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Occupational risk of HCV infection among slaughter house workers

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Abstract
Objectives: To investigate the risk of HCV infection among slaughter house workers (SHWs).
Methods: This cross-sectional study involved 369 SHWs recruited from 3 governorates. A pre-questionnaire was filled. HCV antibody testing and PCR for positive cases were done.
Results: HCV prevalence was 10.3 % among SHWs. It increased significantly with age (p=0.000) and differed significantly according to the place (p =0.034) ranging from 6.2in Al-basateen (Cairo) to 18.6% in Damanhur (Beheira). It was significantly (p =0.002) higher among veterinary assistants (66.7%) followed by manual workers (26.7%). Age older than 47 years, history of blood transfusion and history of schistosomiasis were the independent risk factors associated with HCV infection among SHWs.
Conclusion: There is an occupational risk for HCV infection among Egyptian SHWs amongst whom veterinary assistants and manual workers had the highest risk.

Keywords: HCV; occupational exposure; risk factors; slaughterhouses

1. Introduction
Hepatitis C virus (HCV) is one of the most common blood-borne pathogens which constitutes a major public health problem and represents a leading cause of death and morbidity worldwide [1].
Egypt had the highest HCV prevalence in the world (14.7 %) [2]. This prevalence was declined between 2008 [Egypt Demographic Health Survey (EDHS)] and 2015 [Egypt Health Issues Survey (EHIS)] to reach about 10% among population aged 15-59 years [3].
HCV is mainly transmitted through contact with infected blood caused by injuries to the skin or mucous membranes [4]. Therefore, hepatitis C has been recognized as an important occupational hazard especially among healthcare workers [5]. Injuries to medical and health staff from sharp or pointed objects are among the most frequently reported occupational accidents in healthcare, as about 80% of healthcare worker (HCWs) have been affected by needle-stick injuries (NSIs) [6].
Other occupations that might be at high risk of exposure to sharp injuries and consequently to blood-borne infections have not been well studied. Slaughter house workers (SHWs) are generally at risk from knife-cuts and blood-letting, with the subsequent risk of the transmission of blood-borne infections to their colleagues through sharing knives and other sharp objects [7]. This may explain the reported outbreaks of hepatitis B virus (HBV), one of the major blood-borne infections, among butchers [8, 9].
Very little information is available on occupational transmission of HCV among non-HCWs. Only two studies showed data on HCV as an occupational disease among slaughterhouse workers [10, 11]. The first, reported an occupational transmission of HCV from HCV infected patient to another one working at the same butcher's counter resulting from the use of the same supermarket meat slicer. This was evidenced by phylogenetic homology between the infecting strains [10]. The second research, studied the prevalence of blood-borne biological hazards among abattoir workers; seropositivity for HCV-Ab was diagnosed among 2.5 % of the workers [11].
The objective of this study was to investigate the risk of HCV infection among slaughter house workers and to reveal risk factors that might be associated with HCV infection among them.

2. Subjects and Methods

2.1 Study design, setting and procedure

This cross-sectional study involved 369 slaughterhouse workers including; butchers, veterinarians, veterinarian assistants, manual workers, employees and drivers. They were recruited from five randomly chosen slaughterhouses in 3 governorates namely; Al-basateen in Cairo governorate (65), Al-amereyah (80) and Zeraa (83) in Alexandria governorate, Damanhur in Beheira governorate (86) and Tanta in Gharbia governorate (55).

Each participant answered a pre-questionnaire that was guided by the study that developed the EGCRISC tool; a risk-based screening tool adapted for Egyptians [12]. It included questions that inquire about socio-demographic data (gender, age, residence, educational level, marital status, occupation), community acquired risk factors (history of living or working abroad, tattooing, ear or body piercing, sharing personal items, sharing any of bathroom items, visiting local barbers or coiffeur, having accidental puncture with a protruding needle or sharp object contaminated with blood, ever been bitten by an animal and ever accidentally exposed to blood), medical and iatrogenic risk factors as (histories of blood and blood products transfusion, jaundice, contact with household member who have liver disease, receiving injections, previous blood samplings, hospitalization, schistosomiasis, receiving tartar emetic injection for schistosomiasis, ever had oral sores, genital lesion, invasive procedure, labor at home, circumcision and history of receiving acupuncture), behavioral risk factors as (history of imprisonment, substance abuse, alcohol intake, smoking shisha and being executed the military service), risk factors related to the partner as (partner having any STI or being HCV positive), and nonspecific unexplained fatigue during the previous six months. We added other questions that are related to their occupation as number of years of working in slaughter house, sharing knives and wearing gloves.

