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## ABSTRACT

Cutaneous leishmaniasis (CL) is a threat to U.S. Military personnel as they deploy to endemic areas. As treatment may require evacuation, CL undermines operations. Elucidating the epidemiology of CL in this population is key for prevention. We retrospectively reviewed data from a CL sodium stibogluconate treatment trial at Walter Reed Army Medical Center, Washington DC. 412 military members with parasitologically confirmed CL and deployment to Southwest Asia from May 2002 - August 2004 were enrolled. Subject's CL lesions were counted and measured. 334 subjects completed a risk factor survey. Given no control group, we used number of CL lesions (>4 or ≤4), total lesion area (TLA), and lesion location as outcomes to assess CL risks. Univariable and multivariable logistic and linear regression were used as appropriate. The largest proportion of subjects reported disease onset in September 2003 while independent of year, the largest proportion of subjects reported disease onset in the month of September. After multivariable analysis, no independent variable was a statistically significant predictor of number of lesions. The military occupational specialty 63W (wheeled vehicle repairer) was associated with a 97.95% decreased TLA compared to 19D (calvary scout) as reference (95% CI 71.67%-99.85%). Noting unit members with similar skin lesions (OR 9.97, 95% CI 1.20-82.58) was associated with increased risk of a head/face lesion. Asian ethnicity compared to Caucasian as reference (OR 15.01, 95% CI 1.37-164.66) and service in the National Guard compared to Active Duty as reference (OR 2.87, 95% CI 1.04-7.94) were associated with increased risk of a leg/foot lesion while sleeping in a combat uniform was associated with decreased risk of a leg/foot lesion (OR 0.33, 95% CI 0.14-0.78). This is the largest group of U.S. Military members with CL reported and provides insight into risks for CL to guide preventive efforts to reduce the burden of illness in this population.

## INTRODUCTION

- Leishmaniasis is a neglected tropical disease caused by protozoa of the genus *Leishmania* transmitted by the bite of an infected sand fly
- Cutaneous leishmaniasis (CL) was a health threat to U.S. Military forces amplified during large-scale troop deployments to Southwest Asia beginning in 2001<sup>1</sup>
- CL has significant impact on operational capability as personnel may need evacuation for treatment<sup>1</sup>
- Purpose of this study is to describe risk/protective factors associated with Old World CL among U.S. Military personnel to guide future force health protection (FHP) efforts

## METHODS

- Retrospective review of data from a trial of sodium stibogluconate (SbV) to treat CL at Walter Reed Army Medical Center, Washington DC (n = 418)
  - Inclusion criteria: DoD healthcare beneficiary of any age or sex, parasitologic diagnosis of CL, & willingness to locate to the local area during treatment
  - Exclusion criteria: pregnancy, hypersensitivity to SbV, QTc interval >0.5 sec., or serious medical illness
  - Basic demographics, medical history, travel history, prior treatment, medications, weight/height collected in a standardized fashion
  - CL lesions counted, described, measured & lesion location described in a standardized fashion
  - Survey administered to capture additional epidemiologic information
- Primary outcomes: total number of CL lesions categorized as >4 or ≤4, summed total lesion area (TLA) in mm<sup>2</sup>, and presence/absence of a lesion in grouped anatomic locations (head/face, torso, arm/hand, and leg/foot)
- Multivariable logistic/linear regression performed for variables with statistically significant associations with outcomes on univariable logistic/linear regression

