

# Consequences of occupational exposure to biological material among workers from a university hospital

*Consequências da exposição ocupacional a material biológico entre trabalhadores de um hospital universitário*

*Consecuencias de la exposición ocupacional a material biológico por trabajadores de un hospital universitario*

Maria Helena Palucci Marziale<sup>1</sup>

Heloisa Ehmke Cardoso dos Santos<sup>1</sup>

Camila Maria Cenzi<sup>1</sup>

Fernanda Ludmilla Rossi Rocha<sup>1</sup>

Marli Elisa Mendes Trovó<sup>1</sup>

1. Universidade de São Paulo.  
Ribeirão Preto - SP, Brazil.

## ABSTRACT

**Objective:** This study analyzed the occurrence, characteristics and consequences of occupational accidents involving exposure to biological material for workers and the institution. **Methods:** This exploratory study using quantitative analysis of data was performed in a hospital that is a member of the Occupational Accidents Prevention Network, São Paulo, Brazil. Data concerning accidents in 2010 were collected from the database of the hospital's Safety and Occupational Medicine Department. Interviews were conducted with injured workers (n = 77) and their immediate supervisors (n = 30). **Results:** The results showed that 77 workers were victims of accidents, 55 (71.4%) of which participated in the study, most were women (94.6%) and nursing auxiliaries (67.8%). Among the respondents, 30.4% of the workers were injured while performing venipuncture. **Conclusion:** For 67.9% of the workers, the accident caused preoccupation, fear, discomfort due to prophylaxis, lack of emotional control, and family problems. A total of 93.3% of the 30 supervisors identified absenteeism as a consequence.

**Keywords:** Nursing; Occupational health; Accidents, occupational; Exposure to Biological Agents.

## RESUMO

Este estudo teve como objetivo analisar a ocorrência, as características e consequências do acidente de trabalho com exposição a material biológico para trabalhadores e instituição. **Métodos:** Estudo exploratório com abordagem quantitativa dos dados realizado em hospital integrante da Rede de Prevenção de Acidentes de Trabalho, Estado de São Paulo. **Resultados:** Os dados foram coletados por levantamento da ocorrência dos acidentes ocorridos em 2010 por consulta documental do banco de dados do Serviço de Segurança e Medicina do Trabalho. Foram realizadas entrevistas com trabalhadores acidentados (n = 77) e seus chefes imediatos (n = 30). Os resultados demonstraram que 77 trabalhadores foram vítimas de acidentes, dos quais 55 (71,4%) participaram do estudo, sendo a maioria mulheres (94,6%) e auxiliares de enfermagem (67,8%). **Conclusão:** Dos entrevistados, 30,4% trabalhadores se acidentaram na punção venosa. Como consequências para 67,9% dos trabalhadores, o acidente causou preocupação, medo, mal-estar devido a profilaxia, descontrole emocional e problemas familiares. Dentre os 30 chefes, 93,3% identificaram o absenteísmo como consequência.

**Palavras-chave:** Enfermagem; Saúde do trabalhador; Acidentes de trabalho; Exposição a agentes biológicos.

## RESUMEN

**Objetivo:** Analizar la incidencia, características y consecuencias de los accidentes de trabajo con exposición a material biológico por trabajadores e institución. **Métodos:** Estudio exploratorio cuantitativo, realizado en hospital miembro de la Red para la Prevención de Accidentes de Trabajado, en São Paulo. Los datos fueron recolectados mediante encuestas sobre la ocurrencia de accidentes en 2010, por consulta a la base de datos del Departamento de Seguridad y Medicina del Trabajo. Se realizaron entrevistas con trabajadores lesionados (n = 77) y sus supervisores inmediatos (n = 30). **Resultados:** 77 trabajadores fueron víctimas de accidentes, de los cuales 55 (71,4%) participaron del estudio, siendo la mayoría mujeres (94,6%) y auxiliares de enfermería (67,8%). **Conclusión:** El 30,4% de los trabajadores resultaron heridos en la punción venosa. Para 67,9%, el accidente causó preocupación, miedo, malestar debido a la profilaxia, falta de control emocional y problemas familiares. De los 30 líderes, el 93,3% identificó el absentismo como consecuencia.

