



OCCUPATIONAL ACCIDENTS AND ILLNESSES IN BRAZILIAN SLAUGHTERHOUSES: NATIONAL OVERVIEW

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SUMMARY: Agribusiness is on the rise in Brazil and the slaughtering and meat product manufacturing sector occupies a prominent position in exports. However, there are few epidemiological studies on workplace accidents in this sector. This cross-sectional observational epidemiological study aimed to analyze the national panorama of occupational accidents and illnesses in the slaughtering and meat products manufacturing sector in Brazil. The variables: total occupational accident (ATT), occupational illness (DT), occupational accident (AT) without Work Accident Reporting (CAT) and the number of workers in each National Classification of Economic Activity (CNAE) were extracted from the Statistical Yearbook of Occupational Accidents (AEAT) and the Annual List of Social Information (RAIS) of each CNAE from 2019. The slaughter and meat products manufacturing sector caused 62 ATT and 6.65 AT underreported daily. In absolute numbers, this sector ranked 3rd in ATT (22,757), 2nd in DT (697) and 4th in underreporting of TA in Brazil (2,429; 10.7%). The activity of slaughtering pigs, poultry and small animals (CNAE 1012) was the leader in the sector, ranking 5th nationally in number of ATT (12,474), 2nd in DT (541) and 7th in AT without CAT (1,489; 11.9% underreporting). However, the activity of slaughtering livestock, except pigs (CNAE 1011) was the one with the highest prevalence of ATT (5.62%) among the activities in this sector (5th in the national ranking) and CNAE 1012 of DT (0.1698%) (14th in the national ranking).

KEYWORDS: Slaughterhouses; Work accident; Underreporting.

INTRODUCTION

From June 2016 onwards, a major television advertising campaign began to be broadcast (Agro: the wealth industry of Brazil) in order to present Brazilian agricultural activity and its relations with other sectors of society, aiming to create empathy, build and reinforce a positive image of agriculture among the population (COSTA; OLIVEIRA, 2021). However, questions about the effects of agriculture on the emission of greenhouse gases, which would

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cause global warming and, consequently, climate change, have been raised. Furthermore, criticism is emerging regarding the Brazilian parliament's speeches regarding the denial of responsibility for socio-environmental damages in the agricultural sector (FRANÇA et al., 2021).

In Brazil, the slaughter and manufacturing sector of meat products was the leader in exports of poultry (ABPA, 2020) and cattle (ABIEC, 2020) and the fourth in pigs (ABPA, 2020) in 2019, slaughtering millions of heads of animals per day. Slaughterhouses employ thousands of workers, who are subjected to several occupational risks simultaneously. Studies in slaughterhouses proved that the work pace was high (REIS et al., 2017; 2020), the temperature of workers' fingers was below 15 C° (TIRLONI et al., 2021; 2018), there was a significant increase in risk of developing Work-Related Musculoskeletal Disorders (WMSDs) when knives were poorly sharpened (TIRLONI, et al., 2020a) and manual load transport was carried out in inadequate conditions and with a volume/day above that recommended for a worker (TIRLONI, et al., 2020b, 2020c).

The slaughter and manufacturing of meat products sector is considered to be of medium risk, according to the table presented in Regulatory Standard NR-4 (BRASIL, 1978), therefore, the contribution rate regarding Environmental Risks at Work (RAT) of these companies is 3% (BRASIL, 2021). Depending on the company's performance in relation to workplace accidents occurring in a given period, this percentage can be reduced or increased by applying the Accident Prevention Factor (FAP) (BRASIL, 2021a).

The importance of the slaughterhouse sector in generating jobs and income in Brazil is evident, however, how much is this reflected in registered workplace accidents? An accident at work is one that occurs as a result of carrying out work in the service of a company or domestic employer or when carrying out work by insured persons, causing bodily injury or functional disturbance that causes death or the loss or reduction, permanent or temporary, of the ability to work. work (BRASIL, 1991). According to the Occupational Safety and Health Observatory (SMARTLAB, 2021), in 2018 there were 623.8 thousand total work accidents (ATT) and 154.2 thousand accidents without CAT, the estimated underreporting of work accidents (without Communication of Accidents at Work – CAT) in Brazil was 24.7%.

