

Work, health and disease among rural workers in wetlands: integrative review

Saúde, trabalho e doença do peão pantaneiro: uma revisão integrativa

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ABSTRACT | Rural workers represent the typical population of workers in the Brazilian Pantanal, their work environment being characterized by exuberant fauna and flora, but also countless hazards. The aim of the present study was to analyze work, health and disease aspects of rural workers in Pantanal and the corresponding risk factors. It consists in an integrative review of studies published from 2006 to 2016 located in databases Regional Library of Medicine (BIREME), Latin American and Caribbean Health Sciences Literature (LILACS), Scientific Electronic Library Online (SciELO), MEDLINE, PubMed, Periódicos Eletrônicos em Psicologia (PePSIC), the journal portal and dissertation database of the Brazilian Federal Agency of Support and Evaluation of Graduate Education (CAPES), dissertation databases of Universidade Estadual de Campinas, Universidade de São Paulo, Universidade Católica Dom Bosco (Campo Grande, Mato Grosso do Sul) and Universidade Federal do Mato Grosso do Sul, and Google Scholar. We retrieved 27 publications, being 18 scientific studies, 2 PhD and 5 MA dissertations and 2 e-books. Evidenced hazards include accidents involving animals, work overload, and exposure to weather conditions, viruses, bacteria and chemicals, among others. The results point to the need to implement actions considered in public policies for prevention, health promotion and recovery, with particular focus on safety and health at work.

Keywords | wetlands; occupational health; rural health; working conditions; risk factors.

RESUMO | O peão pantaneiro é um trabalhador típico do pantanal brasileiro, cujo ambiente de trabalho é de fauna e flora exuberante, porém repleto de perigos. Este estudo teve por objetivo analisar os aspectos saúde-trabalho-doença do peão pantaneiro, identificando seus fatores de risco. Trata-se de uma revisão integrativa da literatura, com buscas realizadas no Centro Latino-Americano e do Caribe de Informação em Ciências da Saúde (BIREME), Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), *Scientific Electronic Library Online* (SciELO), *Medical Literature Analysis and Retrieval System Online* (MEDLINE), *Public/Publisher Medical Literature Analysis and Retrieval System Online* (PubMed), Periódicos Eletrônicos em Psicologia (PePSIC), Portal de Periódicos e Banco de Teses da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Banco de Teses e Dissertações da Universidade Estadual de Campinas, da Universidade de São Paulo, da Universidade Católica Dom Bosco (Campo Grande, Mato Grosso do Sul) e da Universidade Federal de Mato Grosso do Sul, além do Google Acadêmico, no período de 2006 a 2016. Os resultados obtidos foram 27 estudos, 18 artigos científicos, 2 teses, 5 dissertações e 2 e-books. Foram evidenciados riscos relacionados a acidentes com animais, sobrecarga de trabalho, bem como exposição a intempéries, vírus, bactérias, substâncias químicas, entre outros. O estudo apontou para a necessidade de implementação das atividades propostas nas políticas públicas que visam à prevenção, promoção e recuperação da saúde, atentando especialmente às relacionadas à segurança e saúde do trabalhador.

Palavras-chave | pantanal; saúde do trabalhador; saúde da população rural; condições de trabalho; fatores de risco.

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INTRODUCTION

The Pantanal is considered the largest floodplain in the world, with about 230,000 km². About 150,000 km² are within Brazil, 35% corresponding to the state of Mato Grosso and 65% to Mato Grosso do Sul, while the remaining 80,000 km² extend into Bolivia and Paraguay¹. This is a vast geographical area, rich in water resources, and subjected to the alternation of wet and dry periods. Its flora, fauna and human population coexist times harmoniously, times in conflict, in their struggle for life and natural wealth².

In Espíndola and Vianna's view³, the local residents are some among the Brazilian "invisible" populations, despite their considerable contribution to the country development. Similarly, Cunha and Atanaka-Santos⁴ call the attention to the need for studies on the Pantanal population as a function of the circumstances under which health and sanitation services are provided, their precarious living conditions, changes in work processes, lifestyle and state of health.

According to Cabrita and Cáceres⁵, Pantanal rural workers are individuals who are born, grow up and live in connection with cattle farming. They are a typical component of this region, have accurate knowledge of the work they perform, and know the area as if they had a map inside their head. The work of Pantanal rural workers is difficult and exhausting, and daily and directly exposes them to sunlight, rain and other weather conditions. While Pantanal stands out for its exuberant beauty, rural workers report hazards with serious implications for those with little experience⁶.

