

## **Labor Activities and Occupational Health in Brazilian Swine Production – A Case Study**

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### **ABSTRACT**

Swine production is an important business in Brazil with 2.5 million sows, and in this economic sector there is large concentration of workers performing both manual and mechanical tasks exposed to numerous labor risks and accidents. Very few ergonomic studies have been done in Brazilian commercial animal production activities. This research aimed to evaluate the symptoms found by swine production workers, relating them with the worker's age and time involved in specific task. A questionnaire was prepared seeking the evaluation of the working environment as well as the worker's life quality, by analyzing any complaint and/or symptom related or found during the research. Twenty five individuals who worked eight hours daily in commercial swine housing were selected randomly to answer the questionnaire. Ages varied from 16 to 60 years old and related to gender, 68% were male and 32% were female. The research was carried out in a commercial swine production facility in the state of São Paulo, Brazil. Data were registered and organized, and Fishers tests and Odds Ratio were used for statistical analysis in order to evaluate associations between worker's age, duration of employment, and selected symptoms. The results showed that work within swine production in Brazil did not represent a risk for worker health. A positive correlation was found between physical fatigue and young workers, apparently because their muscular development is not adapted to the activity. A negative correlation between physical fatigue and the duration of employment performing a certain function was also found.

**Keywords:** Rural labor, ergonomics, pig production, Brazil

### **1. INTRODUCTION**

Brazilian swine herd has grown in the last ten years due to investment in research in the areas of genetics (Pires et al., 2000; Torres et al., 2005), health (Borowsky et al., 2006), nutrition (Bertol & Lima, 1999; Lima et al., 1999), and management (Nunes et al., 2003). Nowadays there are 2.5 million sows in Brazil, with 60 % reared under systems using a certain degree of technology, and 70% is related to integration system located mainly in the Southern region.

Intensive swine production usually seeks the support of an adequate housing environment in order to reach a good growth rate. During the 70's, studies revealed that several airborne diseases were present in swine housing, affecting both animals and workers, leading to respiratory diseases, such as chronic bronchitis, asthma, and organic dust toxic syndrome among workers (Donham et al., 1995; Reynolds et al., 1996; Huttner & Moreira, 2000). Health studies must consider several modifying factors in agricultural exposures which result in physical illnesses including work force age, work practices, engineering controls, and use of personal protective equipment. Pig production involves heavy work operations and repetitive jobs such as cleaning and feeding in growing and finishing units, as well as teeth trimming, tail cutting and feeding in nursery (Stal & Englund, 2005). The work force has significantly changed, and today there has been a slight increase in women and young male

individuals. Labor's occupational health is measured in terms of a continuum, which starts with perfect wellbeing, transitioning into the first symptoms or infections, and culminating with the worker's incapacity (Gonçalves, 1988).

Brazilian legislation lacks specific items regarding the protection of rural labor that with improvement may mean better welfare, as well as reductions in worker's risks (Gonçalves, 1988; Camardella, 1989). Farming and other agricultural production activities are recognized as hard physical labor. Musculoskeletal disorders (MSD) are common in agricultural activities, and have increased over the last 20 years (Villarejo & Baron, 1999). Chronic back pain was identified with 26% of farmers and ranchers in one survey, and it increased with age and years worked (Xiang et al., 1999). Von Essen & McCurdy (1998) found that as many as 71% of swine producers reported chronic back pain.

The aim of this research was to identify and associate the laborer's occupational health with age, gender and time the worker spends performing specific tasks within a commercial swine production.

## 2. MATERIAL AND METHODS

This study was carried out in a commercial swine farm, with open sided natural ventilation confinement buildings, on Salto county, State of São Paulo, Brazil, at latitude 23°02' S and longitude 47°22' W, with an average altitude of 600m. The herd size was of 930 sows and the complete cycle of production was reared within the farm in the total of 10,330 pigs in all ages from farrowing to finishing. Thirty workers were hired and employed by the producer to perform full time all related tasks including catching and repetitive lifting of piglets for gelding, vaccination and treatment, feeding and handling of manure. Twenty five workers were randomly selected for the study. They had a daily journey of eight hours inside and outside the swine houses. Ages varied from 16 to 60 years old. Sixty eight percent were male, and thirty two were female.

