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INTEGRATIVE REVIEW ARTICLE

SICKNESSES AND FACTORS RELATED TO RURAL WORKERS 'HEALTH

ADOECIMENTOS E FATORES RELACIONADOS À SAÚDE DO TRABALHADOR RURAL

ENFERMEDADES Y FACTORES RELACIONADOS A LA SALUD DEL TRABAJADOR RURAL

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ABSTRACT

Objective: to identify the factors that lead to the sickness of the rural worker who uses pesticides. ***Method:*** integrative review accomplishing five steps to systematize the research. Data collected, between February and April 2017, in LILACS, Virtual Library SciElo, MEDLINE / PUBMED, CINAHL and BDENF. The descriptors that guided the research were rural population, occupational health and pesticides, in its English version. ***Results:*** 39 scientific articles were obtained, which gave rise to five categories. In addition to the risk factors, diseases and health problems developed by rural workers were evidenced and related to the organic system which was affected. ***Conclusion:*** the results evidenced intoxication as the main health concern related to the misuse of Personal Protective Equipment. In this way, it is possible to contribute to the scientific advance, since, once health problems and risk factors are identified, ways to prevent rural workers from the effects of pesticides can be studied. ***Descriptors:*** Agrochemicals; Worker's health; Rural Population; Nursing; Disease; Health education.

RESUMO

Objetivo*:** identificar os fatores que levam ao adoecimento do trabalhador rural que utiliza agrotóxico. ***Método*:** revisão integrativa cumprindo cinco etapas para sistematizar a pesquisa. Dados coletados, no período entre fevereiro e abril de 2017, na LILACS, Biblioteca Virtual SciElo, MEDLINE/PUBMED, CINAHL e BDENF. Os descritores que nortearam a pesquisa foram *rural population*, *occupational health* e *pesticides*, na sua versão em inglês. ***Resultados*:** foram obtidos 39 artigos científicos que originaram cinco categorias. Além dos fatores de risco, evidenciaram-se doenças e agravos de saúde desenvolvidos pelos trabalhadores rurais e os mesmos relacionaram-se ao sistema orgânico afetado. ***Conclusão: os resultados evidenciaram a intoxicação como o principal agravo de saúde relacionado ao mau uso de Equipamentos de Proteção Individual. Dessa forma, é possível contribuir para o avanço científico, pois, uma vez que se identificam os agravos de saúde e fatores de risco, podem ser estudadas maneiras de prevenir os trabalhadores rurais dos efeitos dos agrotóxicos. ***Descritores*:** Agroquímicos; Saúde do Trabalhador; População Rural; Enfermagem; Doença; Educação em Saúde.

RESUMEN

Objetivo: identificar los factores que llevan las enfermedades del trabajador rural que utiliza agrotóxicos. ***Método:*** revisión integrativa, cumpliendo cinco etapas para sistematizar la investigación. Datos recogidos en el período entre febrero y abril de 2017, en LILACS, Biblioteca Virtual SciElo, MEDLINE / PUBMED, CINAHL, BDENF. Los descriptores que orientaron la investigación fueron: rural population, occupational health y pesticidas, en su versión en inglés. ***Resultados:*** se obtuvieron 39 artículos científicos, que originaron cinco categorías. Además de los factores de riesgo, se evidenciaron enfermedades y agravios de salud desarrollados por los trabajadores rurales y los mismos se relacionaron al sistema orgánico el cual fue afectado. ***Conclusión:*** los resultados evidenciaron la intoxicación como principal agravio de salud relacionado al mal uso de equipos de protección individual. De esta forma es posible contribuir al avance científico, pues una vez que se identifican los agravios de salud y factores de riesgo, se pueden estudiar maneras de prevenir a los trabajadores rurales de los efectos de los agrotóxicos. ***Descriptores***: Agroquímicos; Salud Laboral; Población Rural; Enfermería; Enfermedad; Educación en Salud.