Occupational risk is categorized in the Brazilian Classification of Occupations from grade 1 to 4; cattle raising is categorized as with risk grade 3⁷. Based on epidemiological data, investigators and international agencies concluded that agriculture and livestock production are among the most dangerous occupations. While they have considerable impact on the economy, they account for a large number of accidents and diseases⁸⁻¹¹. According to the Inter-Union Department of Statistics and Socioeconomic Studies of São Paulo, Brazil (Departamento Intersindical de Estatística e Estudos Socioeconômicos de São Paulo—DIEESE) the agriculture and livestock production sector accounted for 17,008 typical accidents, 1,210 commuting accidents and 3,865 cases of occupational diseases in 2014¹².

The life-disease-death relationship for workers in Brazil is linked to work processes subjected to definite political and economic circumstances which led to the loss of social and labor rights, moral harassment, unhealthy work environments, longer working hours and work overload. This context makes workers increasingly vulnerable and causes psychological and physical harm¹³. The International Labor Organization¹⁴ estimates that 160 million new cases of work-related diseases occur annually, which situation characterizes a hidden pandemic, especially in the case of musculoskeletal and mental (stress, anxiety and depression) disorders. These conditions also affect rural workers.

While workplace health and safety are a right for both urban and rural workers, the latter are victims of various forms of exclusion, particularly as a function of distance and difficult accessibility. This right is more evident within the context of occupational health, i.e. the part of public health within the Unified Health System scope which aims are to analyze, study and monitor environmental hazards and intervene on the work-health relationship to ensure health promotion, protection, diagnosis, treatment and integrated rehabilitation to workers⁷.

Work processes are one of the main determinants of health and disease¹⁵. Health, disease, work, production and environment and indissociable factors, while the right to life and fair and dignified work is synonymous with quality of life and health⁷.

The aforementioned considerations justify the need to gather evidence on the problems and risk factors to which Pantanal rural workers are exposed to make their occupation more visible and identify causes of disease.

METHODS

To analyze and synthesize the information on aspects related to work, health and disease among Pantanal rural workers, we chose to perform an integrative review. This approach enables clustering studies with similar or identical subject although performed with different methods. The aim of integrative reviews is to reunite and summarize studies on a given subject¹⁶. In the present study we followed these steps: formulation of the problem and research question; search, selection and evaluation of studies according

to inclusion and exclusion criteria (Figure 1); definition of the characteristics of the reviewed research (Tables 1 and 2); analysis of findings; interpretation and discussion of results; and conclusion¹⁷.

Based on the identified problem, we selected studies on rural workers in wetlands, their work and aspects of the health-disease process, which led to the following research question: what are the main work, health and disease problems among rural workers in wetlands, as well as occupational health risk factors to which they are exposed?

The following Health Sciences Descriptors (DeCS), Virtual Health Library (VHL), were used in the literature search: in Portuguese, *pantanal, saúde, doença e saúde do trabalhador rural*; in English: wetlands, wetland, health, disease, rural worker health; and in Spanish: pantanal, salud, enfermedad, salud del trabajador rural. These search terms did not lead to any record, therefore we conducted a new search with terms “wetland” and “rural worker.” Use of Boolean operators AND, OR and NOT resulted in the following search strategies: *wetlands AND wetland; wetlands AND health AND disease; wetlands AND rural worker health*; *pantanal OR salud OR enfermedad OR salud del trabajador rural*; *pantanal OR pantaneiro OR peão pantaneiro*; *pantanal AND pantaneiro AND peão pantaneiro NOT fauna NOT flora*.

A search for studies published from 2006 to 2016 (10 past years) was performed from January through April 2016 in databases VHL, Regional Library of Medicine (BIREME); Latin American and Caribbean Health Sciences Literature (LILACS); Scientific Electronic Library Online (SciELO); Medical Literature Analysis and Retrieval System Online (MEDLINE)—Public/Publisher Medical Literature Analysis and Retrieval System Online (PubMed); Periódicos Eletrônicos em Psicologia (PePSIC); the journal portal and dissertation database of the Brazilian Federal Agency of Support and Evaluation of Graduate Education (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—CAPES); dissertation databases of Universidade Estadual de Campinas, Universidade de São Paulo, Universidade Católica Dom Bosco (Campo Grande, Mato Grosso do Sul) and Universidade Federal do Mato Grosso do Sul; and Google Scholar.

Inclusion criteria were:

- scientific articles, MA and PhD dissertations and full books available online;
- published in Portuguese, English or Spanish;

- from 2006 to 2016;
- on the Pantanal population;
- focusing on work, health and disease among Pantanal rural workers and population.

