



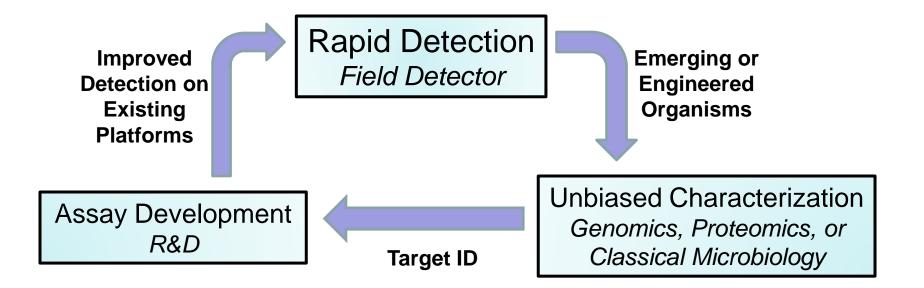
TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

NDIA Biosurveillance Conference

Dr. C. Nicole Rosenzweig US Army, Edgewood Chemical Biological Center 27 August 2012

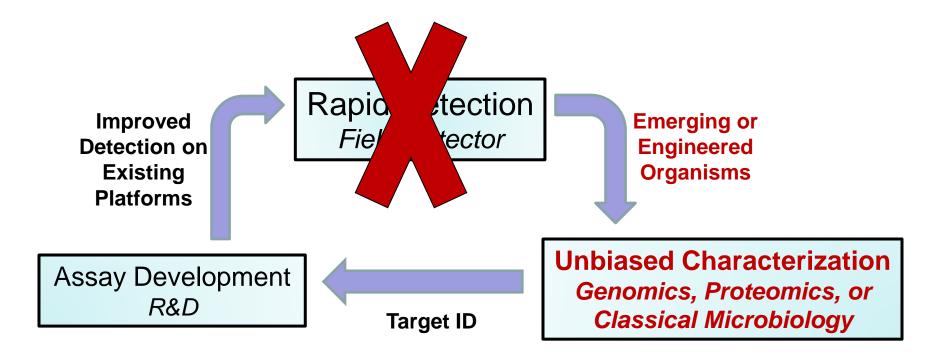
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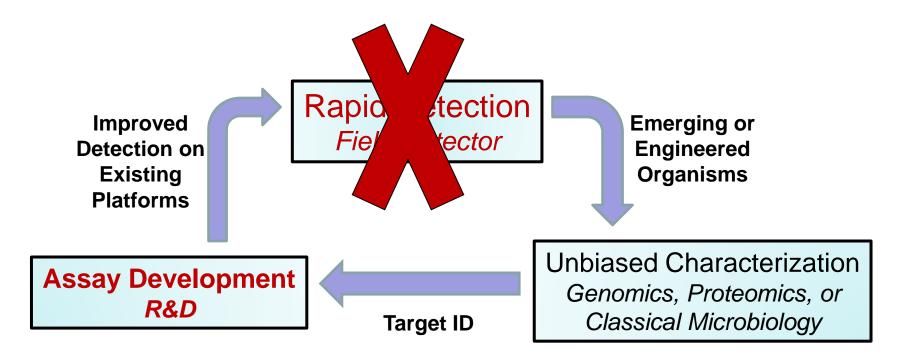
Analytical Gaps in Biological Detection

RDECOM



Analytical Gaps in Biological Detection

RDECON





ECBC Genomic Sciences





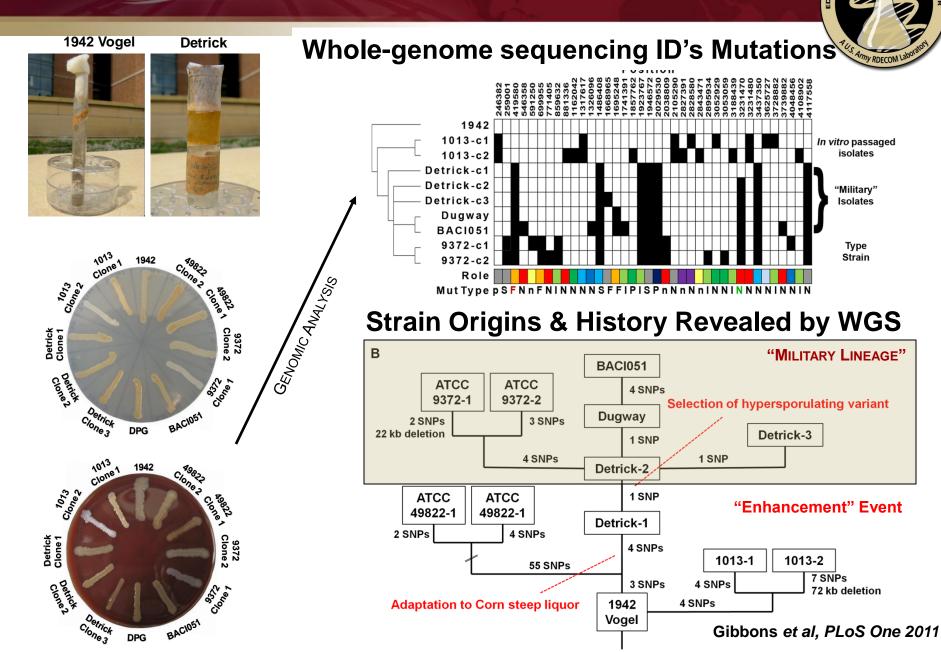




- Biosafety Level 3 laboratory for growing CDC category A and B select-agents
- Sequencing facility with the capacity to support of genomics and transcriptomics research
- BSL 2 and BSL 3 bio-aerosol research for challenging equipment and developing risk assessments
- Contemporary molecular biology, microbiology and biochemistry techniques
- Roche, Illumina, Opgen Argus platforms
- Sample processing experience with medical, environmental, and cultured material
 TECHNOLOGY DRIVEN, WARFIGHTER FOCUSED.