A questionnaire related to work environment and health symptoms was used to collect data from all workers. The selected health symptoms asked in the survey were: stomach acidity; lack of appetite; restlessness; cough during daytime; cough during nighttime; sinus congestion; difficulty in breathing; nervousness; physical fatigue; headache; and musculoskeletal symptoms.

A statistical analysis was done applying Fishers tests and Odds Ratio test in order to evaluate the association between age, gender, and duration of employment, with the overall health symptoms. The software Minitab<sup>®</sup> (2004) was used and the significance level adopted for the observational research was 90% ( $\alpha = 0.10$ ).

## 3. RESULTS AND DISCUSSION

The study group was formed by men (68%) and women (32%). In a study by Stal et al. (2005) the results showed that musculoskeletal morbidity is high among pig farmers in places where the owner performs the tasks. The female worker had significantly more problems than the male, particularly in the upper extremities.

The results of this experiment indicated a strong association between the worker's age and physical fatigue ( $p$  value = 0.00;  $\alpha = 0.10$ ), and the Odds Ratio showed that the younger workers (age = 25 years old) had approximately thirty five times more complaints about physical fatigue than more experienced older workers (Figure 1).

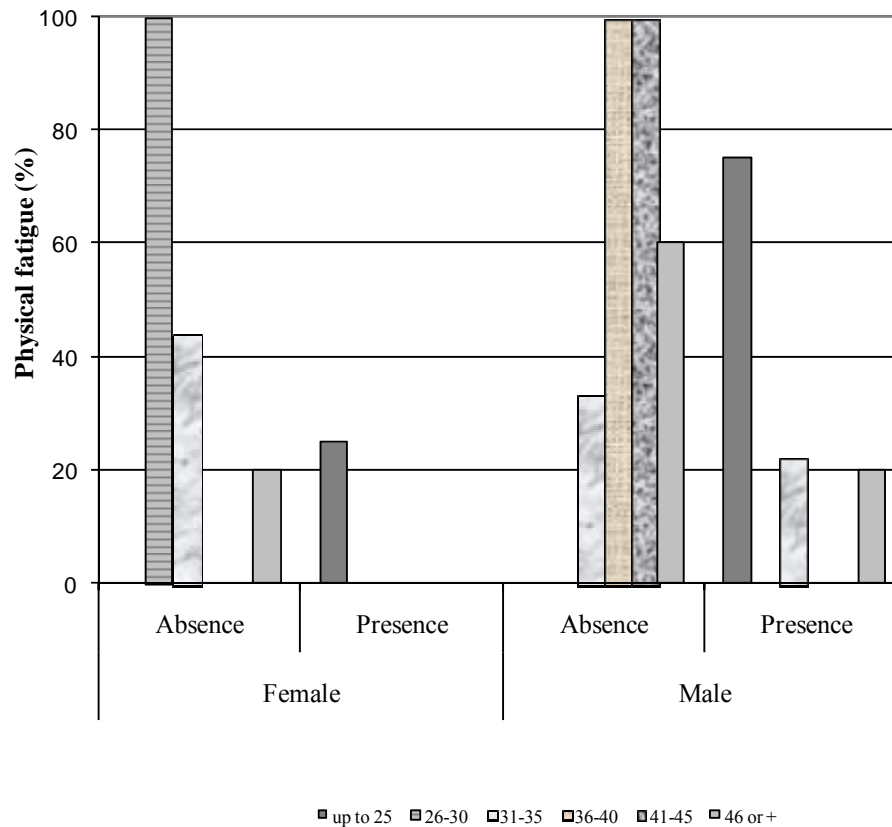


Figure 1. Relation between age, gender and absence at work, and physical fatigue.

This finding is probably related to two facts: first, younger workers may not have enough motivation towards their job; and second, there is evidence that physical conditioning acquired over time did not lead to specific postural pathology that may compromise performance at specific job. As a consequence, muscle conditioning towards a certain task may decrease specific physical fatigue.