We plotted a flowchart to depict the selected and excluded studies (Figure 1). Next we summarized the selected studies in a table (Table 1). Finally, we classified the records according to work-health-disease aspects (Table 2). Following full-text analysis, we categorized the studies according to mentioned problems and hazards as described in Brazilian Regulatory Standards (RS). RS 9 created the Environmental Hazard Prevention Program and indicates the main three categories of occupational hazards: physical, chemical and biological. RS 17 describes ergonomic hazards and RS 31 risk of accidents or mechanical hazards in rural work¹⁸. We further considered psychosocial risks, which according to the European Agency for Safety and Health at Work are those which have psychological, physical and social impacts¹⁹. The complete classification is described in Table 2.

RESULTS

We performed a literature search with the selected keywords alone and combined. This procedure allowed retrieving 1,370 studies; following application of the exclusion criteria, 27 studies were included for review (Figure 1).

Next we describe the results, and respective risk factors, relative to Pantanal rural workers, categorized as:

- physical;
- biological;
- chemical;
- ergonomic;
- mechanical;
- psychosocial.

Most records corresponded to scientific studies (66.7%), followed by MA (18.5%) and PhD (7.4%) dissertations and e-books (7.4%). The largest proportion of studies had been published in 2010 (22.2%) and the smallest in 2006, 2013 and 2016 (3.7%). Fourteen studies (51.8%) had qualitative design, 4 (14.8%) were literature reviews, 4 (14.8%) experimental studies, 2 (7.4%) had mixed methods, qualitative and qualitative, 2 (7.4%) were epidemiological studies,

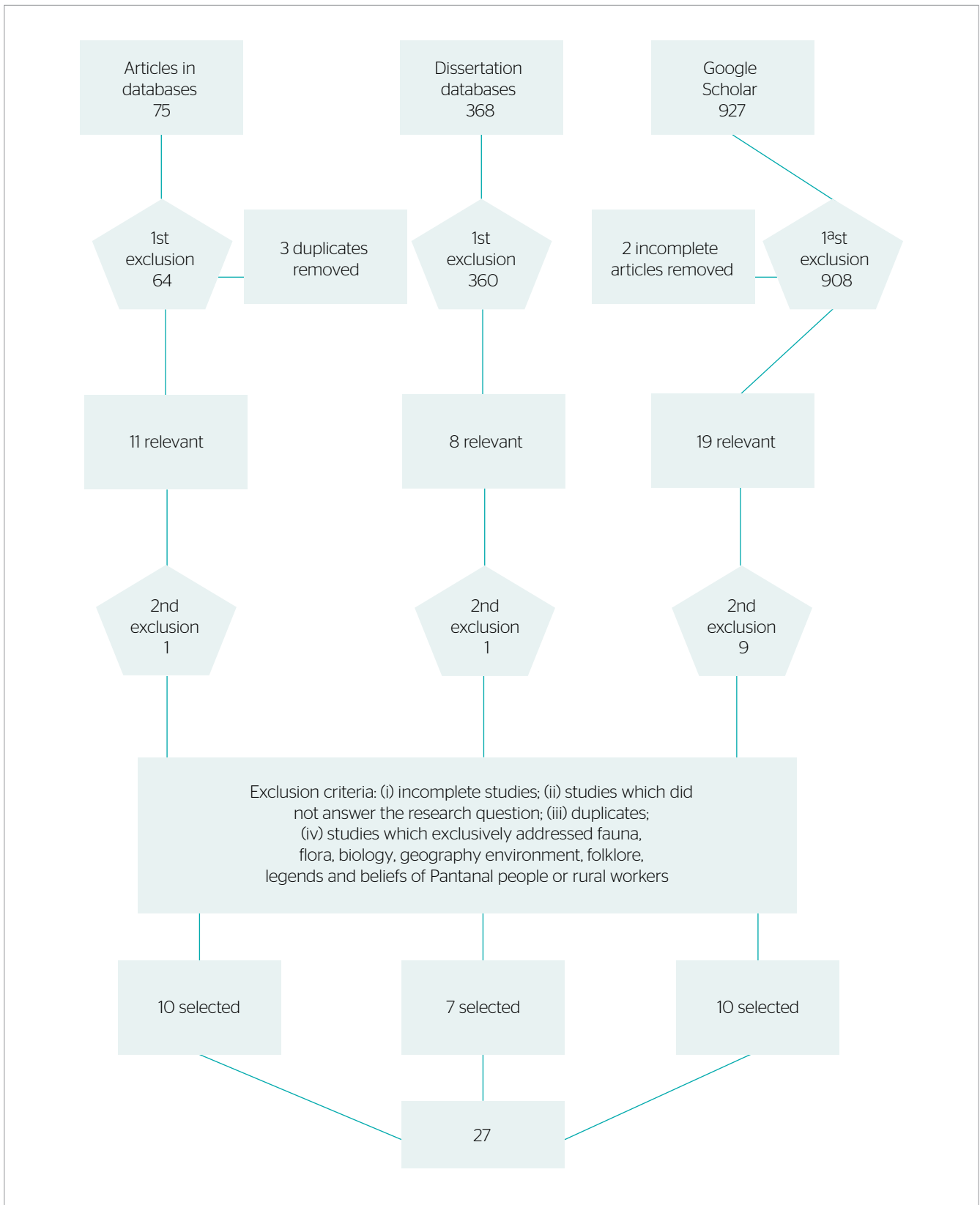


Figure 1. Procedure for article selection, Campo Grande, Mato Grosso do Sul, Brazil, 2016 (n=27).

