2012 Update of Antibiotic Resistance in the **M**ultidrug-resistant organism **R**epository & **S**urveillance **N**etwork (**MRSN**)

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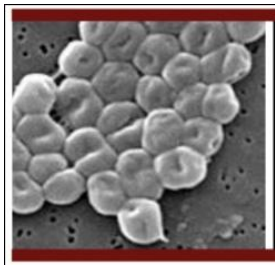
Disclosures & Disclaimer

* Nothing to disclose, no conflicts of interest

* Opinions solely those of the presenter; not official; do not represent the Army's or DoD's

The MRSN



Multidrug-resistant Organism Repository and Surveillance Network (MRSN)

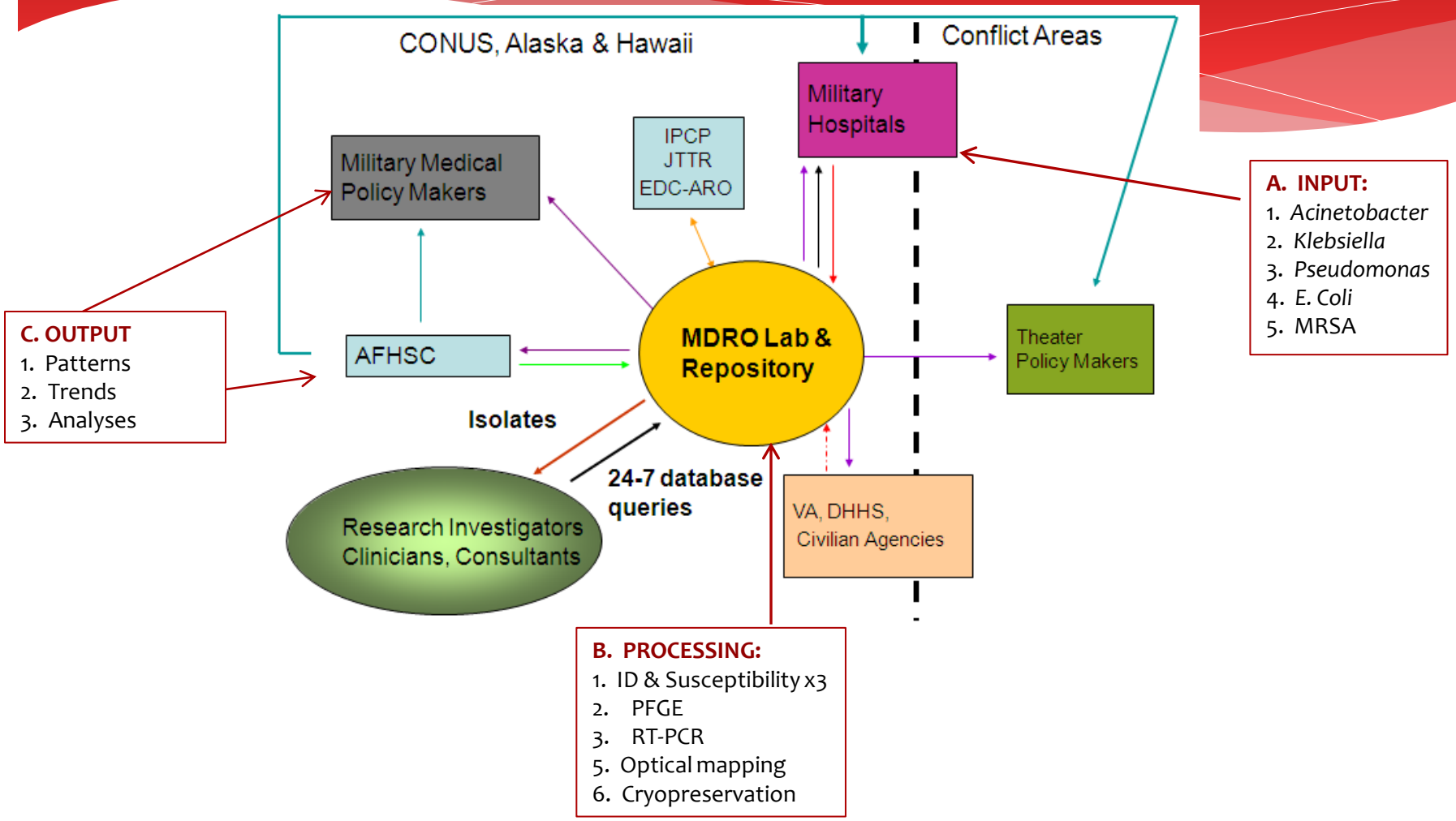
WRAIR

Walter Reed Army Institute of Research

Soldier Health • World Health

- 20+ hospitals
- 10,000+ isolates
- Most contain PII
- Passive & Active Surveillance to inform & enhance infection control, policy, empiric treatment
- AST x3; Trek; PFGE; OGM; RT-PCR; Sequencing
- Adding MALDI-TOF in 2013