All the other symptoms were not statistically significant ( $\alpha = 0.10$ ). A possible reason is that our field observation was limited to labor's information only, while agreeing with Ombredane & Favergé (1955), who state that both laborer's information and examination is necessary to obtain more accurate data and knowledge. Huttner & Moreira (2000) and Tripp et al. (1999) showed that tasks most often associated with an injury or illness in all swine operations in general, and in specific operations with more than 10 employees respectively, are: moving and handling animals (38% all operations, 69.2% operations with more than 10 employees), bending or lifting (35.4%; 69.2%), and performing medical procedures on the animals, such as administering medications, vaccinating, artificial insemination, tail docking, and others

(25.3%; 53.8%). Exposure to substances or conditions associated with injury and illness for all operations were reported most frequently as airborne dust or particles (15.2%), animal medications or vaccines (8.9%), and ammonia (5.1%). In operations with more than 10 employees, exposure to substances or conditions most often cited were airborne dust or particles (30.8%), animal medications or vaccines (30.8%), noxious gases (7.7%), and animal diseases (7.7%).

In Table 1 it is shown that for individuals less than twenty five years old, physical fatigue symptoms were highly present. This does not apply to the other age groups. The results of the association between the variables of musculoskeletal symptoms ( $p$  value = 0.07,  $\alpha$  = 0.10) and age were significant ( $\alpha$  = 0.10). Von Essen & McCurdy (1998) found chronic symptoms of back pain in swine workers, and related them to the specific activities performed which may reflect in fatigue for older workers (age above 46 years).

Table 1. Percentage of physical fatigue per age group.

Age (years)	N <sub>1</sub>	Physical fatigue		
		Absence (%)	N <sub>2</sub>	Presence (%)
Up to 25	0	0.0	8	100.0
26 – 30	1	100.0	0	0.0
31 – 35	7	77.8	2	22.2
36 – 40	1	100.0	0	0.0
41 – 45	1	100.0	0	0.0
Older than 46	4	80.0	1	20.0

N<sub>1</sub> = sample of individuals who did not present physical fatigue; N<sub>2</sub> = sample of individuals who presented physical fatigue.

This study did not observe correlations between the worker duration of employment and presence of symptoms of pulmonary function variables. This is different from the study presented by Kirkhorn & Schenker (2002) which reported the incidence of specific symptoms of animal housing production workers in eye, nose and throat irritations, leading to related fatigue or boredom. This was probably due to the fact that swine housing in Brazil is open sided in the lateral walls, prevailing natural ventilation and continuous air renovation.

Figure 2 shows that those individuals younger than twenty five presented more musculoskeletal symptoms. The Odds Ratio indicates that worker's within this age range (up to 25 years old) have 3.05 times more chance of having muscular tension than their counter part. In a study with Swedish dairy farmers, Gustafson (1994) found that nearly 83% of the workers reported some kind of symptom from the musculoskeletal system during the previous twelve months of working. Even though that in general the activities in pig farms are somewhat distinct from dairy production, some are similar such as handling offsprings, bending or lifting, as well as vaccinating and applying medication.

Figure 2 and Table 2 show that individuals older than 36 years reported more musculoskeletal symptoms, which was less common among younger workers. It was also found that female workers presented higher percentage of MSD.