Table 1. Selected publications, database, author, title, study design, source, Campo Grande, Mato Grosso do Sul, Brazil, 2016 (n=27).

Database	Author (year)	Title	Study design	Source	Location
GS	Espíndola and Vianna ³ (2010) ³	[Pantanal rural workers—their environment, struggles, beliefs: their history]	Literature review	<i>Revista de Trabalhos Acadêmicos</i>	Niterói, RJ
LILACS	Cunha and Atanaka-Santos (2011) ⁴	[Priorities for epidemiological research in the Brazilian Pantanal]	Editorial	<i>Cadernos de Saúde Pública</i>	Campo Grande, MS, Cuiabá, MT
GS	Cabrita and Cáceres (2016) ⁵	Pantanal <i>comitivas</i>	Qualitative	<i>Intercom</i>	São Paulo, SP
GS	Zanata (2015) ⁶	[Memories of cattle farm workers in Pantanal]	Qualitative	<i>Monções</i>	Cuiabá, MT
DD-UNICAMP	Ribeiro (2014) ²⁰	[Between flooding and receding cycles Pantanal people produce and reveal geographies]	Qualitative	PhD dissertation	Aquidauana, Corumbá and Miranda
GS	Araújo et al. (2010) ²¹	[Participatory formulation of sociocultural indicators in Pantanal farms]	Qualitative	V Symposium on Natural and Socioeconomic Resources of Pantanal	Corumbá, MS
GS	Bigatão (2010) ²²	[Pantanal in the media—from inexistence to paradise: an approach to the interrelationship between environment and cultural production]	Literature review	<i>Cordis</i>	Campo Grande, MS
GS	Brito (2012) ²³	[Education of workers and their families in cattle farms in Pantanal, Mato Grosso do Sul: some questions and challenges]	Mixed	III Ibero-American Congress of Education Policy and Administration	Aquidauana, Corumbá and Rio Verde, MS
DD-USP	Leite (2010) ²⁴	[Rural workers in Pantanal, Mato Grosso do Sul: lifestyle and view of the landscape]	Qualitative	MA dissertation	Miranda and Aquidauana, MS
DD-USP	Pinto (2006) ²⁵	[Narrative and everyday life: life stories in Pantanal rural workers' narratives]	Qualitative	PhD dissertation	Aquidauana, MS
DD-USP	Rocha Filho (2010) ²⁶	[The rhythm of water, the pace of cattle: tourism in extensive livestock production farms in Pantanal, Aquidauana/MS]	Qualitative	MA dissertation	Aquidauana, MS
GS	Juliano et al. (2009) ²⁷	[Interaction between Pantanal man and his horse]	Literature review	e-book Embrapa Pantanal	Corumbá, MS
GS	Leite (2012) ²⁸	[A man called Pantanal inhabitant]	Qualitative	e-book [Gender and technologies]	Cuiabá, MT
LILACS	Onuma et al. (2014) ²⁹	[Soil contamination by <i>Toxocara spp.</i> eggs and other geohelminths in a rural community in Pantanal, Mato Grosso, Brazil]	Experimental	Brazilian Journal of Veterinary Research and Animal Science	Corumbá, MS
DD-UFMS	Murat (2011) ³⁰	[Anti- <i>Toxoplasma gondii</i> antibodies and factors related to toxoplasmosis among Pantanal inhabitants, Mato Grosso do Sul]	Experimental	MA dissertation	Porto da Manga, Passo do Lontra, Barra de São Lourenço/Amolar and Paraguai Mirim, MS

Continue...

Table 1. Continuation.