**Palabras-clave:** Enfermería; Salud laboral; Accidentes de trabajo; Exposición a Agentes Biológicos.

### Corresponding Author:

Heloisa Ehmke Cardoso dos Santos.  
E-mail: heloecs@hotmail.com

Submitted on 09/11/2012.  
Resubmitted on 05/24/2013.  
Accepted on 07/06/2013.

DOI: 10.5935/1414-8145.20140002

## INTRODUCTION

According to Law No. 8,213 from July 24 1991, an occupational accident (OA) is one "occurring while performing an occupational activity, under the company's service, or services of insured workers, causing injury or functional disorder, leading to death or temporary or permanent reduced capacity to work. Commuting accidents and occupational diseases are also considered to be occupational accidents"<sup>1</sup>. They can result in death, incapacity and can harm social, family and work relationships.

OAs caused by exposure to biological material such as blood and bodily fluids are of concern because these substances can transmit infection and contagious diseases such as hepatitis B, hepatitis C, and Acquired Immunodeficiency Syndrome (AIDS), among others<sup>2</sup>. The Centers for Disease Control and Prevention (CDC) estimates that the number of injuries caused by sharp objects in the health field is above half a million per year. About half of these injuries, that is, approximately 1,000 accidents per day, occur in hospitals. One figure that portrays the risk of injury to which hospital workers are exposed estimates that 28 injuries per each 100 occupied beds occur every year<sup>2-4</sup>.

In Brazil, nursing workers, more specifically nursing auxiliaries, are the ones who most frequently are victims of accidents with biological material because they are the largest occupational group working in hospitals and are those who have the greatest amount of contact with patients<sup>5</sup>. Other workers, however, who also work in hospitals are subject to accidents with this type of material<sup>5</sup>.

Occupational accidents with biological material (OABM) are more prone to happen in specific work environments where there is inappropriate work organization, in addition to an intense work pace, complex care actions, and the unit is understaffed<sup>5</sup>. This type of accident has consequences for the workers' lives, their families, superiors and people in their social lives, compromising the worker's quality of life and his/her individuality in the face of one's plans and expectations. Among the feelings that emerge after an accident, fear is the first feeling manifested, followed by concern, indecision, anger, outrage, guilt, despair, shame, incapacity, incompetence, anxiety, insecurity and distress<sup>6</sup>. In addition to the consequences for the workers, OABMs also harm the employing institution, leading to lower quality of care delivered to patients and the need for works to use sick leave<sup>6-9</sup>.

The frequent manipulation of needles or other perforating material without protective devices, not using Individual Protection Equipment (IPE), contact with contaminated material, food or air, are some of the factors that favor the occurrence of accidents with exposure to biological material,

in addition to different causes associated with the occurrence of accidents, such as an inappropriate work environment, excessive workload, stress, lack of attention, careless colleagues, hurry, bad luck, and tiredness<sup>6-9</sup>.

Health services should adopt preventive measures in order to avoid the occurrence of this type of accident and encourage reporting so that knowledge of this type of accident is acquired and, as a consequence, work conditions can be improved, and accidents with exposure to biological material can be reduced<sup>9</sup>.

Workers should acknowledge the importance of occupational safety, as well their own safety, so that efficient prevention strategies such as educational actions, guidance and training, can be explored together with workers, emphasizing the risks of exposure to biological material, the use of IPE, and a safe work environment, aiming to acknowledge the risks to which workers are exposed and the importance of accident prevention<sup>8-10</sup>.

The high number of OABMs registered in the database of the Occupational Accidents Prevention Network (REPAT/USP)<sup>6</sup> regarding various hospitals in different Brazilian regions, together with incipient information concerning the consequences of such accidents, justify our motivation and the development of this study, the objective of which is to analyze the occurrence, characteristics and consequences of OABMs for workers from a university hospital and for the employing facility.

We expect that the knowledge acquired in this study can be used in the qualification of nursing professionals and employed in the preventive practice of OABM as implemented in hospitals.

## METHOD

This exploratory study was conducted in the *Hospital das Clínicas*, University of São Paulo at Ribeirão Preto, Medical School (HCFMRP-USP) with all the workers who were victims of OABMs in 2010 and their respective supervisors. In the study's first phase, a search was conducted in the database of the hospital's Safety and Occupational Medicine Department to identify the occurrences of OABMs. This information was later recorded in an online REPAT form<sup>11</sup>, which addresses the workers' characteristics, the causes of accidents, and procedures undertaken after the occurrence of the OABM.