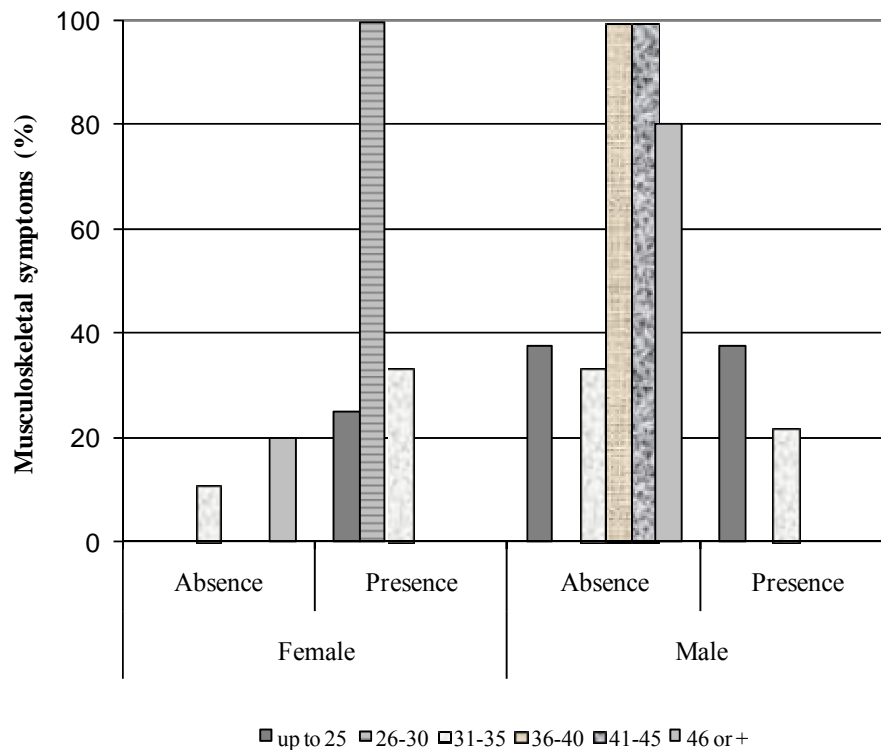


Figure 2. Relation between labor age and percentage of musculoskeletal symptoms

According to Marcondes et al. (2003) one variable related to the fact that female workers in general present higher level of MSD is the accumulation of domestic tasks and those at work. Kolstrup et al. (2006) studying the prevalence of perceived symptoms of MSD among workers in dairy and pig farms in Sweden found that female pig workers reported symptoms in the “upper extremities” especially in the neck more often than did their male counterpart.

Studying the perception of the adults and youth, Bartels et al. (2000) established that age was not the dominant factor in determining the tasks performed by youth workers. Most adults agreed that jobs were assigned to youth based on the task urgency or needs on the farm; however the younger workers need to perform well in all assigned tasks, as they fear for their work security, and this may be an extra stressful factor. Kolstrup et al. (2006) found in their study that despite the young age of the participants in the study, high frequencies of MDS were reported. Old workers already know that the job is physically demanding however they underestimate the potential risk. This was evident in Table 2 that shows the group with an age older than 36 years presents a cumulative 100% of musculoskeletal symptoms.

Table 2. Percentage of musculoskeletal symptoms per age group.

Age (years)	N <sub>1</sub>	Musculoskeletal symptoms		
		Absence (%)	N <sub>2</sub>	Presence (%)
Up to 25	5	62.5	3	37.5
26 – 30	1	100.0	0	0.0
31 – 35	5	55.6	4	44.4
36 – 40	0	0.0	1	100.0
41 – 45	0	0.0	1	100.0
Older than 46	0	0.0	5	100.0

N<sub>1</sub> = sample of individuals who did not present musculoskeletal symptoms; N<sub>2</sub> = sample of individuals who presented musculoskeletal symptoms.

Labor in a typical Brazilian swine farm does not indicate to be prejudicial to the worker's health; however those who are not trained to this kind of labor presented some degree of physical fatigue represented by musculoskeletal symptoms ( $\alpha = 0.10$ ) and some boredom. This specific study did not focus on the psychological factors influencing both physical fatigue and MSD; however, Fischer et al. (2005) found significant associations between body pain and the psychological job demands, in the total psychological stressors scales. Factors that could be critical for the development of musculoskeletal disorders among pig farmers in the study by Huttner & Moreira, 2000 and Kolstrup et al.(2006) were not examined, however it is known that the tasks performed during the work with pigs is a strenuous job, involving heavy work performed repetitively throughout the day.

Table 3 shows that after five years working in swine production workers presented gastro enteric symptoms, which did not occur within a short time span.

Table 3. Presence of gastro enteric symptoms per duration of hired worker employment performing tasks in swine production.