As TA notification causes a financial burden on companies, it is assumed that underreporting of these occurs. Furthermore, another cause of TA under-registration is the existence of several official and public registration systems in Brazil, as found in the study by Rodrigues and Santana (2019).

The Regulatory Impact Analysis (AIR) of Regulatory Standard No. 17 – Ergonomics (NR-17) mentions the occurrence of underreporting in Brazil. In addition to mentioning that the recorded events represent only a small sample of the total number of accidents, as they do not refer to all workers, being restricted to those insured under the General Social Security Regime (RGPS) (BRASIL, 2021b).

There are few epidemiological studies on TA in the slaughter and meat product manufacturing sector, with only one specific study found in a poultry slaughterhouse (TAKEDA et al., 2018). Therefore, the objective of this study was to analyze the national panorama of occupational accidents and illnesses in the slaughtering and meat product manufacturing sector in Brazil.

DEVELOPMENT

Method

This is a cross-sectional, prevalence, population-based, observational epidemiological study, as it represents all workers in Brazil, registered with RAIS for the year 2019. This year

was selected, as it represented the panorama of work accidents in Brazil pre-pandemic caused by the new coronavirus SARS-COV-2.

The numbers of total occupational accidents (ATT) (sum of AT with and without registered CAT) for each National Classification of Economic Activity (CNAE) were extracted from the 2019 Statistical Yearbook of Occupational Accidents (AEAT) (AEAT, 2019). The number of ATs with registered CAT includes accidents by reason: typical, commuting and occupational illness (TD). In the present study, the absolute numbers of ATT, DT and AT without CAT were analyzed.

The CNAE is a hierarchical classification into five levels – sections (letter), divisions, groups, classes and subclasses (numbers). In the present study, the section of interest was the processing industry (C), the division was the manufacturing of food products (10) and the group “Slaughter and manufacturing of meat products” (10.1). Each division has one or more groups of economic activities and each group has one or more classes. The economic group for slaughter and manufacture of meat products is made up of classes with the codes: CNAE 1011 - Slaughter of livestock, except pigs; 1012 - Slaughter of pigs, poultry and other small animals and 1013 - Manufacture of meat products. The subclasses, which correspond to the details of the classes, were not addressed in this study.

The number of ATT, DT and AT without CAT of classes in each division and group were added up and organized in spreadsheets, to later be arranged in descending order. Two economic classes were excluded from the analyses, the variable cited in the AEAT as “ignored”, as this classification represented the sum of several CNAE. CNAE 7010 - “Headquarters of companies and local administrative units” was also not part of the study, as it presented conflicting information, such as the presence of 4 ATTs and no workers linked to this CNAE. Therefore, 87 divisions, 281 groups and 668 classes of economic activities were part of the analysis.

To determine the percentage of underreporting of AT in Brazil, in the slaughter sector and in each CNAE of this economic group, the same calculation used in the Occupational Safety and Health Observatory (SMARTLAB, 2021) was carried out, the percentage of AT was calculated without CAT in relation to the total amount of AT.

In order to verify the prevalence of AT and DT, the number of workers in each CNAE in 2019 was extracted from the microdata of the Annual Social Information List (RAIS) available on the Ministry of Labor (MTE) page, in an open manner, by through the Labor Statistics Dissemination Program (PDET) (BRASIL, 2021c). The ranking of the prevalence of AT and TD was carried out with CNAEs that had at least 1,000 linked workers.

