhood and part of my adolescence in a rural zone, in the interior of the State of Rio Grande do Sul, and also, by the constant visits I still make to this location, where I can observe the use of agrochemicals by small and medium-sized producers. Many times, the poisons are applied with no adequate protection equipment, including by children, and also the inadequate reuse and discard of packages set health at risk. When contact with the nursing area was established, I observed the lack of studies on this theme. As such, we believe that it is important to verify the knowledge production about the subject, both for nursing and for other healthcare professionals, when proposing the creation of subsidies for the education of health-

care professionals, training critical and capable subjects to work in the SUS⁽⁵⁾. These professionals must be qualified to assist the population, with a view towards intervention strategies, mainly in the rural environment.

Therefore, this paper aims at knowing, reuniting and presenting contributions for the healthcare professionals, mainly for nurses, regarding the issue of human health and agrochemicals published in Brazilian journals. The following questions were elaborated for this research: What is the contribution of health professionals, mainly nurses, in the agrochemicals and human health subject? Where do these professionals come from? What education degree do they hold? Which themes are approached? What are the results of their research? Which recommendations are suggested by the authors?

METHODS

The present study is based on literature review, developed from material that had already been developed, located in health area journals. The literature review was developed throughout a series of stages: theme choice; preliminary literature review; establishment of problems; provisory plan about subject development; search of sources; reading material; filing; logical organization of the subject and text writing⁽⁶⁾.

Articles selection was performed by using the *PeriEnf* database journal index search tools at the Nursing School Library (EEUSP) and *SciELO - Scientific Electronic Library Online*. When searching for sources, Brazilian journals were selected and five keywords were used, both in the singular and plural: pesticide, agrochemical, rural worker, health and intoxication by agrochemicals. Public articles published between 1990 and 2005 were located. This temporal limitation was due to the fact that articles produced by nurses were found only in the *PeriEnf* data base. And the oldest text in this data base is from 1990. The most recent are from 2003, making a total of six publications. The publications from other professionals were found in the *SciELO* electronic library, a total of 26 articles. The articles were analyzed, starting from their abstracts and, when this action was not satisfactory, they were located for an integral evaluation. Bibliographic cards were elaborated in order to take notes of references, and also notation cards for ideas and data records. These cards were organized according to the following categories: Problems/Objectives, Results and Contributions/Recommendations within the articles.

RESULTS PRESENTATION AND DISCUSSION

32 articles published in nine journals were found. Physicians rank highest in publication, with a total of 14 articles. The other authors are nurses, biologists, pharma-

cologists, nutritionists, dentists, psychologists, biochemists, zootechnicians, social workers, chemists, historians and economists, configuring the subject as multidisciplinary. When relating to the geographic location of the published articles, most of them come from the South and Southeast regions. Two other articles were also found from foreign writers, published in national magazines. The texts composing the *corpus* of the study are included in the attached chart

For the presentation of the authors' contributions, categories were set according to the theme approached by the articles: comorbidities associated to intoxication by agrochemicals use, rural worker knowledge about intoxication related to the use of agrochemicals and epidemiological data.

Comorbidities associated to intoxication by agrochemical use

In this category, the authors highlight comorbidities related to mental disease, cancer, human reproduction malformation and incidence of alterations. One article⁽⁷⁾ was found among these, which represents the suicide attempts caused by agrochemicals in Mato Grosso do Sul between 1992 and 2002. Intoxications occurred, predominantly, in men (87.0%); however, the difference between suicide attempts in men and women was not highlighted (53.0 and 47.0%, respectively). The study relates the prevalence of suicide attempts related to organophosphate monocrotophos and methamidophos, mainly between October and March.

Some papers establish the relation between pesticide exposition and cancer occurrence. Such is the case of a study performed in eleven Brazilian states⁽⁸⁾, where moderate and high correlation coefficients are described, observed for the majority of the result indicators: testicle, breast, prostate, ovary cancer and infertility, establishing cause-and-effect relations between pesticide exposition and the reproductive disorders analyzed.