Duration of employment in swine production (year)	N <sub>1</sub>	Gastro enteric symptoms		
		Absence (%)	N <sub>2</sub>	Presence (%)
< 1	7	100.0	0	0.0
1 - 5	3	50.0	3	50.0
6 -10	1	33.3	2	66.7
> 10	3	50.0	3	50.0

N<sub>1</sub> = sample of individuals who did not present stomach acidity; N<sub>2</sub> = sample of individuals who presented stomach acidity.

The results also showed that individuals with employment duration greater than five years in swine production have 4.16 times (Odds Ratio) more chance of presenting stomach acidity than their counterpart within the first four years employed. The percentage of workers presenting stomach acidity symptoms, which is a symptom related to stress, was higher (66.7%) in the range of working time from six to ten years, and declines afterwards after ten years (50.0%), and it was not found in the group with less than a year of employment. This may be because the worker takes some time to get acquainted with the activities in the first five years, and afterwards get stressed due to either physical fatigue or boredom. Thelin (1990) showed that farmers who worked more than ten years in the same function were found

to have significantly more hip joint arthritis, which may cause pain and consequent stress. This study also indicates that after ten years in the activity the worker tends to either exercise resignation or learn the task better, and that some workers reported symptom of stomach acidity.

More studies in safety and ergonomics in animal production activities under tropical conditions are needed. Ogilvie (1997) proposes specific studies on environment control to reduce heat stress not only for the animals, but for the worker exposed to the environment as well, pointing out the three key elements to make job more productive, comfortable and safer for the workers as: health, safety and ergonomics.

#### 4. CONCLUSIONS

The method used for the data collection and analysis was efficient in pointing which variables were related with the presence of occupational symptoms such as: musculoskeletal, physical fatigue and gastro enteric symptoms. Female workers presented more MSD symptoms than their male counterpart. Younger workers showed more physical fatigue than more experienced workers. More research is needed to examine specific mechanisms of physical symptoms related to handling and caring for pigs housed under tropical conditions. The results are not yet clear whether working conditions in open sided swine housing in Brazil represent specific departure from ideal labor welfare standards.

#### 5. ACKNOWLEDGMENTS

Financial support from both CNPq and FAPESP is acknowledged.

#### 6. REFERENCES

- Bartels, S., B. Niederman and T.R. Waters. 2000. Job hazards for musculoskeletal disorders for youth working on farms. *Journal of Agricultural Safety and Health* 6: 191-201.
- Bertol, T.M. and G.J.M.M. Lima. 1999. Níveis de resíduo industrial de fécula da mandioca na alimentação de suínos em crescimento e terminação. *Pesquisa Agropecuária Brasileira* 34: 243-248. (In Portuguese).
- Borowsky, L.M., M.C. Bessa, M.I. Cardoso and C.A.M. Avancini. 2006. Sensibilidade e resistência de amostras de *Salmonella Typhimurium* isoladas de suínos abatidos no Rio Grande do Sul/Brasil frente aos desinfetantes químicos quaternário de amônio e iodoform. *Ciência Rural* 36: 1474-1479. (In Portuguese).
- Camardella, A. *Insalubridade: causas, conseqüências, avaliação*. 1989. Brasília: Confederação Nacional da Indústria. (In Portuguese).
- Donham, K.J., S.F. Reynolds, P. Whitten, J. Merchant, L. Burmeister and W. Popenorf. 1995. Respiratory dysfunction in swine production facility workers: dose-response relationships of environmental exposures and pulmonary function. *American Journal of Industrial Medicine* 27: 405-418.
- Fischer, F.M.; Oliveira, D.C.; Nagai, R.; Teixeira, L.R.; Júnior, M.L.; Latorre, M.R.; Cooper, S.P. 2005. Job control, job demands, social, support at work and health among adolescent workers. *Revista de saúde pública* 39: 45-53.
- FTQ. Fédération des travailleurs et travailleuses du Québec. 1995. *Quand le travail "léger" pèse lourd*. Québec: FTQ. (In French).