Database	Author (year)	Title	Study design	Source	Location
SciELO	Pignatti et al. (2011) ³¹	[Aging and social support networks in rural areas of Pantanal, Mato Grosso]	Qualitative	<i>Physis: Revista de Saúde Coletiva</i>	Barão de Melgaço, MT
PubMed	Ramos et al. (2014) ³²	Ticks on humans in the Pantanal wetlands, Brazil	Experimental	Ticks and Tick-borne Diseases	Corumbá, MS
LILACS	Silva et al. (2015) ³³	[Investigation of Leptospira and anti-Leptospira antibodies among animals and humans in rural properties in the Brazilian biomes Pantanal and Caatinga]	Experimental	<i>Brazilian Journal of Veterinary Research and Animal Science</i>	Pantanal - Miranda, MS; Itiquira and Pocone, MT; Caatinga - Sobradinho, CE, Garanhuns, PE, Sobral, BA
SciELO	Pignatti (2015) ³⁴	[On the path to environmental protection: actions centered on human and environmental health among the rural population of Pantanal, Mato Grosso, Brazil]	Qualitative	<i>Caderno de Saúde Coletiva</i>	Barão de Melgaço, MT
DD-UCDB/MS	Zanatta (2012) ³⁵	[Moans of the excluded: social construction of illness]	Mixed	MA dissertation	Corumbá, MS
PubMed	Tourinho et al. (2015) ³⁶	Cross-sectional study of hepatitis A virus infection in the Pantanal population before vaccine implementation in Brazil: usage of non-invasive specimen collection	Epidemiological	<i>International Journal of Environmental Research and Public Health</i>	Porto da Manga, Passo do Lontra, Barra de São Lourenço/ Amolar and Paraguai Mirim, MS
DD-UFMS	Bigaton (2009) ³⁷	[Serologic epidemiology of hepatitis B infection among residents of Pantanal, Mato Grosso do Sul]	Epidemiological	MA dissertation	Porto da Manga, Passo do Lontra, Barra de São Lourenço/ Amolar and Paraguai Mirim, MS
SciELO	Prado et al. (2014) ³⁸	[I experienced it, nobody told me: popular education in the Family Health Strategy, Pantanal, Mato Grosso do Sul, Brazil]	Qualitative	<i>Interface</i>	Rio Negro, MS
GS	Ribeiro (2013) ³⁹	[Social urban problems and their impact on Pantanal residents: the case of alcohol]	Qualitative	<i>Geo Pantanal</i>	Corumbá, MS
MEDLINE	Pignatti and Castro (2010) ⁴⁰	[Human life vulnerability/resistance in rural communities in Pantanal, Mato Grosso, Brazil]	Qualitative	<i>Ciência & Saúde Coletiva</i>	Barão de Melgaço, MT
GS	Guarim Neto et al. (2012) ⁴¹	[Pantanal spaces: everyday life in a traditional farm on the Brazil-Bolivia border: links to non-formal education]	Qualitative	<i>Flovet</i>	Cáceres, MT
GS	Kmitta (2014) ⁴²	[Pantanal: notes and considerations on identity, culture and representation]	Literature review	<i>Outros Tempos</i>	Dourados, MS

LILACS: Latin American and Caribbean Health Sciences Literature; SciELO: Scientific Electronic Library Online; GS: Google Scholar; DD-dissertation database; UNICAMP: State University of Campinas; USP: University of São Paulo; UCDB/MS: Dom Bosco Catholic University, Campo Grande; UFMS: Federal University of Mato Grosso do Sul.

Table 2. Selected studies classified according to author (year of publication), subject, work, health and disease problems, and detected risk factors, Campo Grande, Mato Grosso do Sul, Brazil, 2016 (n=27).