Blood samples were collected and tested for HCV antibody by a commercial Enzyme Linked Immunosorbent Assay (3rd generation ELISA kits; DIALAB®) and it was retested using ELISA kit (Murex®) for confirmation. Only positive cases by ELISA were further tested by quantitative PCR for detection of viremia.

2.2 Ethical considerations

The study was done according to the standard international ethical guidelines. Informed consent was obtained from all subjects and XXX [Blinded by request from JOEM] ethics committee approval was obtained. Approval was also obtained from veterinary Medicine Directorate in Cairo governorate, Alexandria governorate, Beheira governorate and Gharbia governorate. Inclusion of participants was on voluntary bases.

2.3 Statistical analysis

Statistical analysis was done using IBM Statistical Package for the Social Sciences (SPSS) statistics program version 21 and Medcalc programs. Quantitative data were described by mean and median as measures of central tendency and by standard deviation, minimum and maximum as measures of dispersion, while categorical variables were summarized by frequency and percent.

Independent sample t test was used to detect significant difference in the mean quantitative variables between two groups. The choice of test depended on distribution of variables by Kolmogorov Smirnov test and large sample >30 per group. Chi-square test was used to study significant association between two categorical variables. Fisher exact and Montecarlo tests of significance were used if more than 20% of total expected cell counts <5.

Multivariate stepwise logistic regression using backward (Wald and Likelihood ratio) methods was done for statistically significant risk factors by bivariate analysis. It aimed to maximize the log likelihood that how likely the observed grouping can be predicted from observed values of predictors. All statistical tests were done at 0.05 significance level.

3. Results

A whole day visit was done to each slaughterhouse and all available workers who agreed to participate were included in the study making distribution that shown in table 1. Their age range in years was 16-72; their mean age in years was 39.36±12.775 and the majority (97.3%) were males. As regards residency, more than half of the sample was from the urban residence (55.3%). Others were from rural and slums (28.2% and 16.5%) respectively. Regarding educational level, the highest percent (28.2%) were illiterate compared to only (12.5%) who completed their university education. More than three quarters (81.8%) were ever married while (18.2%) were single.

HCV antibodies were detected in 38 SHWs (10.3%), of whom 30 had evidence of viremia (78.9%) making a viremia prevalence of 8.1%. HCV prevalence differs significantly in slaughterhouse workers according to the place (p=0.034) ranging from 6.2% to 18.6% as demonstrated in Table 2. Similarly the rate of persistent viremia varied widely between different places (figure1).

Figure 2 presents the relation between job title and HCV sero-status among slaughterhouse workers. HCV was significantly (p=0.002) higher among veterinary assistants (66.7%) followed by manual workers (26.7%)

HCV prevalence increased significantly with age from 1 % in 16- years to 18.9 % in the 50+ years. (Figure 3)

Rural residence was significantly associated with HCV infection (p=0.006) as 18.3% of rural residents had HCV=Ab compared to 7.8% of urban residents. Moreover, educational level had significant association with the presence of HCV infection (p=0.036). The highest prevalence of HCV infection was among the read and write group (26.5%). (Supplementary table 1)

Regarding community acquired risk factors and HCV infection among slaughter house workers. Although the percentage of anti-HCV seropositivity was higher among those who gave positive history of tattooing, body piercing, accidental puncture with sharp object contaminated with blood and sharing household tools but they were not statistically significant. (Supplementary table 2)

Regarding marital status, married population had the highest percentage of HCV infection (11.9%) compared to only 3 % in the single population and this was statistically significant (p=0.029). History of living or working abroad had significant association with HCV infection (p=0.018). Higher percentage of HCV infection (17.8%) was present among workers with positive history of living or working abroad. However, this was not significantly associated with the place of destination whether Arab or foreign countries.