Results

In Brazil in 2019, there were 582,507 total occupational accidents, of which 374,545 were registered as typical AT, 102,213 commuting, 9,352 occupational illnesses and 96,397 AT without the issuance of a CAT. Brazil employed 47,554,211 workers, while the “Slaughter and manufacturing of meat products” group employed 522,741 workers (1.09%) and accounted for 22,757 total work accidents in its three CNAEs (1011, 1012 and 1013), 697 occupational illnesses and 2,429 occupational accidents without CAT (Table 1); 3.9%, 7.45% and 2.51% in relation to the total values of occurrences in the country, respectively. It was identified that the number of illnesses registered in Brazil corresponded to 1.60% of ATT and in the slaughterhouse sector it was almost double, 3.06%. It was found that in 2019 (365 days), this sector caused 62 AT or DT per day and underreporting was 6.65 AT daily.

Analyzing by CNAE division, the results showed that the manufacturing of food products (Division 10) employed 1,594,827 workers, ranked third in the ATT ranking (43,853) and second in DT (961) and AT without CAT (4,828). Similar positions were found for the

CNAE 10.1 group (Slaughter and manufacturing of meat products) in relation to AT and DT (Table 1). On the other hand, among the 281 groups of economic activities, the slaughterhouse sector was the fourth that failed to issue the most CAT in 2019. The sector represented 51.9% of ATT, 72.5% of DT and 50.3% of AT without CAT granted to workers in companies that manufactured food products (Division 10). Furthermore, it was found that the slaughtering and meat products manufacturing sector employed 36.52% of the workers in this economic division.

Table 1. Presentation of the groups of economic activities with the highest absolute numbers of occupational accidents and illnesses and occupational accidents without CAT in 2019

Ranking	CNAE group	Total ATT (n)	CNAE group	Total DT	CNAE group	Total AT without CAT
1	86.1	56.922	64.2	1.876	84.1	3.784
2	47.1	27.315	10.1	697	86.1	3.160
3	10.1	22.757	86.1	465	47.1	3.128
4	84.1	18.065	53.1	431	10.1	2.429
5	49.3	13.808	29.4	274	49.2	2.243
6	56.1	10.698	47.1	188	64.2	2.233
7	41.2	9.423	29.1	170	49.3	1.808
8	53.1	8.536	84.1	148	81.2	1.627
9	38.1	8.032	49.3	121	41.2	1.456
10	22.2	7.962	56.1	118	80.1	1.177

n = 281 CNAE groups; description of groups of economic activities: 10.1 – Slaughtering and manufacturing of meat products; 22.2 - Manufacture of plastic products; 29.1 - Manufacture of cars, trucks and utility vehicles; 29.4 - Manufacture of parts and accessories for motor vehicles; 38.1 - Waste collection; 41.2 - Construction of buildings; 47.1 - Non-specialized retail trade - hypermarkets and supermarkets; 49.2 - Road passenger transport; 49.3 - Road freight transport; 53.1 - Mail Activities; 56.1 - Restaurants and other food and beverage services; 64.2 - Monetary intermediation - demand deposits; 80.1 - Surveillance, private security and transportation of valuables activities; 81.2 - Cleaning activities; 84.1- Administration of the state and economic and social policy; 86.1 - Hospital care activities.

Table 2 presents the ranking of the first 10 CNAE classes referring to the absolute numbers of accidents and illnesses at work and accidents without CAT, according to AEAT 2019.

Table 2. Absolute numbers of occupational accidents and illnesses and occupational accidents without registered CAT

Ranking	Total work accidents		Occupational Diseases		Work accidents without registered CAT	
	CNAE	n	CNAE	n	CNAE	n
1	8610	56.922	6422	1.772	8411	3.728
2	4711	24.278	1012	541	8610	3.160
3	8411	17.471	8610	465	4711	2.882
4	4930	13.808	5310	431	6422	2.011
5	1012	12.474	2910	170	4921	1.868