Author (year)	Subject	Work/health/disease problems (author)	Risk factors
Espíndola and Vianna (2010) ³ Cunha and Atanaka-Santos (2011) ⁴ Cabrita and Cáceres (2016) ⁵ Zanata (2015) ⁶ Ribeiro (2014) ²⁰ Araújo et al. (2010) ²¹ Bigatão (2010) ²² Brito (2012) ²³ Leite (2010) ²⁴ Pinto (2006) ²⁵ Rocha Filho (2010) ²⁶ Juliano et al. (2009) ²⁷ Leite (2012) ²⁸ Onuma et al. (2014) ²⁹ Murat (2011) ³⁰ Pignatti et al. (2011) ³¹ Ramos et al. (2014) ³² Silva et al. (2015) ³³ Pignatti (2015) ³⁴ Zanatta (2012) ³⁵ Tourinho et al. (2015) ³⁶ Bigaton (2009) ³⁷ Prado et al. (2014) ³⁸ Ribeiro (2013) ³⁹ Pignatti and Castro (2010) ⁴⁰ Guarim Neto et al. (2012) ⁴¹ Kmitta (2014) ⁴²	Health-disease	pesticides, emerging and re-emerging diseases ^{4,34} ; parasitic infections ²⁹ ; toxoplasmosis ³⁰ ; fractures, stroke, leprosy ³¹ ; tick disease ³² ; leptospirosis ³³ ; environmental pollution ³⁴ ; diarrhea ³⁵ ; hepatitis A ³⁶ ; hepatitis B ³⁷ ; hypertension, diabetes ³⁸ ; legal and illegal drugs ³⁹ ; infectious and parasitic diseases and pain in general ⁴⁰ ;	Physical: humidity, cold, heat, winds, extreme temperatures, weather exposure Biological: protozoa, viruses, fungi, bacteria, parasites Chemical: chemicals in general (pesticides), substance use (drugs, alcohol, smoking), toxic plants Mechanical: risk of accidents in general, involving domesticated or wild animals, vehicles, electricity (thunderstorms) or equipment
	Work	work requiring much time riding ^{3,23} ; wild animal attacks ^{3,6,20,22,24-26} ; handling a large number of animals ^{3,5,20,22,24,28} ; weather exposure ^{5,6,20} ; alcohol ^{5,24} ; crossing rivers ^{5,24} ; stampedes and accidents involving animals ^{5,24,25,27} ; floods ^{5,6,24,42} ; leisure for workers and families ^{6,20} ; transport of sick workers ²⁰ ; informal and exhausting work ^{20,24} ; lack of workplace health and safety regulations ^{21,22,23} ; distance ^{22,27} ; conflict resulting in death ^{24,28} ; vehicle accidents, natural obstacles ²⁶ ; rustic tools ⁴¹	Physical: humidity, cold, heat, winds, extreme temperatures, weather exposure Biological: snake bites, insects (bees) Chemical: substance use (drugs, alcohol, smoking) Ergonomic: physical effort, long working hours, lifting and carrying heavy loads, night shift, inadequate body posture Mechanical: risk of accidents in general, involving domesticated or wild animals Psychosocial: work overload, long working hours, work pace and intensity, task responsibility, social isolation, career stagnation, uncertain future, low salary, work-family conflict, location, hazardous physical environment

and 1 (3.7%) an editorial. Twenty-three articles (85.2%) were published in Portuguese and 4 (14.8%) in English. Eighteen studies (66.7%) concerned the state of Mato Grosso do Sul and 9 (33.3%) Mato Grosso

DISCUSSION

WORK-RELATED PROBLEMS AMONG PANTANAL RURAL WORKERS

Pantanal rural workers are people with simple lifestyle, considerable resistance and skills. Since remote times

their everyday life is associated with animal production. Their acknowledged experience in this field is largely due to contact with farm work since childhood^{20,41-44}. On a typical working day, this population of workers ride horses, and their working tools include horse tack, knives, machetes, sickles, axes and chainsaws, with the inherent risk involved in handling⁶.

Rural workers in Pantanal might be employed at farms, formally or informally, or be self-employed, forming groups to transport cattle known as *comitivas*^{5,21-24}. The latter is an ancient practice kept to this day, despite the current availability of trucks, because it is believed to be the best way to

transport cattle, given the local environmental characteristics, floods and bridge failures, which hinder the circulation of trucks, in addition to being less expensive, according some farmers^{3,5,6,20,43}.

The water level rises considerably from November to March, therefore the cattle is taken to higher land, which requires crossing flooded areas. The workers become thus exposed to the water temperature and to attacks by animals, including snakes, alligators and piranhas^{3,6,20,22,25,26}.

Cabrita⁴³ described the experience of one Pantanal rural worker, who transported 1,000 head of cattle with a *comitiva*, having to overcome several natural obstacles. This task might take up to 10 hours on a single day, riding long distances, under strong sunlight, rains or thunderstorms, while being exposed to attacks by wild animals, such as jaguars, snakes, bees and other insects. Cattle transport is associated with other hazards, such as stampedes, getting trampled, or falling off the horse^{24,25,27}. The need to travel large distances, due to the geographical characteristics of the area poses a serious problem, especially in case of emergencies and urgent situations requiring immediate care.

Given these hazardous circumstances, one may wonder: how do rural workers in Pantanal protect themselves in their everyday routine? We believe that the kernel of the answer lies in the fact that to survive in the Pantanal, rural workers had to integrate themselves into nature over time and learn to adjust to adverse conditions. Thus, they became inventive in performing peaceful interventions to accomplish their job at farms, which traditionally consists in beef cattle production⁴⁵.

Horses play a fundamental role in this regard, being seen as an indispensable tool, but also as friends. This relationship, impregnated by historical, cultural and social elements, goes well beyond the limits of human or animal behavior, since as several authors observed, the horse conveys a sense of safety to the workers, and together they feel able to cope with the hostile conditions under which they live^{28,45}.

Based on the problems detected in regard to the work of Pantanal rural workers, multidisciplinary actions considering them, their animals, farmers, health care workers and investigators will have positive effects on the search for strategies to minimize the risks to the health of this population of workers.