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INTRODUCTION

After World War II, the agrochemical industry began to direct its chemicals, used in the war, to combat "pests" in agriculture, a package of measures adopted as a solution to end hunger in the world. This process is known as the Green Revolution and occurred in the mid-1960s, when the workers started to use agrochemicals and technology as a means of achieving widespread food production.[1]

Through this Revolution, in Brazil, there was a growth of agribusiness, driven by public policies that invested in practices that used chemical products. Currently the country is one of the largest consumers of agrochemicals. While the world market has grown by 90% for this type of substance, in the country, the growth has reached 200%.[2] Scientific studies on the use of pesticides show the correlation between their direct use and the health problems of rural workers, proving the harm of these chemicals to health and the environment.[3]

Because it represents a public health problem that harms the health of workers and the community that lives close to the plantation areas, the health sector has sought to define and implement actions aimed at the integral attention of populations exposed to pesticides. In this context, Nursing must know the health problems, contributing to the development of these actions, with the purpose of expanding the theoretical, practical and methodological knowledge of the rural work environment, the rural worker and the use of pesticides regarding possible nexus / association for health / disease production.[4]

In order to understand the issues related to life, and, consequently, the way in which illness occurs, one can perceive the need for an expanded understanding of the health-disease process and its relation to work.[5]

OBJECTIVES

- To identify the factors that lead to the sickness of the rural worker who uses pesticides.
- To identify health problems / diseases related to the use of pesticides presented by these workers.

METHOD

It is an integrative review of the literature, in which the following guiding research questions were developed: "Which factors lead to the sickness of rural workers who use the pesticide?" and "What health grievances and diseases related to the use of pesticides do rural workers present?".

The texts were searched from February to April 2017, based on descriptors controlled by the Medical Subjects Headings (MeSH) and Health Sciences Descriptors (DeCS), in rural population, occupational health and pesticides. The search was refined using the Boolean operator AND, which allowed the following combination: rural population and occupational health and pesticides.

The sources of electronic data used were: Latin American and Caribbean Literature in Sciences and Health (LILACS), Medical Literature Analysis and Retrieval System Online (MEDLINE / PubMed), Scientific Electronic Library Online (SciELO), Cumulative Index to Nursing and Allied Health Literature (CINAHL) and BDENF (Specialized Bibliographic Database in the Brazilian Nursing Area).

The criteria used for inclusion in the sample were: scientific articles, language (Portuguese, English and Spanish) and time cut (from 1989 to 2017), this period being justified by the publication of legislation regulating the use of pesticides (Law No. 7,802, of July 11, 1989). [6] The following exclusion criteria were chosen: to exclude literature reviews, studies that had children as the focus of research, studies that did not

have the described illness and repeated articles, which were considered only once.

The development of the review took place through the following steps: 1) delimitation of the problem; 2) bibliographic survey; 3) evaluation and categorization of data; 4) analysis of results; 5) presentation of the review and synthesis of knowledge - final stage consisting of the presentation of a report on the results, in order to contribute to a new understanding of the phenomenon under study with implications for clinical practice.[7]

The search resulted in 117 scientific articles, of which 26 publications that were repeated in the databases were excluded and 52 publications were excluded, after the other exclusion criteria. After analytical reading of the title and abstract, 39 publications were selected for reading in full, being 15 publications found in the MEDLINE database, 13 publications in LILACS and 11 publications in SciELO. The process of selecting the studies in the databases was as follows, according to figure 1.