Both history of schistosomiasis and receiving tartar emetic

injection for schistosomiasis had significant association with HCV infection (p=0.000). 23.3% of those who had history of schistosomiasis and 27.8% of those who had received tartar emetic injection for schistosomiasis were HCV seropositive. Similarly, history of chronic liver disease, positive history of blood sampling and history of invasive procedure had significant association with HCV sero-positivity (p=0.033, p=0.008 and p= 0.046 respectively). Higher percentage of HCV cases was evident among those who reported histories of chronic liver disease, frequent blood sampling more than ten times and invasive procedure (26.7%, 22.2 %, and 17.2% respectively). History of blood transfusion had significant association with HCV infection (p=0.026), higher percentage of HCV infection (23.1%) are shown among workers with positive history of blood transfusion compared to only 9.3% among those who denied history of blood transfusion. (Supplementary table 3)

Although there was a higher frequency rate of HCV-Ab among workers who worked 10 years or more (11 %) compared to 0.4 % for those who worked for < 5 years, yet it was not statistically significant. (Supplementary table 3)

Age older than 47 years, history of blood transfusion and history of schistosomiasis were the independent risk factors associated with HCV infection among SHWs (Table3).

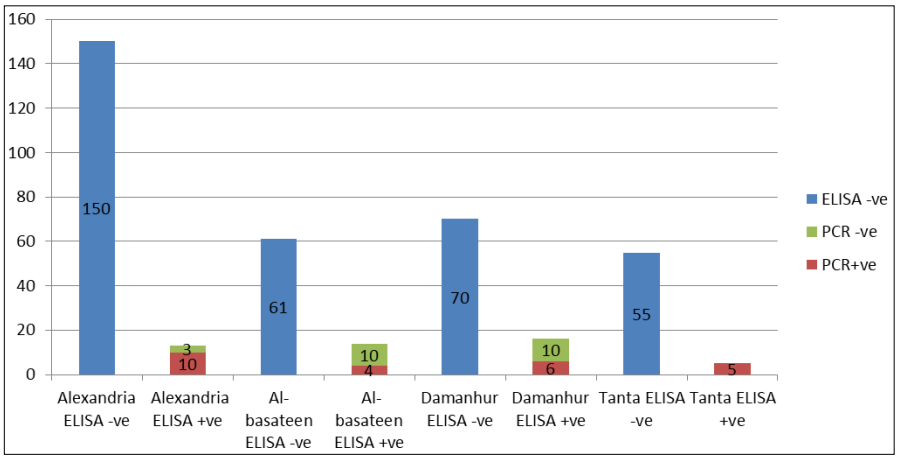
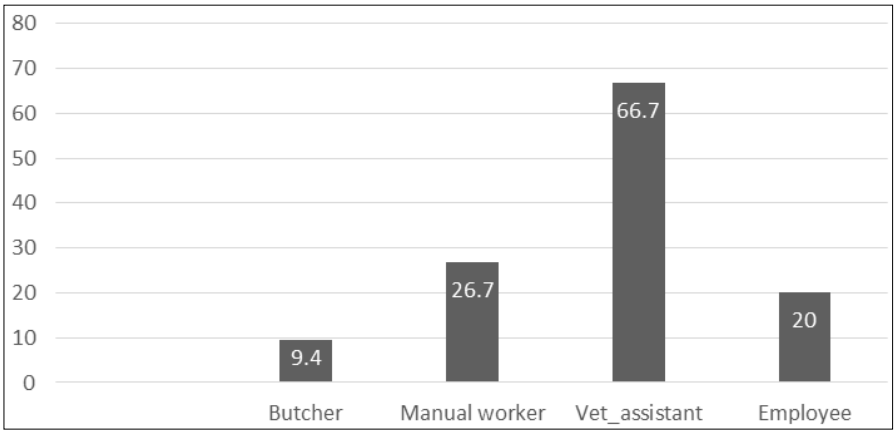


Fig 1: Distribution of slaughterhouse workers according to HCV status (AB and PCR) and slaughterhouse place.