MODUS OPERANDI



MicroScan vs. Phoenix vs. Vitek

Summary Table of Error Types by Machine, Drug, and Organism

	Amikacin					Cefepime					Ceftazidime					Ceftriaxone				
Error Type | Machine	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total
ME|Microscan		41	7	24	72	36	117	19	15	187	5	45	1	13	64				2	2
ME|Phoenix		6		2	8	4	4	2	3	13	3	15	9	15	42				2	2
ME|Vitek		12		8	20	12	1		6	19	49	2		24	75	28			10	38
none	9	183	84	161	437	306	69	50	221	646	145	450	96	181	872	712	780	247	315	2054
VME|Microscan		2			2	1			5	6	9	1		19	29	11			13	24
VME|Phoenix	1	21	5	14	41	63	3	3	11	80	16	2	1	10	29	9			7	16
VME|Vitek		2	4	6	12	4	456	93	13	566	1	113	19	15	148		2			2
Grand Total	**10**	**267**	**100**	**215**	**592**	**426**	**650**	**167**	**274**	**1517**	**228**	**628**	**126**	**277**	**1259**	**760**	**782**	**247**	**349**	**2138**

	Ciprofloxacin					Gentamicin					Levofloxacin					Nitrofurantoin				
Error Type | Machine	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total
ME|Microscan	6	8	2	1	17	12	26	6	8	52	2	12	2	4	20		9			9
ME|Phoenix	2	11	7	15	35	5	4	2	11	22				11	11					
ME|Vitek				2	2		1	1	6	8	13	4	17	7	41		16	4		20
none	687	758	228	210	1883	713	920	282	287	2202	632	686	173	230	1721		5	9		14
VME|Microscan				5	5		3	1	1	5	7	3	8	7	25		3	3		6
VME|Phoenix				2	2		1		20	21	10	1	4	5	20		4			4
VME|Vitek		7	8	17	32	16	7	1	2	26	1	1		2	4					
Grand Total	**695**	**784**	**245**	**252**	**1976**	**746**	**962**	**293**	**335**	**2336**	**665**	**707**	**204**	**266**	**1842**	**0**	**37**	**16**	**0**	**53**

	Pip/Tazo					Tobramycin					Trimeth/Sulfa					Grand
Error Type | Machine	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total	ACB	EC	KPN	PSA	Total	Total
ME|Microscan		1	1	3	5	22	23	2	4	51		6			6	485
ME|Phoenix		16	1	8	25	8	9	2	14	33		4	2	1	7	198
ME|Vitek		60	3	11	74		1		2	3		2		1	3	303
none		155	39	104	298	535	928	287	300	2050		4	6	3	13	12190
VME|Microscan		31	19	8	58		6	1		7		1	1		2	169
VME|Phoenix		6		1	7		1	1	3	5						225
VME|Vitek		2	4	4	10	139	10	1	2	152						952
Grand Total	**0**	**271**	**67**	**139**	**477**	**704**	**978**	**294**	**325**	**2301**	**0**	**17**	**9**	**5**	**31**	**14522**

Staphylococcus aureus

* MRSA most common isolate submitted to MRSN 5:1

* A.I.R. of community and hospital onset bacteremia might be decreasing
  * 2005 – 2010 1.7 vs. 1.2; and 0.7 vs. 0.4 / 100,000 pt. yrs.
  * Proportion of SSTI by MRSA peaked in '06 (62%); low in 2010 (52%)
  * All of above statistically significant drops ($p = 0.005$)
    - JAMA. 2012;308(1):50-59

* Daptomycin resistance: rare
* Linezolid resistance: rare
* Chlorhexidine tolerance: of potential concern (1% - 50%)
* Mupirocin resistance: under study
* Vanco MIC creep: under study

What info is desired from MRSN for clinical trials / drug development?