- Gonçalves, E.L. 1988. *A empresa e a saúde do trabalhador*. São Paulo: Pioneira. (In Portuguese).
- Gustafsson, B., S. Pinzke and P. Isberg. 1994. Musculoskeletal symptoms in Swedish dairy farmers. *Swedish Journal of Agricultural Research* 24: 177-188.
- Hutter, M.U. and Moreira, J.S. 2000. Avaliação ambiental e epidemiológica do trabalhador da indústria de fertilizantes de Rio Grande, RS. *Jornal de Pneumologia* 26: 1-18. (In Portuguese).
- Kirkhorn, S.R. and M.B. Schenker. 2002. Current health effects of agricultural work: respiratory disease, cancer, reproductive effects, musculoskeletal injuries, and pesticide-related illness. *Journal of Agricultural Safety and Health* 8(2): 199-214.
- Kolstrup, C., M. Stal, S. Pinzke and P. Lundqvist. 2006. Ache, pain and discomfort: the reward for working with many cows and sows? *Journal of Agromedicine* 11(2): 45-55.
- Lima, G.J.M.M. and A.L. Guidoni. 1999. Níveis de cromo-ácido nicotínico em dietas de suínos em crescimento e terminação. *Pesquisa Agropecuária Brasileira* 34:433-439.
- Marcondes, W.B., L. Rotenberg, L.F. Portela, and C.R.C. Moreno, C.R.C. 2003. O peso do trabalho "leve" feminino à saúde. *Perspectiva São Paulo* 17(2): 165-170. (In Portuguese).
- Minitab. Minitab® Statistical software for Windows. 2004. Available at: <http://www.minitab.com/products/minitab/>. Accessed: Feb.10, 2004.
- Nunes, C.G.V., E.P. Costa, R.F.M. Oliveira, J.L. Donzele, R.V. Nunes and G.R. Carvalho. 2003. Efeito do condicionamento térmico ambiental sobre o desempenho reprodutivo da fêmea suína. *Revista Brasileira de Zootecnia* 32: 854-863. (In Portuguese).
- Ombredane, A., Faverge, J. M. 1955. L'analyse du travail. Paris: PUF. (In French).
- Pires, A. V.; Lopes, P. S.; Torres, R. A.; Euclides, R.F.; Silva, M. A.; Costa, A. R. C. Tendências genéticas dos efeitos genéticos direto e materno em características reprodutivas de suínos. *Revista Brasileira de Zootecnia*, v.29, p. 213-216, 2000. (In Portuguese).
- Reynolds, S.J., K.J. Donham, P.S. Stookesberry, P. Thorne, K. Subramaniam and P. Whitten. 1996. Air quality assessments in the vicinity of swine production facilities. *Journal of Agromedicine* 4: 37-46.
- Stal, M. and J.E. Englund. 2005. Gender difference in prevalence of upper extremity musculoskeletal symptoms among Swedish pig farmers. *Journal of Agricultural Safety and Health* 11(1):7-17.
- Thelin, A. 1990. Hip joint arthrosis: An occupational disorder among farmers. *American Journal of Industrial Medicine* 18: 339-343.
- Torres Filho, R.A., P.S. Lopes, C.S. Pereira, R.F. Euclides, C.V. Araújo, M.A. Silva, and F.C. Breda. 2005. Estimativas de parâmetros genéticos para características de desempenho de suínos em fase de crescimento e terminação. *Arquivo Brasileiro de Medicina, Veterinária e Zootecnia* 57:237-244. (In Portuguese).
- Tripp, R. S., J.M. Shutske, D. K. Olson and M. Schermann. 1999. Production facilities regarding employee health and safety. *Journal of Agromedicine* 6(2): 3-23.
- Villarejo, D. and S.L. Baron. The occupational health of hired farm workers. *Occupational Medicine* 14(3): 613-635.
- Von Essen, S.G. and S. A. Mccurdy. 1998. Health and safety risks in production agriculture. *Western Journal of Medicine* 169: 214-220.
- Xiang, H., L. Stallones and T.J. Keefe. 1999. Back pain and agricultural work among farmers: an analysis of the Colorado farm family health and hazard surveillance survey. *American Journal of Industrial Medicine* 35: 310-316.