Regarding breast cancer, endometrial, ovary and prostate cancer, a study⁽⁹⁾ discards the hypothesis of DDT as responsible for this type of cancer risk. However, it is not possible to exclude the elevated DDE, DDT metabolic ethylene exposition, particularly for post-menopause breast cancer, as positive for estrogenic receptors.

In an analysis of six epidemiological recent studies about the association between organochloride compounds and breast cancer, the measurement of environmental exposure by biological markers is approached. One of the studies⁽¹⁰⁾ highlights that there is no indication of breast cancer risk related to organochlorides, probably because environmental cancer agents are homogeneously disseminated, causing low levels of exposition for the population.

Congenital malformation related to agrochemical use are presented in a secondary base control case study⁽¹¹⁾, where 274 cases of cleft lip and palate, isolated cleft palate carriers and 548 control cases were evaluated. The variables analyzed were: residential proximity to industrial

areas, exposition to commercial insecticides and agriculture pesticides, as well as occupational expositions, relating risk factors involving environmental with the occupational exposition of parents, resulting in malformation. This association suggested a risk increase of 5.73% in domestic insecticides use and in urban control vectors, where the mother's professional occupation that is mostly associated to these results are domestic services. Proximity to industrial installations was pointed as a potential risk factor (3.32%) for oral-facial clefts. In another study⁽¹²⁾ about the genotoxicity of organochloride compounds was highlighted as more serious among the possible damages caused by these compounds. Among the organochloride estrogenic effects are: increased incidence of alterations in the development of the reproductive system and male fertility for the past decades, relating therefore, organochlorides and chronicle effects caused by exposition.

Rural worker knowledge about intoxication related to agrochemicals use

In three studies⁽¹³⁻¹⁵⁾ related to risk perception, the authors search for data about how rural workers identify and position themselves, facing exposition risks while using agrochemicals. These studies are elaborated from the authors' interpretation about these population's information, beliefs and perceptions. With this view, they made evident the importance of analyses of risk perception to build a rural environment intervention strategy. These studies evaluated the dangers experienced in the working process to develop defensive strategies for workers' health. The importance of communication while building the risk reference among workers highlights subjective answers against potential health damage situations and the role of individual and collective perceptions relating dangerous exposition to chemicals – above all, agrochemicals.

Epidemiological data

In this category, the authors aimed at studying the association between relative variables to occurrence of diseases, as well as the frequency between men and women, rural workers' and general population health consequences, caused by the presence of ingested food residues. These findings are related to intoxication exposition by agrochemicals, both for humans and for the environment. In a study⁽¹⁶⁾ evaluating the frequency of diseases caused by the use of agrochemicals in men and women, women presented higher probability for chronic respiratory diseases and asthma.

In another study, this time a comparative study⁽¹⁷⁾, the use of tomato pesticides was analyzed, where, in the town where tomatoes for domestic consumption are produced, 13.2% of workers have already suffered some kind of intoxication, 70.6% of women reported miscarriages, and

39.4% revealed having lost one child younger than one year old. Workers' exposition to agrochemicals evidenced problems related to the immune system (36.4%), osteomuscular system (35.8%) and central and peripheral nervous system (32.5%). In the city producing tomatoes for industrial use, 80% of workers used agrochemicals in their activities, reporting dizziness, nausea and headaches. In both regions, lack of knowledge from producers and workers about the toxic effects of the inadequate use of pesticides for the health and the environment was verified.

Pesticides also cause gene mutations and chromosome aberrations in individuals. This statement is based on cytogenetic studies that show quite a high frequency of chromosome aberrations in the group exposed to pesticides when compared to the control group, where clinical results reveal that workers had been contaminated. In an experience report⁽¹⁸⁾, a descriptive epidemiologic study was performed in an agrarian reform settlement, when approximately 1200 people were camped next to an organochloride agrochemical warehouse. There have been reports on acute intoxication by the *poison* and, a case of a child carrying a congenital anomaly, whose mother had contact with agrochemicals during most of her pregnancy.

...study evaluating the frequency of diseases caused by the use of agrochemicals in men and women, women presented higher probability for chronic respiratory diseases and asthma.