After this search, the 77 injured professionals and their respective superiors (n = 40) were invited to participate in the study's second stage. A total of 55 workers agreed to participate (71.4% of all injured workers) and 30 superiors (75%), who were interviewed in their work place. Interviews were individually held and recorded by the researcher and later transcribed. The professionals and their respective

superiors were individually interviewed from February to June 2011 using a semi-structured interview and a script containing open and closed questions concerning the OA. This script was developed by the authors and submitted to apparent validation. Three experts from the occupational health field considered it to be appropriate and valid to meet the study's objectives.

Descriptive statistics were used to analyze data with the computation of simple frequencies and qualitative data were qualitatively synthesized and analyzed. The results are presented in tables.

The study was approved by the Institutional Review Board at the studied hospital (Protocol N<sup>o</sup> 5154/2010) on August 3<sup>rd</sup> 2010. All the individuals interviewed signed free and informed consent forms.

## RESULTS AND DISCUSSION

In 2010, a total of 77 OABMs were registered in the hospital's SESMT database: 65 (84.4%) accidents occurred among female workers and 12 (15.6%) among male workers: 50 (64.9%) individuals were nursing auxiliaries, 13 (16.9%) were nurses, five (6.5%) nursing technicians, three (3.9%) physicians, two (2.6%) were service auxiliaries, one (1.3%) was a health auxiliary, one (1.3%) was a dentist, one (1.3%) was a laboratory technician, and one (1.3%) was a radiology technician.

Of the 55 injured workers who agreed to participate in the study, 52 (94.5%) were women and three (5.5%) were men: 37 (67.3%) were nursing auxiliaries, eight (14.5%) were nurses, two (3.6%) were service auxiliaries, two (3.6%) physicians, two (3.6%) were radiology technicians, one (1.8%) was a health auxiliary, one (1.8%) a dentist, one (1.8%) was a laboratory technician and one (1.8%) was a radiology technician. Of the 40 superiors, 30 (75%) consented to participate.

Table 1 shows the unit where OABMs occurred.

Table 1 shows the unit where the OABMs occurred for the workers who agreed to participate in the study. We observe that OABMs more frequently occurred in the surgical center and outpatient clinic. The literature shows that these results differ from other studies reporting that the places where this type of accident occurs were the intensive care units (ICU) and medical clinic<sup>5</sup>.

Table 2 presents the tasks performed by workers during the occurrence of OABMs.

Table 2 presents the tasks being performed at the time of occupational exposure. The most frequent tasks performed at the time exposure occurred were venipuncture and administration of medication, a result that is in agreement with those found by other studies<sup>11</sup>. This situation is related to the practice of activities performed by the nursing staff,

**Table 1.** Distribution of occupational accidents with exposure to biological material among workers from a hospital REPAT-USP, according to the unit of work. Ribeirão Preto, Brazil 2010

Unit	N <sup>o</sup>	%
Surgical center	6	10.9
Outpatient clinic	6	10.9
Medical clinic	5	9.1
Division of Infectious Diseases	4	7.3
Intensive Care Unit	4	7.3
Neurology	3	5.5
Orthopedics	3	5.5
Pediatrics	2	3.6
Head and neck unit	2	3.6
Procedures Units	2	3.6
Cardiology	2	3.6
Bone marrow transplant unit	1	1.8
Renal transplant unit	1	1.8
Central unit of material distribution	1	1.8
Gynecologic and Obstetrics	1	1.8
Dermatology and Immunology	1	1.8
Dialysis unit	1	1.8
Liver transplant unit	1	1.8
Pediatric ICU	1	1.8
Radiotherapy	1	1.8
Decontamination section	1	1.8
Medical care section	1	1.8
Cytopathology section	1	1.8
Nuclear medicine section	1	1.8
Radio diagnosis	1	1.8
Epilepsy surgery center	1	1.8
Eye bank	1	1.8
Total	55	100

in which needles and cutting objects are the material used to perform venipuncture and administration of medication, making the occurrence of accidents more likely<sup>12,13</sup>. Therefore, the use of alternative methods and technologies, such as devices and medical-hospital material, as the safety devices required by Regulatory Standard NR 32 in Brazil<sup>14</sup>, can minimize the occurrence of OABMs. The literature shows that inappropriate disposal of sharps and non-adherence to Standard Precautions<sup>15</sup>, in addition to misuse of IPE such gloves and goggles, are factors that contribute to the