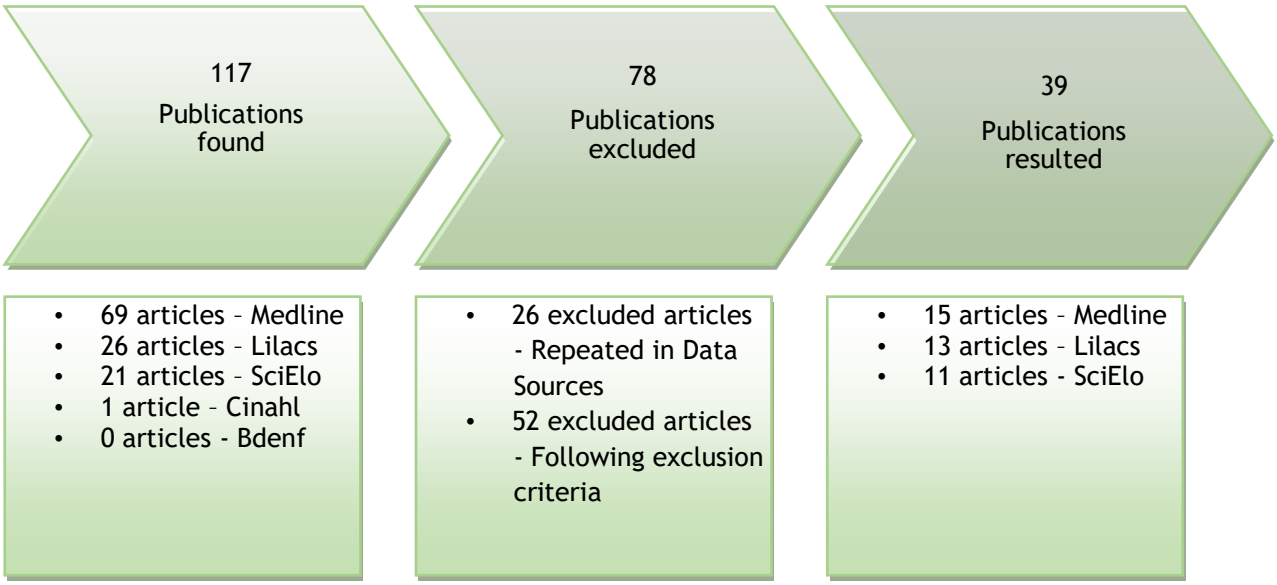

Figure 1. Illustration of the selection of the scientific articles that composed the integrative literature review. Rio Grande (RS), Brazil, 2017.

The analysis of the data was thematic, carried out through the table with information of the articles, and the selected studies were classified according to the levels of evidence: Level I - the evidence comes from a systematic review or meta-analysis of all relevant controlled randomized controlled trials; Level II - evidence derived from individual studies with experimental design; Level III - evidence obtained from well-delineated clinical trials without randomization; Level IV - Evidence from studies with a non-experimental design such as descriptive correlational and qualitative research or case studies; Level V - evidence originating from a case report or data obtained systematically, of verifiable quality or program evaluation data; Level VI - evidence from authorities and / or expert committees report.[8]

From this analysis, two categories emerged for the appreciation of the results: the first on the occupational factors that lead to the sickness of the rural worker and the second one pertinent to the health problems and diseases related to the rural work, against the use of agricultural defensive. For the analysis of the second category, we used the classification of

diseases related to the work of the Ministry of Health.[9]

RESULTS

A total of 39 scientific articles were identified, of which 23 were published in Portuguese; 16, in the English language and none was published in Spanish. In the period of 28 years (1989 to 1998), no scientific studies on the subject were published, nor was there any in the years of 2002, 2006 and 2017. In the years of 2012 and 2014, there were more publications on the theme with five published articles.

The studies were developed in Brazil, the United States of America (USA), El Salvador, Sri Lanka, India, Thailand, Tanzania, England, Egypt and South Korea, Brazil being the country where most of the studies were developed (n=29, 74,36%).

With regard to the factors contributing to the sickness of rural workers, five categories were identified: the use of Personal Protection Equipment (PPE) was the main category, in which seventeen articles (43.59%) resulted in the non-use of PPE and sixteen articles (41.02%) dealt with the misuse of PPE; with ten articles (25.64%) showing the incorrect disposal of the same and four articles (10,26%) addressing its reuse, besides three articles (7.69%) showing that the workers had difficulty in reading the product information on the packaging label; information on the use of chemicals, with six (15.38%) articles addressing the information provided by traders; with seven articles (17.95%) with the use of costal sprays and thirteen (33.33%) articles related to the perception of workers regarding the risks of exposure to these substances. Figure 2 shows the risk factors according to the scientific article.