## RESULTS

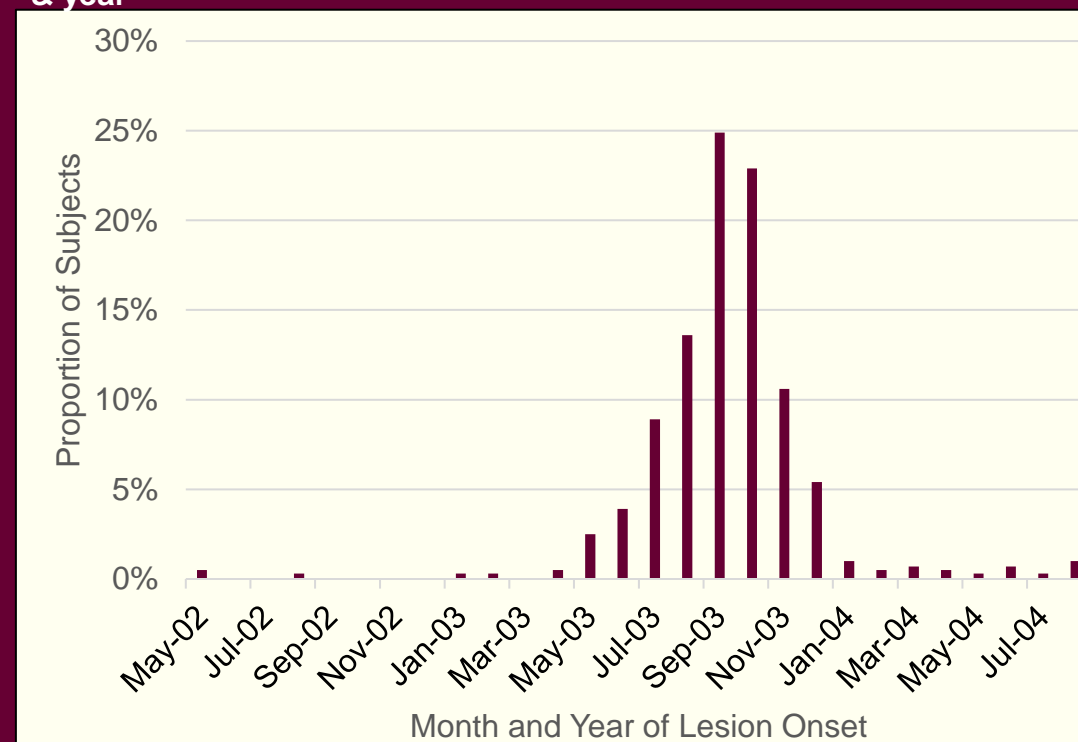
- 385 of 418 (92.1%) subjects enrolled in the treatment study included in review
- L. major* in 333 (86.5%), *L. tropica* in 2 (0.5%), *L. donovani* in 2 (0.5%), & no species identified in 48 (12.5%)
- 327 (84.9%) completed the epidemiologic risk-factor survey
  - 82.5% reported topical insect repellent use and 88% reported using it at night
  - 46.6% of those who used topical insect repellent applied it only once per day
  - Minority reported permethrin-treated uniform use (18.3%), permethrin-treated bed net use (12.5%), or receiving a leishmaniasis health risk briefing before/during deployment (24.4%)
  - 56.8% reported sleeping near an animal burrow

**Table 1. Demographic characteristics of study population**

Age (years)	26 (18-57)
Sex	
Male	376 (98%)
Race/Ethnicity	
White	280 (72.7%)
Black	58 (15.1%)
Hispanic	33 (8.6%)
Asian	6 (1.6%)
Pacific Islander/Other	8 (2.1%)
Location of Deployment	
Iraq	371 (96.4%)
Afghanistan	14 (3.6%)
Skin Phototype	
Fitzpatrick 1	87 (23.9%)
Fitzpatrick 2 & 3	197 (54.1%)
Fitzpatrick 4 & 5	44 (12.1%)
Fitzpatrick 6	36 (9.9%)

Data presented as Median (range) or n (%)  
Age is at time of first clinical evaluation

**Figure 1. Proportion of subjects (%) reporting disease onset by month & year**



**Table 2. Statistically significant results of multivariable analyses of CL risk/protective factors**

Risk/Protective Factor	Outcomes		
	TLA in mm <sup>2</sup>	Head/Face Lesion	Leg/Foot Lesion
Asian Race (Compared to White)			15.01 (1.36-164.66)
National Guard Service (Compared to Active Duty)			2.87 (1.04-7.94)
Wheeled Vehicle Repairer (Compared to Calvary Scout)	98% decrease (-72%- -100%)		
Slept in Combat Uniform			0.33 (0.14-0.78)
Unit Members with Similar Skin Lesions		9.97 (1.2-82.58)	

Data is presented as OR (95% CI) or percent change compared to the reference (95% CI)

**Figure 2. Non-ulcerative cutaneous leishmaniasis caused by *L. major***



**Figure 3. Ulcerative cutaneous leishmaniasis caused by *L. major* (image courtesy of Laura Gilbert, MD, MPH)**



## DISCUSSION

- Epidemic curve & median incubation of *L. major* CL suggests peak infection late-July to late-August<sup>2</sup>
  - Complicated by large variation in incubation, clinical progression & healthcare seeking behavior
- Findings suggest health risk communication/education and personal protective measures underutilized
- Asian race associated with increased risk of CL & military occupational specialty 63W (wheeled vehicle mechanic) associated with decreased TLA with caveat that there were small number of subjects in these categories which may skew results
- Potential targets for efforts to prevent CL in U.S. Military population based on these results:
  - Enhanced health risk education/communication
  - Enhanced education on, and enforcement of personal protective measures use
  - Guidance on reporting skin lesions suspicious for CL to leadership to enhance FHP measures
  - Review/optimization of FHP strategies before and during deployment for National Guard units
- Limitations:
  - No control group of servicemembers without CL for comparison
  - Study population predominantly composed of young Caucasian males
  - Survey typically administered months after disease onset introduces possibility of recall bias
  - Study population may have been too small to detect statistically significant associations on multivariable analyses

## REFERENCES

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