**Table 2.** Distribution of occupational accidents with exposure to biological material among workers from a hospital REPAT-USP, according to the task performed at the time of occupational exposure. Ribeirão Preto, Brazil. 2010

Task	Nº	%
Venipuncture	16	29.1
Administration of medication	11	20.0
Disposal of sharps	6	10.9
Handling of surgical material	5	9.1
Unblocking indwelling urinary catheter	3	5.5
Manually recapping needle	3	5.5
Capillary puncture	2	3.6
Changing the patient's position	2	3.6
Patient tracheal aspiration	2	3.6
Thyroid puncture	1	1.8
Handling clothes	1	1.8
Direct contact of mucosa with patient's body fluids	1	1.8
Inappropriate use of needle	1	1.8
Handling hemodialysis	1	1.8
Total	55	100

occurrence of OABMs and should be treated with attention and included in interventions and corrections in environments where these accidents are observed.

Table 3 presents the causes of OABMs from the perspective of workers.

Table 3 presents the number of OABMs according to the cause from the perspective of the participants. Most individuals either did not attribute OABMs to a specific cause, or attributed them to external causes or causes unique to a particular worker. They believe that basic measures of protection and guidance, when workers will comply, would reduce the causes that lead to the occurrence of OABMs and that if workers had complied with guidance and basic protection measures, they would have reduced that occurrence of OABMs. Part of the workers (37.5%) identified a lack of attention on the part of colleagues (14.3%), their own lack of attention (10.7%) or hurrying, or failure to utilize IPE (12.5%). These are of concern because they show the workers blame themselves or transfer the cause of the accident to their co-workers and are unable to detect factors related to the work organization and work conditions. It indicates the need to sensitize these workers to adopt safe work practices but also acknowledge the occupational risk factors to which they are exposed. It is known that educational strategies are

**Table 3.** Distribution of occupational accidents with exposure to biological material among workers from a hospital REPAT-USP according to the cause. Ribeirão Preto, Brazil. 2010

Cause	n	%
None listed	10	18.1
Lack of attention on the part of a co-worker	8	14.3
Hurry in, did not use IPE	7	12.5
Lack of attention	6	10.7
Inappropriate material	5	8.9
Luck/Fate	4	7.1
Patient moved	4	7.1
Worker's neglect	3	5.4
The disposal receptacle was full	2	3.6
Material inappropriately placed	2	3.6
The institution did not provide IPE	2	3.6
Lack of experience	1	1.8
Lack of organization on the part of the team	1	1.8
Total	55	100

relevant to the adoption of safe work practices; however, the reduction of OABMs does not depend only on these actions, because appropriate work conditions should be provided.

Table 4 shows the number of OABMs according to the consequences perceived by workers after exposure and reported during the interviews.

**Table 4.** Distribution of occupational accidents with exposure to biological material among workers from a hospital REPAT-USP, according to consequences after exposure. Ribeirão Preto, Brazil. 2010

Consequences	n	%
None listed	17	30.9
Preoccupation, loss of sleep	14	25.4
Anxiety, preoccupation, fear	14	25.4
Discomfort due to chemoprophylaxis	5	9.0
Emotional lack of control, family problem	3	5.4
Guilt	2	3.6
Total	55	100

Data in Table 4 shows the number of OABMs according to the consequences perceived by workers after exposure and reported during the interviews. These consequences were grouped according to similarity of reports. OABMs result in

consequences that cause workers to experience frustration and loss, minimization or denial of the risk involved, anxiety, fear, concern, panic, anger, guilt, pain, and side effects from prophylaxis<sup>16-17</sup>.

This study shows that 38 (67.9%) workers reported that OABMs caused them to experience diverse feelings and emotions such as insomnia, emotional lack of control, and problems in family relationships. For 17 (30.9%) workers, the accident caused no consequences and they reported no concern with the event, a result also found in another study<sup>16</sup>. We observe that OABMs can generate problems in the lives of workers as a whole, affecting their health and causing mental and personal disorders and also discomfort with the chemoprophylaxis adopted.