6	5611	10.659	4711	143	4930	1.808
7	4120	9.423	8411	141	1012	1.489
8	5310	8.536	1011	130	4120	1.456
9	3811	7.827	4930	121	8121	1.429
10	1011	7.718	5611	117	8220	1.036

n = 668 CNAE; description of classes of economic activities: 1011 - Slaughter of livestock, except pigs; 1012 - Slaughter of pigs, birds and other small animals; 2910 - Manufacture of cars, trucks and utility vehicles; 3811 - Collection of non-hazardous waste; 4120 - Construction of buildings; 4711 - Retail trade of general merchandise, with a predominance of food products - hypermarkets and supermarkets; 4921 - Public road transport of passengers, with fixed itinerary, municipal and in metropolitan areas; 4930 - Road freight transport; 5310 - Postal activities; 5611 - Restaurants and other food and beverage service establishments; 6422 - Multiple banks, with commercial portfolio; 8121 - Cleaning in buildings and homes; 8220 - Teleservice activities; 8411 - Public administration in general; 8610 - Hospital care activities.

Based on Table 2, it was found that CNAES 1011 and 1012 are among the ten activities with the highest absolute number of ATT (7,718 and 12,474, respectively) and among the eight with the most DT (130 and 541, respectively).

According to the declared data, underreporting of occupational accidents in Brazil in 2019 was 16.5% and in the slaughtering and meat products manufacturing sector it was 10.7%. CNAE 1012 was the seventh activity that presented the most AT without registered CAT (1,489) and the one that most underreported in the slaughterhouse sector (11.9%). CNAE 1011 had 743 ATs without CAT, an underreporting of 9.6%. It is noteworthy that CNAE 1013 presented 2,565 ATT, 26 DT and 197 AT without CAT, 7.7% underreporting of AT, and in absolute numbers, it occupied the 40th, 45th and 49th positions in the national ranking, respectively. Table 3 presents the prevalence of accidents and illnesses at work in 2019.

Table 3. Prevalence of accidents and illnesses at work in all economic activities in Brazil in 2019.

Rank	Work accidents				Occupational Diseases			
	CNAE	Work	Total ATT	Prevalence	CNAE	Work	Total DT	Prevalence
1	0141	14.873	2.241	15,07	6422	370.199	1.772	0,4787
2	2451	40.225	4.450	11,06	2942	10.546	46	0,4362
3	5310	132.772	8.536	6,43	2831	5.891	24	0,4074
4	3811	131.710	7.827	5,94	5310	132.772	431	0,3246
5	1011	137.308	7.718	5,62	3031	2.466	7	0,2839
6	1082	2.591	143	5,52	3316	9.799	25	0,2551
7	3822	5.370	296	5,51	2622	21.156	50	0,2363
8	2930	45.956	2.309	5,02	3091	14.002	33	0,2357
9	1623	13.067	634	4,85	2531	4.695	11	0,2343
10	0500	3.607	174	4,82	3012	2.597	6	0,2310
11	2531	4.695	223	4,75	2910	80.742	170	0,2105
12	8610	1.254.829	56.922	4,54	3099	3.364	7	0,2081
13	1210	3.974	176	4,43	2943	13.860	26	0,1876
14	1932	3.355	148	4,41	1012	318.519	541	0,1698
15	1322	1.349	57	4,23	0710	54.445	92	0,1690
16	2942	10.546	433	4,11	2853	5.481	9	0,1642
17	2311	17.813	731	4,10	3011	16.039	24	0,1496
18	1012	318.519	12.474	3,92	2443	4.870	7	0,1437

19	4912	35.830	1.393	3,89	2211	28.081	40	0,1424
20	2411	10.921	423	3,87	2941	35.231	48	0,1362
21	1013	66.914	2.565	3,83	0141	14.873	20	0,1345