The chronic risk of pesticide ingestion through the diet was investigated in the city of Santa Maria (RS), Brazil⁽¹⁹⁾, where the levels of pesticide frequency in hot-dog samples was lower than the maximum accepted by legislation. In another research⁽²⁰⁾, performed with 1,064 rural workers, aimed at characterizing the working process of workers with intoxication by agrochemicals, studies results show that 50% of the interviewed workers were, at least, slightly intoxicated. In another study⁽²¹⁾

organochloride pesticide levels were analyzed in human milk samples, with seven rural workers, where DDT total was found in 100% of the samples, holding levels that varied between 0.008 and 0.455mg/kg, showing recent expositions to DDT.

Presenting Recommendations

The analyzed articles present recommendations to readers, which will be presented in this chapter. Among these recommendations, actions to avoid workers' health damage must offer available alternative conditions for producers to control organisms that eventually decrease crop production⁽²²⁾ is emphasized. Therefore, a higher amount of resources should not only be aimed at decreasing product toxicity, but also to seeking agro ecological alternatives for production.

In the articles featured in Chart, suggestions are presented, both for healthcare professionals and for the competent organs:

- Simplifying products labels;
- Using protection equipment;

- Supervising product commercialization;
- Encouraging prevention, using educational measures;
- Monitoring pesticides residues in food products;
- Developing actions with a view to protect the workers' health;
- Analyzing risk perception in intervention strategies process in the rural environment;
- Establishing policies and educational and communication risk campaigns;
- Prioritizing research about acute intoxication by agrochemicals;
- Monitoring populations exposed to agrochemical mixtures through biological trials by micronucleus test;
- Equipping health professionals with notification instruments that can serve the rural population.

FINAL CONSIDERATIONS

While writing this text, there were no concerns about building a history of the research findings produced by health professionals regarding agrochemicals. The aim was to simply identify some of the various sources that composed this production, aiming at recognizing each contribution and in which way this production may be used. Therefore, a reflection about these texts is featured here; not aimed at what was produced, as if it was the final stated truth; however, done in order to highlight some of their findings, understand their concerns in order to make it possible to evaluate the use of these texts. As such, there were no concerns on providing a complete inventory about the theme, since we took the liberty to approach aspects that seemed more relevant in the articles.

REFERENCES

1. Organização Pan-Americana de Saúde (OPAS). Proposta de uma metodologia para implantação de um sistema de vigilância à saúde de populações expostas agrotóxicos em cinco estados do Brasil: Relatório final. Brasília; 1996.
2. Peres F, Oliveira-Silva JJ, Della-Rosa HV, Lucca SR. Desafios ao estudo da contaminação humana e ambiental por agrotóxicos. *Ciênc Saúde Coletiva*. 2005;10 Supl:27-37.
3. Peres F, Moreira JC. É veneno ou é remédio? Agrotóxicos, saúde e ambiente. Rio de Janeiro: FIOCRUZ; 2003.
4. Dejours C, Abouchely E, Jayet C. *Psicodinâmica do trabalho*. São Paulo: Atlas; 1994.
5. Silva CC, Egry EY. Constituição de competências para a intervenção no processo saúde-doença da população: desafio ao educador de enfermagem. *Rev Esc Enferm USP*. 2003;37(2):11-6.
6. Gil AC. *Como elaborar projetos de pesquisa*. São Paulo: Atlas; 2002.
7. Pires DX, Caldas ED, Recena MCP. Intoxicações provocadas por agrotóxicos de uso agrícola na microrregião de Dourados, Mato Grosso do Sul, Brasil, no período de 1992 a 2002. *Cad Saúde Pública*. 2005;21(3):804-14.
8. Koifman S, Koifman RJ, Meyer A. Human reproductive system disturbances and pesticide exposure in Brazil. *Cad Saúde Pública*. 2002;18(2):435-45.

Therefore, we point out that the health professionals' contributions to this theme are focused on human health, especially, the workers' health, and on food products quality. Nurses have initiated their intellectual production about the subject in the 1990s⁽²¹⁾. Since then, there was no increase on scientific production in the area, since only five papers were published about agrochemical intoxication and the effects for workers' health by exposition to these products, in the studied database.