Categories	Authors/Year
Use of PPEs	Sena et al. (2013)[11], Hoshino et al. (2008)[13], Recena e Caldas (2008)[14], Faria et al. (2004)[18], Peres et al. (2004)[19], Silva et al. (2016)[21], Viero et al. (2016)[22], Cezar-Vaz et al. (2015)[23], Preza e Augusto (2012)[25], Gregolis et al. (2012)[26], Menegat e Fontana (2010)[30], Jacobson et al. (2009)[31], Araújo et al. (2007)[32], Oliveira-Silva (2001)[33], Mathew et al. (2015)[34], Raksanam et al. (2015)[35], Saleh et al. (2014)[37], Lekei et al. (2014)[38], Oliveira Pasiani et al. (2012)[40], Whalley et al. (2009)[41], Soares et al. (2003)[45], Araújo et al. (2000)[46], Faria et al. (2000)[47].
Packages	Recena e Caldas (2008)[14], Silva et al. (2016)[21], Preza e Augusto (2012)[25], Menegat e Fontana (2010)[30], Jacobson et al. (2009)[31], Oliveira-Silva (2001)[33], Mathew et al. (2015)[34], Lekei et al. (2014)[38], Oliveira Pasiani et al. (2012)[40], Araújo et al. (2000)[46], Faria et al. (2000)[47].
Use information	Recena e Caldas (2008)[14], Peres et al. (2001)[20], Mathew et al. (2015)[34], Oliveira Pasiani et al. (2012)[40], Soares et al. (2003)[45].
Costal Sprayer	Peres et al. (2004)[19], Menegat e Fontana (2010)[30], Araújo et al. (2007)[32], Mathew et al. (2015)[34], Lekei et al. (2014)[38], Kim et al. (2014)[39], Oliveira Pasiani et al. (2012)[40], Araújo et al. (2000)[46].
Perception of the worker	Sena et al. (2013)[11], Recena e Caldas (2008)[14], Peres et al. (2005)[15], Levigard e Rozemberg (2004)[17], Peres et al. (2004)[19], Viero et al. (2016)[22], Gregolis et al. (2012)[26], Menegat e Fontana (2010)[30], Jacobson et al. (2009)[31], Raksanam et al. (2015)[35], Saleh et al. (2014)[37], Weerasinghe et al. (2008)[43].
They show no factor, just diseases	Rigotto et al. (2013)[10], Orantes et al. (2011)[12], Pires et al. (2005)[16], Belo et al. (2012)[24], Brazilio et al. (2012)[27], Souza et al. (2011)[28], Camarinha et al. (2011)[29], Miranda Filho et al. (2014)[36], Ritz et al. (2009)[42], Solomon et al. (2007)[44], Faria et al. (1999)[48].

Figure 2: Articles that show the risk factor that rural workers are exposed to. Rio Grande (RS), Brazil, 2017.

Regarding the second category, the main health problems and diseases identified in the studies were those of the nervous system (n = 12, 30.77%), through

intoxications, seizures, neurological diseases, peripheral neuropathy, Parkinson's disease and mental / psychiatric disorders. Secondly, the studies presented sensory system diseases (n = 8, 20.51%) represented by eye irritation, hearing loss, irritative peripheral vestibular syndrome, sensorineural hearing loss and temporal auditory processing problems. Third, the respiratory system alterations (n = 7, 17.95%) in the occurrence of allergic rhinitis, asthma and chronic obstructive disease followed by other affected organic systems such as the integumentary system (n = 6, 15,38 (n = 5, 12.82%), the digestive system (n = 3, 7.69%), the musculoskeletal system (n = 2, 5,13%), the immune system = 2, 5.13%), the endocrine system (n = 1, 2.56%) and the cardiovascular system (n = 1, 2.56%).

Some diseases and illnesses were not specified in the articles according to systems, being poisoning (n = 16, 41.02%), neoplasias (n = 2, 5,13%), congenital malformation (n = 1, 2.56 %), allergy (n = 1, 2.56%) and teratogenic effects (n = 1, 2.56%). Figure 3 summarizes the information in the articles.

Country Year	Publication Journal	Type of study	Level of evidence	Organic System
Brazil 2013[10]	Brazilian Journal of Epidemiology	Quantitative and ecological	6	Not specified.
Brazil 2013[11]	Science and Collective Health	Cross-sectional observational study	6	Nervous, Sensory.
El Salvador 2011[12]	MEDICC	Cross-sectional descriptive and analytical study	6	Genito-urinary.
Brazil 2008[13]	Brazilian Journal of Otorhinolaryngology	Historical cohort study, with cross-sectional	4	Sensory.
Brazil 2008[14]	Journal of Public Health	Qualitative study	6	Not specified.
Brazil 2005[15]	Public Health Notebook	Exploratory study.	6	Nervous, Sensory, Tegumentar.
Brazil 2005[16]	Public Health Notebook	Cohort study	4	Not specified.
Brazil 2004[17]	Public Health Notebook	Exploratory field study	6	Nervous, Osteomuscular, Immune, Cardiovascular.
Brazil 2004[18]	Public Health Notebook	Cross-sectional design	6	Not specified.
Brazil 2004[19]	Public Health Notebook	Qualitative research	6	Not specified.
Brazil 2001[20]	Journal of Public Health	Exploratory study	6	Respiratory, Genito-urinary, Digestive.
Brazil 2016[21]	Care is fundamental magazine	Descriptive with quantitative approach	6	Respiratory, Genito-urinary, Digestive.
Brazil 2016[22]	Anna Nery School	The research is descriptive and exploratory, with qualitative approach	6	Not specified.
Brazil 2015[23]	Nursing School Journal USP	Observational-exploratory study	6	Integumentary
Brazil 2012[24]	Brazilian Journal of Occupational Health	Descriptive, qualitative exploratory study	6	Endocrine.
Brazil 2012[25]	Brazilian Journal of Occupational Health	Sectional study	6	Not specified.
Brazil 2012[26]	Brazilian Journal of Occupational Health	Exploratory study	6	Not specified.
Brazil 2012[27]	Journal of the Brazilian Society of Speech Therapy	Cross-sectional epidemiological study	6	Sensory.
Brazil 2011[28]	Science and Collective Health	Cross-sectional design	6	Nervous, Sensory.
Brazil 2011[29]	Journal of the Brazilian Society of Speech Therapy	Cross-sectional	6	Sensory.