n = 668 CNAE; description of classes of economic activities: 0141 - Production of certified seeds; 0710 - Extraction of iron ore; 1011 - Slaughter of livestock, except pigs; 1012 - Slaughter of pigs, birds and other small animals; 1013 - Manufacture of meat products; 2211 - Manufacture of tires and inner tubes; 2443 - Copper metallurgy; 2531 - Production of steel forgings and non-ferrous metals and their alloys; 2622 - Manufacture of peripherals for computer equipment; 2831 - Manufacture of agricultural tractors; 2853 - Manufacture of tractors, except agricultural; 2910 - Manufacture of cars, trucks and utility vehicles; 2941 - Manufacture of parts and accessories for the engine system of motor vehicles; 2942 - Manufacture of parts and accessories for the gear and transmission systems of motor vehicles; 2943 - Manufacture of parts and accessories for the braking system of motor vehicles; 3011 - Construction of vessels and floating structures; 3012 - Construction of boats for sport and leisure; 3031 - Manufacture of locomotives, wagons and other rolling stock; 3091 - Manufacture of motorcycles; 3099 - Manufacture of transport equipment not previously specified; 3316 - Aircraft maintenance and repair; 3811 - Collection of non-hazardous waste; 5310 - Postal activities; 6422 - Multiple banks, with commercial portfolio; 8610 - Hospital care activities.

Evaluating economic activities with at least 1,000 workers, it was found that the slaughtering and meat product manufacturing sector was among the 21 activities with the highest prevalence of ATT (Table 3), with CNAE 1011 being the most prevalent (5 .62%; 5th position), followed by 1012 (3.92%; 18th position) and 1013 (3.83%; 21st position).

The prevalence of ATT in this sector was 4.35%, of TD was 0.133% and of underreporting of TA was 0.465%. This means that for every 10,000 slaughterhouse workers, 435 had an accident at work and 13.3 had an illness at work, 46.5 had AT without CAT in 2019.

The activity of slaughtering pigs, poultry and other small animals was the 14th economic activity that caused the most occupational diseases in Brazil, with a prevalence of 0.1698%, leading the group of slaughter and manufacturing of meat products.

Discussion

It is specified in the law that an occupational or work-related illness is equated to an accident at work, understood as being inherent or peculiar to a given field of activity and constant in a relationship organized by the Ministry of Social Security and Assistance (MPAS) (BRASIL, 1976). However, according to AIR (BRASIL, 2021), occupational illnesses are possibly underreported, as they represent 2% of accidents from 2016 to 2019, which could lead to data distortions. The present study found similar results, as 1.6% and 3.06% of ATT were occupational diseases, in Brazil (all sectors) and in the slaughterhouse sector, respectively.

Several factors can interfere with underreporting. As evidenced by Rodrigues and Santana (2019) in the city of Palmas – Tocantins (TO) from 2007 to 2015, cases of deaths due to work accidents were not simultaneously recorded by all official and publicly accessible data systems, which generated AT sub-registration. Another issue is that AT only refers to workers registered as RGPS insured, exclusively covering a portion of the working population (BRASIL, 2021). Furthermore, due to the relationship between AT and the payment of Occupational Accident Insurance (SAT) by companies, in which the rate of 1 to 3% may be reduced or increased, depending on the company's performance. The change in the rate occurs through the application of a multiplier (FAP - Accident Prevention Factor) defined based on the severity, frequency and cost indices of each company (BRASIL, 2009). The tendency towards underreporting is clear, as when analyzing Decree No. 6,957, it appears that to determine the severity index, all cases of sickness benefit, accident benefit, disability retirement and death pension, all accidental in nature , should be considered. Also for calculating the frequency index, records of occupational accidents and illnesses reported to the INSS through CAT and accident benefits established by technical links (NTEP) by INSS medical expertise, even without a CAT linked

to them, will be considered. And finally, the cost index, which determines the values of accident benefits paid or owed by Social Security.

According to the results of the present study, the underreporting of TA in the slaughter and meat products manufacturing sector is lower than the general percentage in Brazil in 2019. On the other hand, the pig, poultry and small animal slaughter sector is largest, in addition to being the activity in the sector that causes the most occupational illnesses. This fact can be explained, as studies showed that the average repetitive actions per minute of poultry slaughterhouse workers were 64.4 ± 16.1 per minute (Reis et al., 2017), 69.1 ± 13.3 (TIRLONI et al., 2020a) and 77.0 ± 22.5 (Reis et al., 2020), considered high frequencies (COLOMBINI et al., 2008). Kilbom (1994) states that a job is repetitive if the duration of the work cycle is less than 30s and that the frequency range of 25-33 movements per minute should not be exceeded in order to prevent tendonitis.