This study shows that many workers do not realize the relevance of OABMs, which leads us to reflect on whether these individuals are aware of the risks of the injuries they suffered. This fact reaffirms the previous inference that workers need to be sensitized about safe work practices and the risks accruing from OABMs.

Table 5 shows the consequences that exposure to biological material caused in the studied hospital.

**Table 5.** Distribution of occupational accidents with exposure to biological material among workers from a hospital REPAT-USP, according to the consequences for the employing facility HCFMRP. Ribeirão Preto, Brazil. 2010

Consequences	n	%
Absenteeism	22	73.3
Absenteeism, risk of contamination, financial loss	6	20
Absenteeism, occupation and personal loss for the institution	2	6.7
Total	30	100

Table 5 presents the consequences of exposure to biological material caused for the studied hospital according to the reports of the supervisors participating in the study, which were grouped according to similarities.

This study's results concerning consequences identified by the superiors were: absenteeism, need to reorganize work schedules and assignments in order to continue providing care to patients, and financial loss for the institution. These results corroborate those available in the literature, showing that OABMs, in addition to harming workers, harm the employing institution as well, because accidents require workers to be released from their duties, even if temporarily, generating economic loss in the healthcare system<sup>12</sup>.

## CONCLUSIONS

The conclusion is that most OABMs occurred during venipuncture and administration of medication with the handling of needles without a protective device, indicating that working conditions in the studied facility need to be assessed in accordance with NR 32 standards. Some of the workers attributed the occurrence of accidents to themselves or to colleagues, suggesting the need to implement educational strategies and sensitize these workers in regard to the need to adopt safe working practices and to be aware of the risks imposed by OABMs since many workers do not identify the risks of the injuries they suffer. OABMs had several consequences for workers (preoccupation, loss or sleep, anxiety, fear, emotional lack of control, guilt, problems in family relationships, and discomfort with chemoprophylaxis) and to the employing institution (absenteeism, the need to reorganize work schedules, and financial losses).

This study gathers scientific knowledge for the Nursing and Occupational Health fields, presenting important data concerning lack of information on the part of nursing workers. Such gaps should be addressed during formal education, and serve as a warning sign for educational institutions, and in-service education. The results, however, indicate the need for a broader view of factors involving nursing work, seeking to prevent accidents and improve working conditions.

## REFERENCES

1. Lei nº 8.213, de 24 de julho de 1991. Dispõe sobre o seguro de acidentes do trabalho a cargo do INPS e de outras providências. Diário Oficial da República Federativa do Brasil, Brasília (DF), 25 jul 1991: Seção 1: 1.
2. Centers for Disease Control and Prevention - CDC. Massachusetts Department of Public Health Occupational Health Surveillance Program. Sharps Injuries among Hospital Workers in Massachusetts, 2005: Findings from the Massachusetts Sharps Injury Surveillance System; 2008 [cited 2010 jan 15]. p 1-5. Available from: [http://www.ms.gov/Eeohhs2/docs/dph/occupational\\_health/injuries\\_hospital\\_2008.pdf](http://www.ms.gov/Eeohhs2/docs/dph/occupational_health/injuries_hospital_2008.pdf).
3. Panalilio AL, Orelie JG, Srivastava PU, Jagger J, Cohn RD, Cardo DM. Estimate of the annual number of percutaneous injuries in U.S. health care workers. *Infection control and hospital epidemiology*; 2004 [cited 2010 jan 15]; 25(7):556-62. Available from: <http://www.healthsystem.virginia.edu/internet/epinet/panalilio-et-al-estimate-annual-number-pis-iche-2004.pdf>.
4. Perry J, Parker G, Jagger J. Percutaneous injury rates. *Adv Expos Prev*. 2001 [cited 2010 jan 15];6(3): 32-6.
5. Bakke HA, Araujo NMC. Acidentes de trabalho com profissionais de saúde de um hospital universitário. *Produção* [online]; 2010 [citado 2010 jan 15]; 20(4): 669-76. Disponível em: <http://www.scielo.br/pdf/prod/2010nahead/aop00040109.pdf>.
6. Marziale MHP, Zapparoli AS, Felli VE, Anabuki MH. Rede de Prevenção de Acidentes de Trabalho: uma estratégia de ensino a distância. *Rev. bras. enferm.* [online]. 2010 [citado 2010 jan 15]; 63(2): 250-6. Disponível em: <http://www.scielo.br/pdf/reben/v63n2/13.pdf>.
7. Martinato MCNB, Severo DF, Marchand EAA, Siqueira HCH. Absenteísmo na enfermagem: uma revisão integrativa. *Rev. gauch. enferm.* [online]. 2010 [citado 2010 jan 15]; 31(1). Disponível em: [http://www.scielo.br/scielo.php?pid=S1983-14472010000100022&script=sci\\_arttext](http://www.scielo.br/scielo.php?pid=S1983-14472010000100022&script=sci_arttext).

