

Investigation of the Epidemiology and Microbiology
of Wounds and Wound Infections in the
Royal Thai Army (RTA)

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OBJECTIVES :

1. To describe the extent and distribution (by agent and anatomical site) of wounds, incurred as a result of combat, appearing at 2° and 3° surgical centers.
2. To establish the types and quantities of microbial flora coexisting with these injuries.
3. To relate microbial occurrence to risk of overt infection, severity and type of injury, subsequent treatment and residual morbidity.
4. To ascertain the value of the injury/microbiology/infection approach for use in predicting infection potential in combat injuries.

BACKGROUND : Descriptions of wounds incurred and microbiologic flora associated with those wounds have been made in the English language literature for each major military excursion since World War II. Primarily by American clinicians, these accounts have suffered from two basic deficiencies unrelated to the expertise of the authors. The primary problem has been that chains of evacuation, while efficient, have been so long that no one person or group of persons could observe the effects of primary microbiological inoculation into a combat injury and its subsequent effects related to morbidity.

The second corollary problem is that microbiologic data have been reported as occurrence of contamination of the wound site at the time of injury or as occurrence of overt infection later in the post-surgical period without a relationship being established between them.

Pre-injury antibiotic prophylaxis in RTA troops is confined to a sulfadoxine-pyrimethamine combination for antimalarial prophylaxis. Post-injury antibiotic coverage is at the discretion of the treating physician, but usually includes ampicillin (Personal communication MAJ Narong Rodwanna).

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The chain of evacuation of a wounded RTA soldier includes :

Emergency life-saving care-company aidman

1° surgical care - battalion aid station/brigade dispensary

2° surgical care - provincial hospital/area military hospital

3° surgical care - RTA hospital, Bangkok

Convalescence-rehabilitation center, Bangkok

Any or all of the above may be by-passed if the condition of the patient warrants it. Ninety percent of the cases seen at RTA hospital, Bangkok, had received previous care at a provincial hospital. Ten percent were either evacuated from an area military hospital or flown directly to Bangkok. (Personal communication COL Boonket Loovanich).

METHODS :

Microbiological Sample Collection : Both aerobic and anaerobic specimens were routinely collected from the wound site and a blood culture was taken concurrently. Wound specimens consist of tissue, fluid exudate or swab from infection surface, and are collected on admission, at surgery, and when clinically indicated. Cultures are inoculated into transport media and a blood culture bottle. Wound cultures are reported only when flora speciation and antibiotic sensitivity data are available. Blood specimens for culture are taken for culture on three successive days following any clinical indication of septicemia, following surgery, and following any positive culture report, and also taken if no specimen has been otherwise required for 3 days. Blood cultures are incubated for a minimum of 72 hrs., read at 24, 48 and 72 hrs., and then submitted to the main laboratory for further study. Any positive bottle culture is gram stained and examined microscopically prior to subculture.

Epidemiologic Data Collection : Each combat injured soldier is interviewed by a nurse as soon after admission as feasible. The interview concerns demographic data on the patient, type of injuring agent, if known (booby trap, mine, shoulder weapon, hand weapon, etc.), geographical location of the area in which the injury was sustained and activities at the time of injury. The nurse makes an objective assessment of injury severity using a standard scale. From the patient's chart, a clinical description of all injuries and concurrent medical problems (diabetes, helminthiasis, etc.), therapy prior to admission, initial laboratory findings, and place and length of prior hospitalizations with this injury are abstracted.

RESULTS : A pilot study and training period is currently being performed at Phramongkutklao Hospital, Bangkok (RTA Hospital). Preliminary results on the first twenty-five patients enrolled are presented below :

Military status :	Officer	1
	Enlisted (included 3 police)	20
	PVT	12
	CPL	2
	SGT	4
	MSG	2
	Civilian (working with military units)	4

Agent of injury :	Missile projectile	7
	Land mine	8
	Rifle bullet	10
Anatomical location of injury :	Head and neck	6
	Chest and back	3
(total exceeds 25 because of multiple site involvement)	Abdomen	1
	Upper extremities	10
	Lower extremities	18

Casualties occurred on the Malaysian, Laotian and Cambodian borders as well as internally in the Northeast area of the country. The majority of injuries were incurred in inter-camp movement and patrolling.

From wound cultures, 37 isolates of 17 different species were made, but the largest single group, accounting for one-third of total isolates, were species of the genus *Pseudomonas*. Twelve of the 13 isolates were *P. aeruginosa* and one could not be speciated. No bacterial growth was observed in only five (20%) of the battlefield casualties cultured. The list of isolates obtained is presented in Table 1. No isolates were obtained from blood culture.

It is anticipated that this study will be continued at Phramongkutklao Hospital and at an area military hospital outside of Bangkok beginning on or about 1 October 1978.

Table 1.

Organism	Anatomical Location of Injury												Total	Remarks			
	Head & Neck			Chest & Back			Abdomen			Upper Extremities					Lower Extremities		
	B	M	R	B	M	R	B	M	R	B	M	R			B	M	R
1. <i>Bacillus</i> spp.																1	Agent of injury B = Missile projectile M = Land mine R = Rifle bullet
2. <i>Clostridium glycolicum</i>																1	
3. <i>Diphtheroid</i> spp.	1															1	
4. <i>Enterobacter</i> spp. <i>E. aerogenes</i>	1															1	
<i>E. agglomerans</i>				1												1	
<i>E. cloacae</i>				1												1	
<i>E. hafnia</i>																1	
5. <i>Escherichia coli</i>																1	
6. Hemophilis parainfluenza	1															1	
7. Herella spp.	1															1	
8. <i>Pseudomonas</i> spp. <i>Ps. aeruginosa</i>																2	
<i>Ps. unspeciata</i>																1	
9. <i>Staphylococcus</i> spp. <i>S. aureus</i>																13	
<i>S. epidermidis</i>																12	
10. <i>Streptococcus</i> spp. <i>S. faecalis</i>																1	
β																1	
B. (not group A)																1	
11. <i>Candida</i> spp.																1	
Total Isolations	7	1	1	1	1	1	3	1	1	1	1	1	2	1	1	37	