Most of the articles on the subject are produced in universities, demonstrating that the institutions are involved in the issue. This study field has generated a discipline, constituted in the 1970s, biosafety. Form the 1990s on, this concept was redefined, where it became known as the measure compound aimed at prevention, minimization or elimination of inherent risks to research, production, education, technological development and service providing activities that may compromise human, animal and environment health, or the quality of the work developed⁽²³⁾. Therefore, we highlight the importance of including these findings, as well as the our concerns about including this theme in curriculum of undergraduation courses in order to build a biosafety culture, making professionals aware of these risks and for possible damage prevention, both for their own health and for those under their care. For that, an inter-sectorial and inter-disciplinary approach is necessary, involving health, agriculture, science and technology, environment, work, and rural extensions, which represent a great challenge for social the actors interested in the issue⁽²⁴⁾.

In conclusion, we observe this text as an invitation for the readers to commit, with their own opinions, to the process constructing a collective reflection around the role of health professionals in the agrochemical and human health theme study, observing potentials and limitations, as well as their commitment to the construction of more simply health policies, systems and practices.

9. Cocco P. On the rumors about the silent spring: review of the scientific evidence linking occupational and environmental pesticide exposure to endocrine disruption health effects. *Cad Saúde Pública*. 2002;18(2):379-402.
10. Silva M, Gulnar A. Measuring exposure to organochlorinated pesticides. *Cad Saúde Pública*. 1998;14 Supl 3: S177-9.
11. Leite ICG, Paugartten FJR, Koifman S. Orofacial clefts in the newborn and environmental and occupational parental exposures: a case-control study in Rio de Janeiro, Brazil. *Rev Bras Saúde Matern Infant*. 2003;3(4):401-9.
12. Nunes MV, Tajara EH. Efeitos tardios dos praguicidas organoclorados no homem. *Rev Saúde Pública*. 1998;32(4):372-82.
13. Budó MLD, Gonzales RMB, Beck CLC. Saúde e trabalho: uma correlação de conceitos na perspectiva de uma população rural e de Christophe Dejours. *Rev Gaúcha Enferm*. 2003;24(1):43-53.
14. Peres F, Lucca SR, Ponte LMD, Rodrigues KM, Rozemberg B. Percepção das condições de trabalho em uma tradicional comunidade agrícola em Boa Esperança, Nova Friburgo, Rio de Janeiro, Brasil. *Cad Saúde Pública*. 2004;20(4):1059-68.
15. Peres F, Rozemberg B, Lucca SR. Percepção de riscos no trabalho rural em uma região agrícola do Estado do Rio de Janeiro, Brasil: agrotóxicos, saúde e ambiente. *Cad Saúde Pública*. 2005;21(6):1836-44.
16. Faria NMX, Facchini LA, Fassa AG, Tamasi E. Pesticides and respiratory symptoms among farmers. *Rev Saúde Pública*. 2005;39(6):973-81.
17. Araújo ACP, Nogueira DP, Augusto LGS. Impacto dos praguicidas na saúde: estudo da cultura de tomate. *Rev Saúde Pública*. 2000;34(3):309-13.
18. Ambrosini MB, Marona DS. Pesquisando intoxicações por agrotóxicos durante o curso de enfermagem: relato de experiência. *Rev Gaúcha Enferm*. 1999;20(2):143-50.
19. Bogusz Júnior S, Santos JS, Xavier AAO, Weber J, Leães FL, Costabeber I. Contaminação por compostos organoclorados em salsichas hot-dog comercializadas na cidade de Santa Maria (RS), Brasil. *Ciênc Rural*. 2004;34(5):1593-6.
20. Soares W, Almeida RMVR, Moro S. Trabalho rural e fatores de risco associados ao regime de uso de agrotóxicos em Minas Gerais, Brasil. *Cad Saúde Pública*. 2003;19(4):1117-27.
21. Matudo YK, Lopes JNC, Casanova IC. Praguicidas organoclorados no leite humano: um estudo em um grupo de trabalhadores rurais do município de Jaboticabal, Estado de São Paulo, Brasil. *Rev Bras Saúde Ocup*. 1990;18(69):27-32.
22. Soares WL, Freitas E, Antônio V, Coutinho JAG. Trabalho rural e saúde: intoxicações por agrotóxicos no município de Teresópolis - RJ. *Rev Econ Sociol Rural* 2005;43(4):685-701.
23. Teixeira P, Valle S. Biossegurança: uma abordagem multidisciplinar [texto na Internet]. Rio de Janeiro: FIOCRUZ, 1996 [citado 2007 jun. 16]. Disponível em: <http://www.fiocruz.br/biossegurancahospitalar/dados/material10.htm>
24. Silva JM, Novato-Silva E, Faria HP, PinheiroTMM. Agrotóxico e trabalho: uma combinação perigosa para a saúde do trabalhador rural. *Ciênc Saúde Coletiva*. 2005;10(4):891-903.