The underreporting of TD in this sector is evident, given that there are several risk factors present in poultry slaughterhouses. According to OSHA (2013), repetitiveness, force, inadequate and static postures and vibrations, added to the cold work environment, increase the development of WMSDs. A study carried out with 925 workers from three Brazilian poultry slaughterhouses revealed that the chance of a worker who felt cold having some musculoskeletal discomfort was twice as high as a worker who did not feel cold. Overall, 71.5% of these workers felt some musculoskeletal discomfort and 59.2% felt cold (Tirloni et al., 2019).

In a historical series from 2002-2019, the worst prevalence of workplace accidents in Brazil was in 2008, with 242 cases per 10,000 formal workers, and in 2019, there were 164 cases registered (SMARTLAB, 2021), a prevalence of 1.64. In the present study, a prevalence of ATT almost three times higher was found in the slaughter and meat products manufacturing sector (4.35%), with the activity of slaughtering livestock, except pigs, being the most prevalent in the sector (5.62%). Studies show that in cattle slaughterhouses, the strength requirement is high, as workers carried out manual load transport with parts (quarter of the animal) that varied from 50.3 kg to 76 kg and the individual cumulative mass handled daily was greater than 10 tons (TIRLONI, et al., 2020b). In another study, it was found that the mass of the object handled for men was no more than 25 kg, however, the daily cumulative mass per worker was 35,333 kg. Furthermore, each worker transported 2,848 boxes per day, a lifting frequency of 6.3 per min, resulting in a variable lifting rate of 4.99 (very high) (TIRLONI, et al., 2020c).

There are several risk conditions for accidents and occupational diseases present in slaughterhouses. The sector's specific regulatory standard (NR-36) highlights several activities and conditions that can cause workplace accidents, such as the processing of animals, especially large and medium-sized animals, and the maintenance and hygiene of machines and equipment. Furthermore, it recommends that the electrical installations of machines and equipment must be designed and maintained in order to prevent, by safe means, the risks of electric shock and all other types of accidents; also accidents due to ammonia leaks and exposure of workers to biological agents (BRASIL, 2013).

CONCLUSION

The group of economic activities of slaughtering and manufacturing meat products employed more than a third of the workers who manufactured food products in Brazil. In 2019, the slaughterhouse sector ranked third in absolute numbers of total occupational accidents, second in occupational illnesses and fourth in cases of accidents without a CAT registered in the country.

The activity of slaughtering pigs, poultry and other small animals was fifth in the national ranking in relation to the absolute number of total occupational accidents, second in

occupational diseases and seventh in cases of accidents without registered CAT. Underreporting in this activity was greater than other slaughterhouse activities.

From another perspective, of the three CNAEs in group 10.1, the slaughter of livestock, except pigs, was the most prevalent in total occupational accidents, on the other hand, the activity of slaughtering birds, pigs and other small animals was the most prevalent in occupational diseases. work. Despite the evident underreporting of occupational diseases, the percentage of these in slaughterhouses was almost double the percentage of diseases registered in Brazil in 2019.

The results of this study show how the slaughterhouse sector stands out not only in exports, but also in the ranking of accidents and illnesses at work and in underreporting of accidents in relation to other economic activities, even with a specific regulatory standard. for the sector. In view of the above, it is recommended that inspection actions should be intensified and not made precarious, as worker health is a constitutional right. Therefore, more public and private preventive interventions are needed in order to reduce the risks inherent to this work, preventing the occurrence of accidents and damage to the health of these workers.

REFERENCES

ABIEC. Associação Brasileira das Indústrias Exportadoras de Carne (ABIEC). **Beef report - Perfil da Pecuária no Brasil 2019**. Disponível em: <http://abiec.com.br/publicacoes/beef-report-2021/>. Acesso em: 10 ago 2021.

