

Short Report: Changes in Knowledge of Bat Rabies and Human Exposure among United States Cavers

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Abstract. The purpose of the study was to evaluate changes in the knowledge of bat rabies and human exposure among United States cavers during the last decade. A survey was distributed among cavers who attended the National Speleological Society convention in 2000 and those who attended in 2010. In 2000 and 2010, 392 and 108 cavers, respectively, responded to the questionnaire. Eighty-five per cent of respondents in 2000 indicated a bat bite as a risk for rabies compared with all respondents in 2010 ($P < 0.0001$ controlling for age). The proportion of respondents indicating that they were advised to receive rabies pre-exposure prophylaxis (PreEP) because of caving increased (17% and 29%; $P = 0.03$ controlling for age). Among these, PreEP was received by 56% and 45%. Although recognition of the risk of rabies exposure from bats is important, the proportion of cavers acting on current recommendations regarding PreEP does not appear to have improved in the past decade.

INTRODUCTION

During the last century, the number of human rabies cases in the United States has dramatically decreased, particularly as a result of vaccination of domestic animals and wildlife, education of the public and health professionals, and successful administration of post-exposure prophylaxis.¹ Despite this progress, human rabies cases persist, particularly those resulting from exposure to bats.^{1,2} During 2002–2011, 88% ($N = 21$) of all domestically acquired human rabies cases were caused by bat rabies variants.¹ Because of the potential for exposure to possibly rabid bats associated with caving, it is currently recommended by the Advisory Committee on Immunization Practices that cavers receive pre-exposure prophylaxis (PreEP)²; however, many cavers do not agree with or adhere to these recommendations.³ This study aims to evaluate changes in the knowledge of bat rabies and human exposure among United States cavers during the last decade.

METHODS

A survey was distributed among cavers attending the National Speleological Society (NSS) Convention in Essex Junction, Vermont in August 2010. The NSS has approximately 10,000 members, which may approximate the number of active United States cavers.⁴ A copy of the survey was included in the registration packet given to all attendees. The survey assessed demographic information, knowledge of bat rabies, and potential for human exposure. Categorical characteristics were compared between groups using the χ^2 test or the Fisher's exact test (2-sided) as appropriate; to control for age, logistic regression was conducted using the age groups < 40 , 40–49, 50–59, and ≥ 60 years.⁵ Continuous characteristics were compared between groups using the Wilcoxon rank-sum test.⁶ Comparisons were also made between corresponding characteristics of the current 2010 survey and a prior survey administered at the 2000 NSS Convention in Elkins, West Virginia.³

RESULTS

Questionnaires were returned from 108 (15%) of 709 individuals attending the 2010 convention. Respondents had a median age of 58 years (interquartile range [IQR]: 49–64), were predominantly male (67%), and 88% had at least a college degree (Table 1). The median number of years caving among respondents was 35 (IQR: 23–44). The majority (64%) of respondents indicated seeing bats about half the time or more ($> 40\%$) that they go caving; 5% indicated having ever been bitten or scratched by a bat while caving. Twenty-nine per cent of respondents had been advised to get rabies PreEP because of their caving activities; however, only 15% had received PreEP (Table 1). Those advised to get PreEP were more likely to have received it than those who were not advised (45% and 3%, respectively; $P < 0.0001$ controlling for age). Although 95% of respondents considered rabies a very severe disease, only 6% of respondents considered caving to be an activity that warrants rabies PreEP.

Respondents were asked to indicate which type(s) of bat contact they considered as a risk for getting rabies. All respondents acknowledged a bat bite as a rabies exposure risk, and 69% believed a bat scratch was a risk for rabies exposure. About one-fourth indicated touching bat guano, urine, or blood (26%) or contact with a dead bat (25%) as risks for rabies exposure. Few respondents identified touching with exposed skin (13%), being around bats that never touch you (6%), or contact with a flying bat (5%) as a risk for rabies exposure.

Responses from the 2010 survey were compared with those from a similar survey given at the 2000 NSS Convention (Table 1).³ Compared with respondents in the 2000 survey, participants in this survey were older, had been caving longer, and were more likely to have a college degree; the proportion of male respondents was similar for both surveys (Table 1). Although the proportion of respondents advised to receive PreEP increased from 2000 to 2010 (17% and 29%, respectively; $P = 0.02$ controlling for age), the proportion who had received PreEP remained similar (19% and 15%; $P = 0.16$ controlling for age). Respondents in this study more commonly identified a bat bite as a risk for rabies (85% versus 100%; $P < 0.0001$ controlling for age).

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TABLE 1

Comparison between characteristics from surveys distributed to cavers at the National Speleological Society Conventions in 2000 and 2010, United States*

Characteristic	2000 Survey no. (%)	2010 Survey no. (%)	P value†	P value controlling for age‡
Total	392	108		
Male gender	266/389 (68)	72/108 (67)	0.74	–
College degree	295/388 (76)	94/107 (88)	0.01	0.01
Advised to get PreEP because of caving	66/391 (17)	31/108 (29)	0.01	0.03
Received PreEP among those advised to get PreEP	37/65 (57)	14/31 (45)	0.28	0.06
Received PreEP	76/391 (19)	16/108 (15)	0.27	0.15
Had a rabies titer checked among those who received PreEP	36/76 (47)	6/16 (38)	0.47	0.15
Had a rabies titer checked	45/390 (12)	6/108 (6)	0.07	0.01
Consider scenario as a risk for rabies				
Bat bite	333/390 (85)	107/107 (100)	< 0.0001	< 0.0001
Bat scratch	233/385 (61)	74/107 (69)	0.10	0.42
Being around bats that never touch you	45/389 (12)	6/107 (6)	0.08	0.01
Contact with a flying bat	51/388 (13)	5/107 (5)	0.02	0.01
	<i>Median (IQR)</i>	<i>Median (IQR)</i>		
Age (years)	48 (39–54)	58 (49–64)	< 0.0001	–
Years caving	22 (11–32)	35 (23–44)	< 0.0001	< 0.0001

*Not all respondents provided a response for each question in the survey.

†Comparing 2000 and 2010 surveys.

‡Age groups < 40, 40–49, 50–59, and ≥ 60 years were used to control for age.

PreEP = pre-exposure prophylaxis.

DISCUSSION

Although respondents acknowledged the severity of rabies and the risk of transmission through bat bites and scratches, only 6% believed caving to be an activity that warrants PreEP, and 15% had received PreEP. Low perceived risk of exposure to rabies, particularly unrecognized exposure, may have influenced individuals not to seek PreEP.^{7,8} Other barriers to PreEP may include a limited knowledge of rabies, high cost of vaccination, and fear of adverse vaccine reaction.^{8,9} The proportion of respondents advised to receive PreEP increased from 2000 to 2010; however, the proportion who had received PreEP remained similar.

Several limitations of this study should be considered. The low response rate and incomplete responses to the 2010 survey may have limited the ability to detect associations between characteristics. Additionally, the survey may have been subject to response bias and/or selection bias. Respondents to the survey may not have been representative of all cavers or those attending the NSS Convention. Comparisons between the present and earlier survey responses may have been affected by underlying differences in the respondent groups.³

The proportion of cavers acting on current recommendations regarding PreEP does not appear to have increased in the past decade; however, greater compliance may be achieved by increasing awareness of the recommendation, as nearly half of those advised to receive PreEP had done so. Additional messaging should be developed for this population to ensure appropriate risk assessments and recommendations for PreEP are considered for their recreational or occupational caving activities.

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