None of the drivers (n=9) or veterinarians (n=17) had HCV-Ab
$p < 0.05$

Fig 2: Prevalence of HCV in relation to job title among slaughterhouse workers

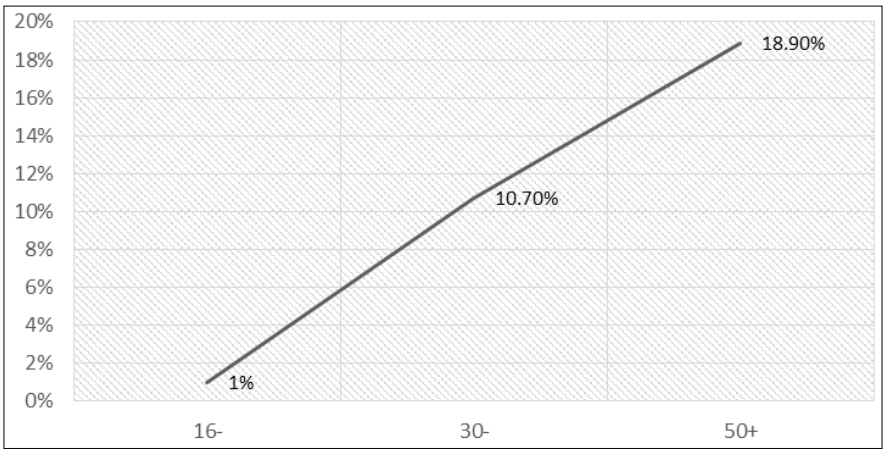


Fig 3: Prevalence of HCV according to age of slaughterhouse workers

Table 1: Distribution of slaughterhouse workers according to their socio-demographic characteristics and recruitment sites

Variable (n=369)	No.	%
Age in years		
• 16-	96	26.0
• 30-	178	48.2
• 50+	95	25.7
Gender		
• Male	359	97.3
• Female	10	2.7
Residence		
• Urban	204	55.3
• Rural	104	28.2
• Slums	61	16.5
Education		
• Illiterate	104	28.2
• Read & write	34	9.2
• Primary	51	13.8
• Preparatory	47	12.7
• Secondary	87	23.6
• University	46	12.5
Marital status		
• Single	67	18.2
• Ever married	302	81.8
Slaughterhouse name		
Alexandria		
• Al-amereyah	80	21.7
• Zeraa	83	22.5
Cairo		
• Al- basateen	65	17.6
Beheira		
• Damanhur	86	23.3
Gharbia		
• Tanta	55	14.9
Total	369	100

Table 2: Distribution of slaughterhouse workers according to HCV status and slaughterhouse place

Place	Total	Anti-HCV Elisa				
		-ve		+ve		Chi-Square Test (*p*-value)
		No.	%	No.	%	
• Alexandria	163	150	92.0	13	8.0	.034*
• Al- basateen	65	61	93.8	4	6.2	
• Damanhur	86	70	81.4	16	18.6	
• Tanta	55	50	90.9	5	9.1	

**Test of significance: Chi-square test
*$P < 0.05$

Table 3: Logistic regression model of HCV risk factors among slaughterhouse workers

Factor	B	SE	Wald statistic	*p*-value	Odds ratio	95% CI for odds ratio	
						Lower	Upper
Age (older than 47 years)	1.570	0.372	17.800	<.001*	4.807	2.318	9.969
History of blood transfusion	1.237	0.551	5.047	.024*	3.446	1.171	10.140
History of schistosomiasis	1.296	0.395	10.786	.0010*	3.655	1.686	7.923

Model: x^2=33.2, p=<0.001*
Hosmer and lameshow test: x^2=8, p=0.330
Nagelkerke R^2:17.8%

4. Discussion

The Centers for Disease Control and Prevention (CDC) findings confirmed that occupational hazards have continued to rise in the past decades, resulting in increasing rates of occupational exposure to blood- borne illnesses mostly in the developing countries. SHWs are exposed to remarkable work-related physical and biological hazards which may adversely affect their health status if left undetected [11].

These blood-borne infections are mostly due to frequent knife-cuts and wounds with the attendant risk of the transmission of blood-borne infections to colleagues through sharing knives [7].

Most of the available studies [7, 9, 13-15] have focused mainly on HBV as an occupational risk of infection among them. These studies have concluded that butchers constitute a high

risk occupational group and serve as reservoirs for HBV infection in the community and that they should be screened for HBV infection.

Although HBV and HCV share the same modes of transmission and therefore HCV is assumed to constitute an occupational risk among SHWs, there is very limited data concerning HCV prevalence and risk among them. To our knowledge no study in Egypt has focused on HCV risk of infection among SHWs.