ABPA. Associação Brasileira de Produção Animal. **Relatório Anual 2019**. Disponível em: <https://abpa-br.org/mercados/#relatorios>. Acesso em: 10 ago 2021.

BRASIL. Ministério da Economia. Secretaria do Trabalho. **Portaria MTb n. 3.214, de 08 de junho de 1978**. NR 4 - Serviços especializados em engenharia de segurança e em medicina do trabalho. Brasília, 1978. Disponível em: <https://www.gov.br/trabalho/pt-br/inspecao/seguranca-e-saude-no-trabalho/normas-regulamentadoras/nr-04.pdf/view>. Acesso em: 01 Ago. 2021.

BRASIL. Ministério da Economia. Receita federal. **FAP – Fator Acidentário de Prevenção**. Disponível em: <https://receita.economia.gov.br/orientacao/tributaria/declaracoes-e-demonstrativos/gfip-sefip-guia-do-fgts-e-informacoes-a-previdencia-social-1/fap-fator-acidentario-de-prevencao-legislacao-perguntas-frequentes-dados-da-empresa>. Acesso em: 08 ago. 2021a.

BRASIL. Ministério da Economia. Secretaria de Previdência e Trabalho. **Relatório Análise de Impacto Regulatório - Norma Regulamentadora nº 17 – Ergonomia**. Brasília, 2021b. Disponível em: <https://www.gov.br/economia/pt-br/assuntos/air/relatorios-de-air/seprt/strab/sit/relatorio-air-nr-17.pdf>. Acesso em: 30 jul 2021.

BRASIL. Ministério do Trabalho. **Programa de Disseminação das Estatísticas do Trabalho (PDET)**. Microdados RAIS e CAGED. Disponível em <http://pdet.mte.gov.br/microdados-rais-e-caged>. Acesso em: mar de 2021c.

BRASIL. **Lei nº 8.213, de 24 de julho de 1991**. Dispõe sobre os Planos de Benefícios da Previdência Social e dá outras providências. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/18213cons.htm. Acesso em: 01 ago 2021.

BRASIL. Ministério da Economia. Secretaria da Previdência, 2019. **Anuário Estatístico de Acidentes do Trabalho - 2019**. Disponível em: <https://www.gov.br/previdencia/pt-br/assuntos/previdencia-social/saude-e-seguranca-do-trabalhador/dados-de-acidentes-do-trabalho>. Acesso em: 31 mar. 2021.

BRASIL. **Decreto nº 6.957, de 9 de setembro de 2009**. Altera o Regulamento da Previdência Social, aprovado pelo Decreto no 3.048, de 6 de maio de 1999, no tocante à aplicação, acompanhamento e avaliação do Fator Acidentário de Prevenção - FAP. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/decreto/d6957.htm. Acesso em: 01 ago 2021.

BRASIL. **Lei nº 6.367, de 19 de outubro de 1976**. Dispõe sobre o seguro de acidentes do trabalho a cargo do INPS e dá outras providências. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/l6367.htm. Acesso em: 18 ago de 2021.

BRASIL. Ministério do Trabalho e Emprego. **Portaria MTE n. 555, de 18 de abril de 2013**. Norma Regulamentadora 36. Segurança e Saúde no Trabalho em Empresas de Abate e Processamento de Carnes e Derivados. Brasília: MTE, 2013.

COLOMBINI, Daniela *et al.* **Método Ocrá Para Análise e a Prevenção do Risco por Movimentos Repetitivos**: Manual Para a Avaliação e a Gestão do Risco. São Paulo: LTr, 2008.

COSTA, Débora P. L.; OLIVEIRA, Tania P.de. Da Carta de Achamento à publicidade televisiva: a mídia e a construção de sentidos para o agronegócio brasileiro. **Cadernos Discursivos**, Catalão-GO, v. 2, n. 1, p. 81-94, 2021.

dos REIS, Diogo C. *et al.* Effects of Reduced Work Pace on the Risk of Developing Upper-Limb Musculoskeletal Disorders in a Poultry Slaughterhouse. *In*: KARWOWSKI, W. *et al.* (Org.). **Advances in Intelligent Systems and Computing**. Cham: Springer International Publishing, 2020, v. 1215, p. 87-94.