RISK FACTORS AND THEIR RELATIONSHIP TO WORK-HEALTH-DISEASE AMONG PANTANAL RURAL WORKERS

The health of rural, forest and water workers, including those in Pantanal, is influenced by social, racial, gender, economic, technological and organizational factors related to the profile of production and consumption, in addition to physical, chemical, biological, mechanical and ergonomic hazards inherent to the work process⁴⁴. These risk factors are described in regulatory standards.

RS were formulated based on the Law no. 6,514, from 1977, approved by the Ministry of Labor Administrative Ruling no. 3,214, from 8 June 1978, and deal with safety and occupational health, inasmuch as they provide the grounds for employers to manage and prevent possible risks to the health of workers¹⁸. While RS were intended for workers with “formal” employment relationship, they might also be applied to “informal” workers, together with the laws which underlie the Unified Health System, which have universal scope. This is a quite relevant aspect, because informal work is one of the main problems detected in the present, and also in other studies²⁰⁻²³. We further found there are not statistical data for large part of this population of workers, and that their length in the job does not ensure employment stability. In a study, 32.6% of the workers did not have formal employment relationship²³.

The *European Agency for Safety and Health at Work*¹⁹ called the attention of the scientific community to the so-called psychosocial risk factors at work as a function of their paramount importance, even though they are often hidden or neglected. These factors are globally seen as a cause of concern and as stressors for workers without sufficient resources to cope with them. Therefore, following Cox and Griffiths⁴⁶ and the *International Labor Organization*^{47,48}, we included them in the general classification of risk factors, since they might influence all of them.

Psychosocial factors gained in relevance in recent years as a function of the increase in the incidence of diseases among workers in different economic activities⁴⁹. Yet, one still needs to know what they exactly are. According to the *European Agency for Safety and Health at Work*¹⁹, “Psychosocial risks relate to the negative psychological, physical and social outcomes that arise from unfavorable organization and management in the workplace, as well as a poor social context at work.”

Some of the studies included in the present review mentioned psychosocial risk factors related to the job of workers in wetlands. Among these, informal and exhausting work, long working hours, managing a large number of animals, lack of safety and health at work regulations, and leisure for workers and their families stand out^{5,20-24}.

Costa and Santos⁵⁰ rate the psychosocial factors as one of the main challenges to workplace safety and health in the present time. Their implications for the health of workers should be established to design interventions to develop new management styles to improve the health and safety conditions and quality of life especially of rural workers. Indeed, the latter are an occupational group which health problems do not receive the due attention.

HEALTH AND DISEASE ISSUES AMONG PANTANAL RURAL WORKERS

Some studies performed in Brazil found high morbidity and mortality rates, high incidence of regional diseases and poor sanitation, related to difficult access to resources indispensable to life. This picture represents a situation of extreme dearth and represents the Pantanal inhabitants^{4,40,44,51}. Several authors reported soil contamination by enteric parasites and parasitic diseases in general, including toxoplasmosis, which might cause fetal malformations, blindness and organ injury^{29,30}.

Pantanal rural workers work outdoors, without any control of the environmental conditions. They start work early in the morning, and their job poses heavy physical demands over long periods of time^{25,52}. Brucellosis is frequent, and might be transmitted to humans through direct contact with affected animals, including cattle^{4,6}. Also cases of foot-and-mouth disease are reported, which causes lesions to the skin, mouth and between the toes, and might be contracted through intake of raw milk or meat from contaminated animals. One further risk is represented by rabies (hydrophobia), which is transmitted through the saliva and other animal secretions⁵³.

Among the infectious diseases to which Pantanal rural workers are exposed, the following stand out in terms of risk and relevance: spotted fever, a severe acute febrile condition transmitted by ticks infested with bacteria of genus *Rickettsia*; leprosy, caused by *Mycobacterium leprae*, which is associated with blindness, kidney failure, facial and body deformities, and peripheral nerve injury;

leptospirosis, caused by bacteria from genus *Leptospira*, a zoonosis transmitted through contact with the urine of infected animals (equines, cattle, dogs and rats) or contaminated water or mud, that affects the liver, kidneys and lungs, and might further cause bleeding. Leptospirosis is endemic in flood zones, such as Pantanal. As a function of weather exposure (heat, cold and humidity), Pantanal rural workers are also at high risk for infectious diseases including dengue fever, respiratory problems, such as pneumonia, eye problems, and kidney and gastrointestinal disorders, among others^{25,44,51}.