ANNEX

Chart – List of analyzed articles – Porto Alegre – 2006

- Ambrosini MB, Marona DS. Pesquisando intoxicações por agrotóxicos durante o curso de enfermagem: relato de experiência. *Rev Gaúcha Enferm.* 1999;20(2):143-50.
- Araújo ACP, Nogueira DP, Augusto LGS. Impacto dos praguicidas na saúde: estudo da cultura de tomate. *Rev Saúde Pública.* 2000;34(3):309-13.
- Bogusz Junior S, Santos JS, Xavier AAO, Weber J, Leães FL, Costabeber I. Contaminação por compostos organoclorados em salsichas hot-dog comercializadas na cidade de Santa Maria (RS), Brasil. *Ciênc Rural.* 2004;34(5):1593-6.
- Bréga SM, Vassilief I, Almeida A, Mercadante A, Bissacot D, Cury PR, et al. Clinical, cytogenetic and toxicological studies in rural workers exposed to pesticides in Botucatu, São Paulo, Brazil. *Cad Saúde Pública.* 1998;14 Supl 3:S117-23.
- Budó MLD, Gonzales RMB, Beck CLC. Saúde e trabalho: uma correlação de conceitos na perspectiva de uma população rural e de Christophe Dejours. *Rev Gaúcha Enferm.* 2003;24(1):43-53.
- Caldas ED, Souza LCKR. Avaliação de risco crônico da ingestão de resíduos de pesticidas na dieta brasileira. *Rev Saúde Pública.* 2000;34(5):529-37.
- Cocco P. On the rumors about the silent spring: review of the scientific evidence linking occupational and environmental pesticide exposure to endocrine disruption health effects. *Cad Saúde Pública.* 2002;18(2):379-402.
- Delgado IF, Paumgarten FJR. Intoxicações e uso de pesticidas por agricultores do Município de Paty do Alferes, Rio de Janeiro, Brasil. *Cad Saúde Pública.* 2004;20(1):180-6.
- Faria NMX, Facchini LA, Fassa AG, Tomas E. Estudo transversal sobre saúde mental de agricultores da Serra Gaúcha (Brasil). *Rev Saúde Pública.* 1999;33(4):391-400.
- Faria NMX, Facchini LA, Fassa AG, Tomas E. Trabalho rural e intoxicações por agrotóxicos. *Cad Saúde Pública.* 2004;20(5):1298-308.
- Faria NMX, Facchini LA, Fassa AG, Tomas E. Pesticides and respiratory symptoms among farmers. *Rev Saúde Pública.* 2005;39(6):973-81.
- Favera LRD, Melo EP. Agrotóxicos: o grande dilema - produzir vida ou morte. *Disciplinarum Sci.* 2000;1(1):87-100.
- Koifman S, Koifman RJ, Meyer A. Human reproductive system disturbances and pesticide exposure in Brazil. *Cad Saúde Pública.* 2002;18(2):435-45.
- Leite ICG, Paumgarten FJR, Koifman S. Orofacial clefts in the newborn and environmental and occupational parental exposures: a case-control study in Rio de Janeiro, Brazil. *Rev Bras Saúde Matern Infant.* 2003;3(4):401-9.
- Matudo YK, Lopes JNC, Casanova IC. Praguicidas organoclorados no leite humano: um estudo em um grupo de trabalhadores rurais do município de Jaboticabal, Estado de São Paulo, Brasil. *Rev Bras Saúde Ocup.* 1990;18(69):27-32.
- Nunes MV, Tajara EH. Efeitos tardios dos praguicidas organoclorados no homem. *Rev Saúde Pública.* 1998;32(4):372-82.