FRANÇA, Karine A. *et al.* O aquecimento global no discurso parlamentar brasileiro: denúncia e negação de responsabilidade do agronegócio. **Revista do Direito, Estado e Sociedade**, Ahead of Print, n. X, mês/mês, 2021.

KILBOM, Åsa. Repetitive work of the upper extremity: Part II—The scientific basis (knowledge base) for the guide. **International Journal of Industrial Ergonomics**, v. 14, p. 59–86, 1994.

OSHA. Occupational Safety and Health Administration. **Prevention of Musculoskeletal Injuries in Poultry Processing**. 2013. Disponível em: <https://www.osha.gov/Publications/OSHA3213.pdf/>. Acesso em: 1 mar 2020.

REIS, Diogo C. *et al.* G3-2-Assessment of Risk Factors of Upper-limb Musculoskeletal Disorders in a Chicken Slaughterhouse. **Japanese Journal of Ergonomics**, v. 53, p. S458-S461, 2017.

RODRIGUES, Alana B.; SANTANA, Vilma S. Acidentes de trabalho fatais em Palmas, Tocantins, Brasil: oportunidades perdidas de informação. **Revista Brasileira Saúde**

Ocupacional, v. 44, p. e8, 2019. Disponível em:
<https://www.scielo.br/j/rbso/a/gQBMKYK6tnFNKFqT38tvnr4P/?format=html&lang=pt>.
Acesso em: 08 ago. 2021.

SMARTLAB. Observatório de Segurança e Saúde no Trabalho – Promoção do meio ambiente do trabalho guiado por dados. Disponível em: <https://smartlabbr.org/sst/> Acesso em: 30 jul. 2021.

TAKEDA, Fabiano *et al.* Indicators of Work Accidents in Slaughter Refrigerators and Broiler Processing. **Brazilian Journal of Poultry Science**, v. 20, n. 2, p. 297-304, abr. – jun., 2018.

TIRLONI, Adriana S. *et al.* Poultry Slaughterhouse Workers: Finger Temperatures and Cold Sensation in the Hands. *In*: BLACK, N.; NEUMANN, P.; NOY, I. (Org.). **Lecture Notes in Networks and Systems**. Cham: Springer International Publishing, 2021. v. 222, p. 852-859.

TIRLONI, Adriana S. *et al.* The Use of Personal Protective Equipment: Finger Temperatures and Thermal Sensation of Workers' Exposure to Cold Environment. **International Journal of Environmental Research and Public Health**, v. 15, p. 2583, 2018.

TIRLONI, Adriana S. *et al.* Exertion Perception When Performing Cutting Tasks in Poultry Slaughterhouses: Risk Assessment of Developing Musculoskeletal Disorders. **International Journal of Environmental Research and Public Health**, v. 17, p. 9534, 2020a.

TIRLONI, Adriana S. *et al.* Ergonomic Risk Evaluation of the Manual Handling Task of Bovine Quarters in a Brazilian Slaughterhouse. *In*: GOONETILLEKE, Ravindra, S.; KARWOWSKI, Waldemar. (Org.). **Advances in Intelligent Systems and Computing**. Cham: Springer International Publishing, 2020b. v. 967, p. 57-69.

TIRLONI, Adriana S. *et al.* Ergonomic Approaches to Reduce the Risk of a Manual Material Handling Task in a Brazilian Poultry Slaughterhouse. *In*: KARWOWSKI, W. *et al.* (Org.). **Advances in Intelligent Systems and Computing**. Cham: Springer International Publishing, 2020c. v. 1215, p. 244-251.

TIRLONI, Adriana S. *et al.* Association between perception of bodily discomfort and individual and work organisational factors in Brazilian slaughterhouse workers: a cross-sectional study. **BMJ Open**, 9:e022824, 2019.