8. Sancinetti TR, Gaidzinski RR, Felli VEA, Fugulin FMT, Baptista PCP, Ciampone MHT, et al. Absenteísmo - doença na equipe de enfermagem: relação com a taxa de ocupação. *Rev. Esc. Enferm. USP* [online]. 2009 [citado 2010 jan 15]; 43(spe2): 1277-83. Disponível em: [http://www.scielo.br/scielo.php?pid=S0080-62342009000600023&script=sci\\_arttext](http://www.scielo.br/scielo.php?pid=S0080-62342009000600023&script=sci_arttext).
9. Sarquis LMM, Felli VEA. Os sentimentos vivenciados após exposição ocupacional entre trabalhadores de saúde: fulcro para repensar o trabalho em instituições de saúde. *Rev. bras. enferm.* [online]. 2009 [citado 2010 jan 15]; 62(5). Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0034-71672009000500008](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71672009000500008).
10. Castro MR, Farias SNP. Repercussões do acidente com perfurocortantes para a enfermagem: uma construção a partir do grupo focal. *Esc. Anna Nery* [online]. 2009 [citado 2010 jan 15]; 13(3):523-29. Disponível em: <http://www.scielo.br/pdf/ean/v13n3a10.pdf>.
11. Network for the Prevention of Work Accidents with Exposure to Biological Material in University Hospitals (REPAT) [Internet]. [Accessed 2011 jun 05]. Available at: <http://repat.eerp.usp.br>
12. Moura JP, Gir E, Canini SRMS. Acidentes ocupacionais com material perfurocortante em um hospital regional de Minas Gerais, Brasil. *Cienc. enferm.* [Internet]. 2006 [citado 2010 jun 15]; 12(1): 29-37. Disponível em: <http://www.scielo.cl/pdf/cienf/v12n1/art04.pdf>.
13. Gomes AC, Agy LL, Malaguti SE, Canini SRMS, Cruz EDA, Gir E. Acidentes ocupacionais com material biológico e Equipe de enfermagem de um hospital-escola. *Rev. enferm. UERJ* [online]. 2008 [citado 2010 jun 15]; 17(2):220-3. Disponível em: <http://www.facenf.uerj.br/v17n2/v17n2a14.pdf>.
14. Portaria GM n.º 1.748, de 30 de agosto de 2011. NR 32 - Segurança e saúde no trabalho em serviços de saúde. *Diário Oficial da República Federativa do Brasil, Brasília (DF)*, 31 ago 2011: Seção 1: 1.
15. Silva JA, Almeida AJ, Paula VS, Villar LM. Investigação de acidentes biológicos entre profissionais de saúde. *Esc. Anna Nery* [online]. 2009 jul/set [citado 2010 jun 18]; 13(3): 508-1. Disponível em: <http://www.scielo.br/pdf/ean/v13n3/v13n3a08.pdf>.
16. Oliveira AC, Gonçalves JA. Acidente ocupacional por material perfurocortante entre profissionais de saúde de um Centro Cirúrgico. *Rev. Esc. Enferm. USP* [online] 2010 [citado 2010 jul 12]; 44(2): 482-7. Disponível em: <http://www.scielo.br/pdf/reeusp/v44n2/34.pdf>.
17. Damasceno AP, Pereira MS, Souza ACS, Tipple AFV, Prado MA. Acidentes ocupacionais com material biológico: a percepção do profissional acidentado. *Rev. bras. enferm.* [online]. 2006 [citado 2010 jul 12]; 59(1): 72-7. Disponível em: <http://www.scielo.br/pdf/reben/v59n1/a14v59n1.pdf>.