Pseudomonas

Anatomical Site-specific *P. aeruginosa* Antibiogram

Drug	Call [a]	Blood	Respiratory	SSTI	Sterile	Surveillance	Urine	All Sites
Amikacin	NS	25.8 (8)	30.4 (72)	**12.9 (19)**	19.4 (20)	**8.1 (5)**	22 (65)	21.6 (189)
	S	74.2 (23)	69.6 (165)	**87.1 (128)**	80.6 (83)	**91.9 (57)**	78 (231)	78.4 (687)
Gentamicin	NS	17.5 (11)	**36.4 (129)**	**18.6 (52)**	26.3 (47)	21.6 (16)	25.8 (137)	26.5 (392)
	S	82.5 (52)	**63.6 (225)**	**81.4 (227)**	73.7 (132)	78.4 (58)	74.2 (395)	73.5 (1089)
Tobramycin	NS	29 (9)	**38.5 (90)**	**21.9 (32)**	27.5 (28)	23.8 (15)	28.8 (85)	29.7 (259)
	S	71 (22)	**61.4 (144)**	**78.1 (114)**	72.5 (74)	76.2 (48)	71.2 (210)	70.3 (612)
Aztreonam	NS	26.3 (5)	**49.6 (67)**	38.3 (36)	27.5 (14)	36.6 (15)	33.5 (62)	37.9 (199)
	S	73.7 (14)	**50.4 (68)**	61.7 (58)	72.5 (37)	63.4 (26)	66.5 (123)	62.1 (326)
Cefepime	NS	39.9 (22)	**58.2 (189)**	**33.2 (84)**	36.8 (63)	31.9 (23)	40.1 (184)	42.3 (567)
	S	60.7 (34)	**41.8 (136)**	**66.8 (169)**	63.2 (108)	68.1 (49)	59.9 (278)	57.7 (774)
Ceftazidime	NS	18 (11)	**27.2 (80)**	14.3 (36)	19.7 (35)	**7.8 (5)**	**13.8 (68)**	17.5 (235)
	S	82 (50)	**72.8 (214)**	85.7 (215)	80.3 (143)	**92.2 (59)**	**86.2 (424)**	82.5 (1105)
Ciprofloxacin	NS	36.5 (23)	**52 (184)**	**25.6 (71)**	34.1 (61)	36 (27)	38.7 (205)	38.6 (571)
	S	63.5 (40)	**48 (170)**	**74.4 (206)**	65.9 (118)	64 (48)	61.3 (325)	61.4 (907)
Levofloxacin	NS	**65 (13)**	**62.1 (72)**	**31.3 (25)**	37.5 (21)	39.5 (17)	42.8 (71)	45.5 (219)
	S	**35 (7)**	**37.9 (44)**	**68.8 (55)**	62.5 (35)	60.5 (26)	57.2 (95)	54.5 (262)
Imipenem	NS	23.8 (15)	**41.8 (147)**	**18.6 (51)**	23.5 (42)	31.1 (23)	**18.6 (98)**	25.6 (376)
	S	76.2 (48)	**58.2 (205)**	**81.74 (223)**	76.5 (137)	68.9 (51)	**81.4 (430)**	74.4 (1094)
Piperacillin-	NS	52.3 (23)	**52.9 (128)**	45.7 (90)	48.3 (71)	**24.1 (13)**	45.6 (171)	46.8 (496)
Tazobactam	S	47.7 (21)	**47.1 (114)**	54.3 (107)	51.7 (76)	**75.9 (41)**	54.4 (204)	53.2 (563)

[a] NS, Resistant or Immediate; S, sensitive to drug based on 2012 CLSI guidelines.

Green or Red shading indiciates signifcant difference (Fisher's exact test, p-value ≤ 0.05) between anatomical site and all other sites. Red shading = significantly higher resistance, green =significantly lower resistance compared to all other sites

Klebsiella pneumonia

* 39,331 isolates from main referral center –Wash, DC
* 2002-2010 8.4 % (3,320) K. pneumonia
* 90% from urine
* Highest percent of MDRO from resp. and sterile sites
* Resistance by site:
  * Blood vs. cipro; wound vs. gent; sterile site vs. cpm & ctx
* Resistance varied linearly but not over time
  * Pattern of change depended on culture site
* CRE: n = 4 (1 each year)

MDR, CRE, & Carbapenemase producers

* 452 MDR Klebsiella submitted from 18 hospitals
  * 267 different PFGE groups; 7 associated w >1 hospital

* 18,259 *Klebsiella* spp; 15,6271 *E. coli*; 10,791 *Enterobacter* spp; 2010-2012
  * Prevalences of CRE not greater that 0.21%

* Approx 1300 isolates representing 14 species of CR-Gram- negatives
  * 38 (6 *E.coli* from 3 patients, and 32 *K. pneumoniae* from 14 patients)
  * 3 $bla_{NDM:}$ *P. stuartsii* -AFG; *A. schlenderi* – AFG/NCA; *A. baumanni* Honduras
  * 1 *VIM* Pseudomonas - Baltimore

Colistin Resistance

* 2 clusters *A. baumannii* over 10 month (3/11 – 1/12)
  * 7 war-wounded patients
* Initially colistin only suscept. (CoS) [n= 13]
  developed resistance during colistin Tx [n = 14]
* Same unique PFGE & OGM clone
  * [n = ~1600; ~20 hospitals]
* No increased susceptibility to other agents including vanc.
* Low MICs to arbekacin
* Novel *pmrCAB* operon; high homology to *A. nosocomialis*

Questions for Closing Discussion:

* How can a surveillance network & isolate repository better serve antibiotic development and clinical trials?

* What information or material would you like to have?