Particular attention deserves the disposal of sewage, pesticides, waste and sediments from products used in farms, which pose a threat to the water cycle of the rivers which compose the Pantanal through contamination, which is associated with diarrhea, and consequent risk of dehydration^{4,31,34,35,54}. In a study³⁶, the prevalence of confirmed hepatitis A among Pantanal rural workers was 79.1%. The authors observed that the participants drank river water and also used it for personal hygiene and washing without any treatment.

In Bigaton's study³⁷, the prevalence of hepatitis B in the Pantanal communities of Passo do Lontra and Paraguai Mirim (Mato Grosso do Sul) was 36.5%. In Rodrigues' study⁵⁵, the prevalence of the hepatitis B virus among users of illegal drugs was 0.4%.

One further source of risk is represented by emerging diseases, i.e. new and unknown to the population, such as H1N1 flu, as well as re-emerging diseases, this is, previously known and controlled, but now reappearing, as e.g. yellow fever and tuberculosis. All these conditions should be monitored in Pantanal⁴.

Noncommunicable diseases became the leading global causes of death in the past two decades; four conditions in particular (cardiovascular disease, chronic obstructive pulmonary disease, diabetes and cancer) account for more than 60.0% of deaths⁵⁶. These data should serve as a serious warning, especially since they represent the current health situation, and some of these diseases affect Pantanal rural workers. Several authors^{31,38} call the attention to the challenges posed by the care of individuals with high blood pressure and diabetes, as a function of cultural, economic and climatic aspects inherent to Pantanal, especially in the Rio Negro (Mato Grosso do Sul) and Barão de Melgaço (Mato Grosso) areas.

Legal and illegal drugs were mentioned in the study by Ribeiro³⁹ as a serious social and public health problem, since they are associated with violence, family breakdown, all sorts of diseases, and admission for treatment, among other issues. This author explains that the changes brought in by new agriculture and livestock production technologies, tourism and new forms of social relationships promoted an uncontrolled circulation of alcohol in Pantanal. She further observes that in the past, farm owners were able to control better the availability of alcohol in their properties, based on the awareness that too frequent consumption impaired the quality of work and triggered violence between coworkers and their families³⁹. Therefore, drug consumption can account for the so-called external causes of morbidity and mortality, which are a relevant health problem among Pantanal rural workers. According to the International Classification of Diseases and Related Health Problems, 10th revision, external causes of morbidity and mortality include accidents, violence, injuries, poisoning, homicide and suicide⁵⁷.

One of the Pantanal rural workers Pinto²⁵ interviewed thus described the occurrence of musculoskeletal pain: "I kept on with my life in the field again, a country guy, but I got a blow and [my body] was shattered, I almost died, I passed out a full day...". This type of accidents can cause disease, all sorts of pain, and require time off work; recovery is slow and painful, surgery is often needed, as well as physical therapy over a long period of time^{29,31,51}.

CONCLUSION

As a function of the factors described above, international agencies consider that the working conditions for rural workers have become seriously poorer worldwide, as reflected by high morbidity and mortality rates. The situation is even worse in emerging countries, due to lack of support to this occupational group. Occupational health agencies should increase interventions on work processes which put the life of workers at risk, of rural workers in particular.

The selected studies address several aspects of the work and health of Pantanal rural workers, and also describe risk factors, including psychosocial factors of work with possible influence on this population of workers.

The results of the present study indicate that Pantanal rural workers are exposed to hazardous and unhealthy working conditions, communicable and noncommunicable diseases, and all sorts of risk factors. Thus they clearly point to the need to ensure appropriate health care to this population, through the implementation of actions considered in public policies for prevention, health promotion and recovery, especially those centered on health and safety at work. We also suggest increasing the support to future exploratory and diagnostic studies aiming at bringing benefits to this occupational group. In particular, we call the attention to the relevance of multidisciplinary work, including farm owners, workers, handlers, trainers, breeders, researchers and other professionals to acquire knowledge and promote discussions to improve the health of Pantanal rural workers.

The present study has to some limitations, for instance, the lack of relevant studies in major databases such as PePSIC and SCOPUS, and the small number of studies in different fields on the health of workers in wetlands. Then, there is our choice of an integrative over a systematic review. The latter yields more statistical data, especially when meta-analysis is performed, which would be appropriate to answer our research question and elucidate particular issues related to causes and diagnosis, as well as the efficacy of interventions designed to solve the identified problems. A systematic review would have been also methodologically adequate as a function of its focus on experimental studies.

Nevertheless, our integrative review enabled a synthesis of the results of the studies selected as a function of the subject of interest and research question, which are described in a broadly encompassing and orderly manner. It yielded considerable information on our subject of interest, thus it contributes to the body of knowledge on wetland rural workers. This approach enabled simultaneous consideration of different types of studies, both theoretical and empirical, which affords a more thorough comprehension of the analyzed subject.

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