- Olaya-Contreras P, Rodríguez-Villamil J, Posso-Valencia HJ, Cortez JE. Organochlorine exposure and breast cancer risk in Colombian women. *Cad Saúde Pública.* 1998;14 Supl 3 S125-32.
- Oliveira RM, Brilhante OM, Moreira JC, Miranda AC. Contaminação por hexaclorociclohexanos em área urbana da região Sudeste do Brasil. *Rev Saúde Pública.* 1995;29(3):228-33.
- Oliveira-Silva JJ, Alves SR, Meyer APF, Sarcinelli PN, Mattos RCOC, Moreira JC. Influência de fatores socioeconômicos na contaminação por agrotóxicos, Brasil. *Rev Saúde Pública.* 2001;35(2):130-5.
- Pacheco AO, Hachel C. Instabilidade cromossômica induzida por agroquímicos em trabalhadores rurais na região de Passo Fundo, Rio Grande do Sul, Brasil. *Cad Saúde Pública.* 2002;18(6):1675-83.
- Paumgarten FJR, Delgado IF, Oliveira ES, Alleluia IB, Barreto HHC, Kussumi TA. Levels of organochlorine pesticides in the blood serum of agricultural workers from Rio de Janeiro State, Brazil. *Cad Saúde Pública.* 1998;14 Supl 3: S33-9.
- Peres F, Lucca SR, Ponte LMD, Rodrigues KM, Rozemberg B. Percepção das condições de trabalho em uma tradicional comunidade agrícola em Boa Esperança, Nova Friburgo, Rio de Janeiro, Brasil. *Cad Saúde Pública.* 2004;20(4):1059-68.
- Peres F, Rozemberg B, Lucca SR. Percepção de riscos no trabalho rural em uma região agrícola do Estado do Rio de Janeiro, Brasil: agrotóxicos, saúde e ambiente. *Cad Saúde Pública.* 2005;21(6):1836-44.
- Pires DX, Caldas ED, Recena MCP. Uso de agrotóxicos e suicídios no Estado do Mato Grosso do Sul, Brasil. *Cad Saúde Pública.* 2005;21(2):598-60.
- Pires DX, Caldas ED, Recena MCP. Intoxicações provocadas por agrotóxicos de uso agrícola na microrregião de Dourados, Mato Grosso do Sul, Brasil, no período de 1992 a 2002. *Cad Saúde Pública.* 2005;21(3):804-14.
- Ramos HH, Maziero JVG, Yanai K, Correa IM, Severino FJ, Kanno OY, et al. Exposição dérmica do aplicador de agrotóxicos na cultura da uva, com diferentes pulverizadores. *Rev Bras Eng Agríc Ambient.* 2002;6(1):175-9.
- Silva M, Gulnar A. Measuring exposure to organochlorinated pesticides. *Cad Saúde Pública.* 1998;14 Supl 3:S177-9.
- Soares W, Almeida RMVR, Moro S. Trabalho rural e fatores de risco associados ao regime de uso de agrotóxicos em Minas Gerais, Brasil. *Cad Saúde Pública.* 2003;19(4):1117-27.
- Soares WL, Freitas E, Antônio V, Coutinho JAG. Trabalho rural e saúde: intoxicações por agrotóxicos no município de Teresópolis - RJ. *Rev Econ Sociol Rural.* 2005;43(4):685-701.
- Stopelli IMBS, Magalhães CP. Saúde e segurança alimentar: a questão dos agrotóxicos. *Ciênc Saúde Coletiva.* 2005;10 Supl:91-100.
- Walter EV, Robazzi MLCC, Marziale MHP, Campoamor MM. Efeitos neurológicos causados por agrotóxicos: a realidade mostrada através de prontuários hospitalares. *Rev Enferm UERJ.* 2003;11(2):171-6.