Brazil 2010[30]	Science, care and health	Descriptive, qualitative approach	6	Respiratory.
Brazil 2009[31]	Science and Collective Health	Cross-sectional study	6	Integumentary
Brazil 2007[32]	Science and Collective Health	Cross-sectional study	6	Nervous, Respiratory.
Brazil 2001[33]	Journal of Public Health	Case-control study	4	Not specified.
Índia 2015[34]	Indian, Journal of Occupational Environmental Medicine	Cross-sectional study	6	Nervous, Respiratory, Tegumentar, Genito-urinary.
Tailândia 2014[35]	Asia Pac J Public Health	Mixed Study	6	Not specified.
Brazil 2014[36]	BMC Cancer	Population cohort study	4	Nervous.
Egito 2014[37]	BMC Public Health	Exploratory descriptive study	6	Sensory, Respiratory, Tegumentar.
Tanzânia 2014[38]	BMC Public Health	Exploratory cross-sectional study	6	Respiratory, Tegumentar.
Coréia do Sul 2014[39]	Environmental Research	Census type search	6	Nervous, Sensory, Digestive.
Brazil 2012[40]	International Journal of Environmental Research and Public Health	Cross-sectional epidemiological study	6	Not specified.
EUA 2009[41]	Journal of Agromedicine	Longitudinal study	6	Not specified.
EUA 2009[42]	Environmental Health Perspectives	Case-control study	4	Nervous.
Sri Lanka 2008[43]	BMC Public Health	Descriptive cross-sectional study	6	Not specified.
Inglaterra 2007[44]	Occupational medicine	Cross-sectional exploratory study	6	Nervous, Sensory.
Brazil 2003[45]	Public Health Notebook	Cross-sectional study	6	Not specified.
Brazil 2000[46]	Journal of Public Health	Exploratory study	6	Nervous, Osteomuscular, Immune.
Brazil 2000[47]	Public Health Notebook	Descriptive study	6	Nervous.
Brazil 1999[48]	Journal of Public Health	Cross-sectional study	6	Nervous.

Figure 3. Characterization of the studies regarding the title of articles, year of publication, journal of publication, level of evidence of the studies and the organic systems that were affected. Rio Grande (RS), Brazil, 2017.

Most of the productions were classified at level of evidence six, which indicates evidence from the opinion of authorities (based on clinical competence) or expert committee reports. These studies indicate the health problems and diseases related to their distribution in time, space and according to the individual peculiarities of the research subjects. Through this classification, subsidies are provided that help the nurse in the critical evaluation of the studies and, consequently, in the decision making on the incorporation of this evidence into clinical practice.

DISCUSSION

The use of Personal Protection Equipment (PPE) was the most frequent factor in the studies, and it was subdivided into two categories: workers who did not use and workers who did not use it. Rural workers who participated in the studies reported not wearing gloves, masks or waterproof clothing, and had operational habits, such as using their mouths to remove spray nozzle blockages, while applying pesticides, even though they had a perception of the risk of this action.[49] The fact that it does not use masks, for example, presents a significant dimension, since the health problems that affect the respiratory system were indicated in six articles of the review and were represented by chronic and acute alterations such as: allergic rhinitis, asthma and obstructive disease chronic diseases, being this system the most affected in the articles that brought as a factor of illness the use or misuse of PPE.