In this study, HCV infection was reported among 10.3% of the studied SHWs. It is higher than that reported by Banjo *et al*. [11] who determined HCV prevalence among Abattoir workers in Abeokuta (Nigeria) to be 2.5% only. This was very close to the reported HCV prevalence (2.8%) among out-patients in Abeokuta [16].

The higher prevalence in the present study may be attributed to the epidemic nature and high prevalence of HCV in Egypt rather than the possibility of occupational transmission of HCV among SHWs. Furthermore, our result strongly correlates with Egypt Health Issues Survey EHIS (2015) that estimated national prevalence of 10% among general Egyptian population aged 15-59 years old [3].

In our study Damanhur (Beheira) workers have the highest prevalence (18.6 %) followed by Tanta (Gharbia) (9.1 %), Alexandria (8 %) and Cairo (6.2 %). These figures are higher than those reported from the general population in these governorates by EHIS which were 7.4 %, 7.7%, 3.6 % and 5.1 % respectively [3].

Results of the present study regarding HCV risk factors have matched HCV risk factors in the general Egyptian population. As regards socio-demographic factors that significantly linked with HCV infection; several Egyptian studies confirmed the role of rural residence and increasing age with HCV seropositivity [3, 17, 18].

This was also confirmed in the current study as 18.3% of those from rural residence were HCV cases. Moreover, Damanhur (Beheira) has significantly higher prevalence in comparison with Cairo and Alexandria. This should be attributed to higher prevalence of Schistosomal infection in rural Egypt, low awareness and educational level as well as the poor health services in these areas.

Regarding age, it is demonstrated that HCV prevalence has increased significantly with age. Furthermore, it was found to be the highest independent risk factor associated with HCV infection (OR=4.807) shown by the logistic regression model. This is consistent with both demographic health survey (DHS) in 2008 and the EHIS in 2015. Although, there was an observed relative reduction in HCV prevalence, yet, a positive correlation was demonstrated between the age group and the prevalence. It ranged from 4.1% (2008) and 1% (2015) for the 15-19 years age group to reach 39.4% (2008) and 33.9% (2015) for the 55-59 years age group [19].

The findings of Reker and Islam [20] and El-Ghitany *et al.* [18] matched ours in that poor education had significant association with HCV infection and transmission in Egypt.

The present study highlighted the important role of Schistosomal infection and parenteral antischistosomal therapy (PAT). This has confirmed what has been stated in the literature, that the national campaigns for the parenteral treatment of schistosomiasis that have been carried out from the late 1950s till 1980s was claimed to be the main cause of HCV epidemic in Egypt [17, 20, 21]. This also could in part explain the higher HCV prevalence in older age group (logistic regression model OR= 3.665).

Blood transfusion was incriminated to be an important cause for HCV transmission particularly before the application of universal blood screening [22]. Consistent with the previous conclusion, history of blood transfusion was significantly associated with HCV positivity and appeared to be a significant independent risk factor in the logistic regression model in the current study. This finding correlates with that of Mohlman *et al.* [17] and El-Ghitany *et al.* [18].

5. Conclusion

This study shows evidence of occupational risk for HCV infection among Egyptian slaughterhouse workers. Generally SHWs had a higher prevalence of HCV compared to general population of the same area. Among SHWs, Veterinary assistants and manual workers had the strongest evidence of HCV infection risk, while other employees did not show enough evidence. The independent risk factors associated with HCV infection among SHWs were older age, history of blood transfusion and history of schistosomiasis.

The most important limitation of this study was recruitment of all SHWs regardless of their job description. Further studies may be needed to focus on those who showed the highest risk.