Among the diseases, however, the nervous system was the most affected, in which the workers presented intoxication, Parkinson's disease, peripheral neuropathy, among others, since the chemical compounds can enter the dermal or respiratory pathway and carry out the inhibition of aceticolinesterase (ACE), that is, reaching the nerve endings, this factor related to the PPEs intensifies the problematic. Inhibition of ACE, in turn, leads to an accumulation of neurotransmitter acetylcholine (AC) at the synapses and this accumulation triggers a number of effects, demonstrating that the nervous system has been impaired, [50] thus, highlighting the importance of using PPE to protect them against nervous changes.

In the dermal and respiratory tract, the main ones for the activation of nervous system diseases, the importance of the use of equipment, such as masks or respirators, is observed, since pesticides can be highly volatile when inhaled by the respiratory tract when not in use of this equipment. Absorption of the dermis occurs through direct skin contact with pesticides or by not wearing appropriate clothing, such as waterproof overalls, or by using such protective equipment contaminated by chemical residues.[52]

Other studies have evidenced the misuse of these devices, attributing to the heat the reason, according to workers' reports, and the use of PPE affects the physiological mechanisms of thermoregulation. Therefore, they distort the farmer as the heat dissipation process is impaired.[53] It was also found that in the spraying process the farmers did not use PPE, since the activity was considered a quick task and thus, there would be no need to use protective equipment.[54]

Often the financial question has been another factor that has limited the acquisition of PPEs for many farmers, since most of them have a limited family income, which also makes access to the correct information on pesticides difficult, which makes them deal with this product in the wrong way, since they cannot hire a qualified professional, such as Agronomy Engineers, providing greater exposure to risks.[55]

According to Regulatory Standard 31, the main PPE to be provided to rural workers are: impermeable and resistant protectors for working with chemicals; facial protectors; glasses against the action of aggressive liquids; protection of the respiratory tract; respirators with chemical filters; protection of the whole body against chemical injury such as aprons, gloves and sleeves to protect against injury or disease caused by chemicals and waterproof and resistant shoes in jobs with chemicals.[56]

The review also identified that, intoxication was one of the main health problems presented by workers. There is a greater risk of intoxication when there is contact the pesticide intensively, such as transportation, storage, preparation of the syrup, application and cleaning of the spraying equipment, and the disposal of empty containers.[57]

Evidence from the studies reveals that depending on the risk factors which workers are exposed to, will be developed specific types of diseases that may be manifested in the short or long term. In addition, the studies evidenced gaps in the literature, since most of the studies used only the report of the participants, and few performed specific tests that demonstrated the change in the organism.

Regarding the handling of chemical packaging, studies have shown that workers perform incorrect disposal and reuse of these packages and also have difficulty in reading the labels. A study showed that workers burned the packaging or discarded it in the environment (landfills, dumps and riverside), and although most read the label, they reported that there were technical terms, lack of clarity in the language and use of very small letters which made it difficult to understand the information contained on the label.[58]

Therefore, when identifying the risk factors for the health of these workers, some measures can be developed and adopted aimed at reducing work-related illness, such as investing in scientific research that uses laboratory tests to detect changes in the body, encouragement through public policies to organic agriculture, guidance to workers on safe practices in the application of these products, health education work for the population. However, in order to know the consequences and know how to prevent them, a multi-professional work in health is required, in which professionals report cases of diseases that may be associated with pesticides. In this way, it will be possible to have a greater vision about the sickness of the rural population.

Faced with all these issues that involve the work process of farmers, Nursing can work through health education in the Primary Care Units, as well as through the notification of diseases from the use of pesticides, thus, strengthening the importance of notifying, so that public health gains greater investments, to carry out examinations and appropriate treatment.

CONCLUSION

It was evidenced that the prominent disease factor was related to the use of personal protective equipment (PPE), especially in the case of non-use or inadequate use which contributed, according to the majority of studies, to the nervous system-related intoxication Thus, the results of the review strengthened the importance of encouraging the use of Personal Protective Equipment, highlighting its importance in the face of the possibility of pathological involvement of a vital organic system to the human being. In addition, the relevance of the identification of different pathways of intoxication is highlighted, as well as the inhalation route, the dermal route, involved in the different processes of rural work.

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