6. Authors Statements

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7. References

1. Lavanchy D. The global burden of hepatitis C. Liver Int. 2009; 29(1):74-81.
2. Mohamoud YA, Mumtaz GR, Riome S, Miller D, Abu-Raddad LJ. The epidemiology of hepatitis C virus in Egypt: a systematic review and data synthesis. BMC Infect Dis. 2013; 13:288.
3. El-Zanaty. Egypt health issues survey. Cairo, Egypt: Ministry of Health and Population, 2015.
4. Askarian M, Yadollahi M, Kuochak F, Danaei M, Vakili V, Momeni M. Precautions for healthcare workers to avoid hepatitis B and C virus infection. Int J Occup Environ Med. 2011; 2(4):191-8.
5. Yazdanpanah Y, De Carli G, Migueres B, Lot F, Campins M, Colombo C *et al*. Risk factors for hepatitis C virus transmission to healthcare workers after occupational exposure: a European case-control study. Rev Epidemiol Sante Publique. 2006; 54(1):23-31.
6. Westermann C, Peters C, Lisiak B, Lamberti M, Nienhaus A. The prevalence of hepatitis C among healthcare workers: a systematic review and meta-analysis. Occup Environ Med. 2015; 72(12):880-8.
7. Mevorach D, Brezis M, Ben Yishai F, Sadeh T, Shouval D, Eliakim R. Increased risk of exposure to hepatitis B infection among butchers sharing knives. Am J Med. 1999; 106(4):479-80.
8. Gerlich WH, Thomssen R. Outbreak of hepatitis B at a butcher's shop. Dtsch Med Wochenschr. 1982; 107(43):1627-30.
9. Mijch AM, Barnes R, Crowe SM, Dimitrakakis M, Lucas CR. An outbreak of hepatitis B and D in

butchers. Scand J Infect Dis. 1987; 19(2):179-84.
10. Bocket L, Chevaliez S, Talbodec N, Sobaszek A, Pawlotsky JM, Yazdanpanah Y. Occupational transmission of hepatitis C virus resulting from use of the same supermarket meat slicer. Clin Microbiol Infect. 2011; 17(2):238-41.
11. Banjo T, Onilude A, Amoo A, Busari A, Ogundahunsi O, Olooto W *et al*. Occupational health hazards among abattoir workers in Abeokuta. Academia Arena. 2013; 5(10):29-36.
12. El-Ghitany EM, Farghaly AG, Abdel Wahab MM, Farag S, Abd El-Wahab EW. Toward a simple risk assessment screening tool for HCV infection in Egypt. J Med Virol. 2016; 88(10):1767-75.
13. Ola SO, Otegbayo JA, Yakubu A, Odaibo GN, Olaleye DO. Nigerian butchers and hepatitis B virus infection. Trop Gastroenterol. 2008; 29(1):32-4.
14. Ola SO, Otegbayo JA, Yakubu A, Odaibo GN, Olaleye DO. Risk of hepatitis B virus in the slaughter house. Trop Doct. 2008; 38(4):249-50.
15. Mevorach D, Eliakim R, Brezis M. Hepatitis B-an occupational risk for butchers? Ann Intern Med. 1992; 116(5):428.
16. Iwayemi FA. Hepatitis C virus infection among out-patients in three hospitals in Abeokuta, Ogun State, Nigeria. Thesis. Federal University of Agriculture, Abeokuta, 2011.
17. Mohlman MK, Saleh DA, Ezzat S, Abdel-Hamid M, Korba B, Shetty K *et al*. Viral transmission risk factors in an Egyptian population with high hepatitis C prevalence. BMC Public Health. 2015; 15:1030.
18. El-Ghitany EM, Abdel Wahab MM, Abd El-Wahab EW, Hassouna S, Farghaly AG. A comprehensive hepatitis C virus risk factors meta-analysis (1989-2013): do they differ in Egypt? Liver Int. 2015; 35(2):489-501.
19. Kandeel A, Genedy M, El-Refai S, Funk AL, Fontanet A, Talaat M. The prevalence of hepatitis C virus infection in Egypt 2015: implications for future policy on prevention and treatment. Liver Int. 2017; 37(1):45-53.
20. Reker C, Islam KM. Risk factors associated with high prevalence rates of hepatitis C infection in Egypt. Int J Infect Dis. 2014; 25:104-6.
21. Frank C, Mohamed MK, Strickland GT, Lavanchy D, Arthur RR, Magder LS *et al*. The role of parenteral antischistosomal therapy in the spread of hepatitis C virus in Egypt. Lancet. 2000; 355:887-91.
22. Abd El-Wahab EW, Mikheal A, Sidkey F, Shatat HZ. Factors associated with hepatitis C infection among chronic HCV Egyptian patients. Iran J Public Health. 2014; 43(11):1510-8.