Research Example: Microbial Forensics of a Historical Biowarfare Simulant

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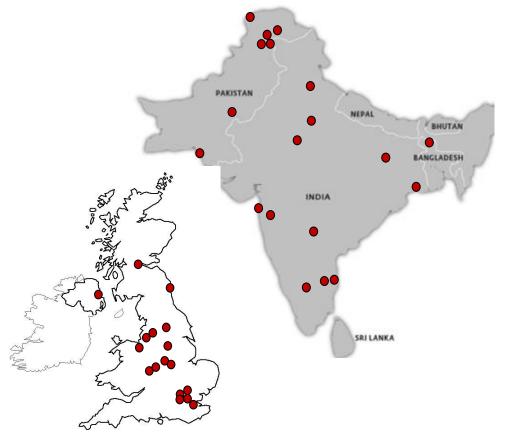
Research Example: MDR Surveillance: NDM-1 *Klebsiella* and *E. coli*



MBL's are β -lactamase enzymes that can destroy virtually all β -lactam based Antibiotics Penicillins, cephalosporins and carbapenems

Antibiotic	MIC (mg/L)			% susceptible ^a
	Range	MIC ₅₀	MIC ₉₀	
Imipenem	8 - >128	32	128	0%
Imipenem + EDTA	0.125 - 8	0.25	1.2	n/a
Meropenem	2 - >32	32	32	3%
Ertapenem	2 - >16	16	16	0%
Ampicillin	>64	>64	>64	0%
Piperacillin	>64	>64	>64	0%
Piperacillin- tazobactam	32 - >64	>64	>64	0%
Cefotaxime	128 ->256	>256	>256	0%
Ceftazidime	64 - >256	>256	>256	0%
Cefpirome	>64	>64	>64	0%
Aztreonam	0.125 - >64	>64	>64	11%
Ciprofloxacin	0.125 - >8	>8	>8	8%
Gentamicin	0.5 - >32	>32	>32	3%
Tobramycin	8 - >32	>32	>32	0%
Amikacin	16 - >64	>64	>64	0%
Minocycline	2 - >32	16	>32	0%
Tigecycline	0.25 - 8	1	4	64%
Colistin	0.5 - >32	0.5	8	89% ^b

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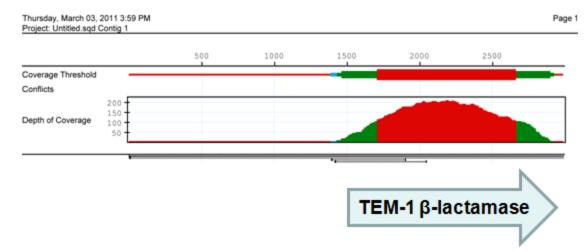


Mark Toleman, Cardiff University

Research Example: Detection of Genetically Modification – Yersinia pestis

- Yersinia pestis KIM
- Constructed in 1990's in U.S.A. to facilitate pCD1 virulence plasmid transfer between strains
- Contains ampicillin resistance marker

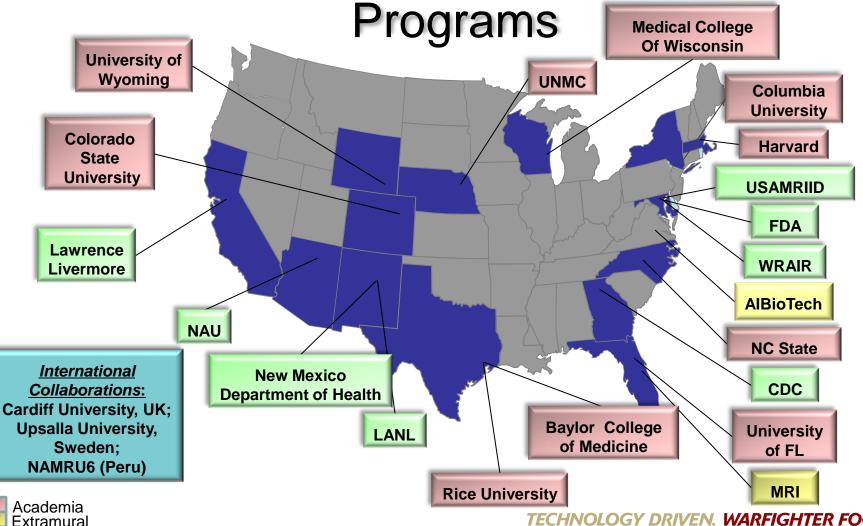
Iteration	De novo contigs (Median Depth)	Total Assembled Bases	Identified Reference	RefSeq Accession	# Reads Mapped	% Ref coverage
1	205 (44)	4586247	YP KIM Chromosome	NC_004088.1	555517	98.64
2	14 (76)	169035	YP KIM pCD1	NC_004836.1	29312	95.92
3	6 (66)	104051	YP KIM pMT1	NC_004838.1	16076	95.43
4	2 (23)	8844	E. coli A2363 plasmid pAPEC-02-R	NC_006671.1	368	1.0
5	1 (22)	7616	YP KIM pPCP1	NC_004837.1	442	90.95



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ECBC Is Involved in Active Biosurveillance



Government

V RDECOM





Long term: use best of breed analytics to improve analysis

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Short term: identify capabilities that provide high-value analysis







Amazon Cloud

Web Services Communication Analysis Requests Data Exchange

DoD Firewall

ECBC HPC







Amazon Cloud

Web Services Communication Analysis Requests Data Exchange

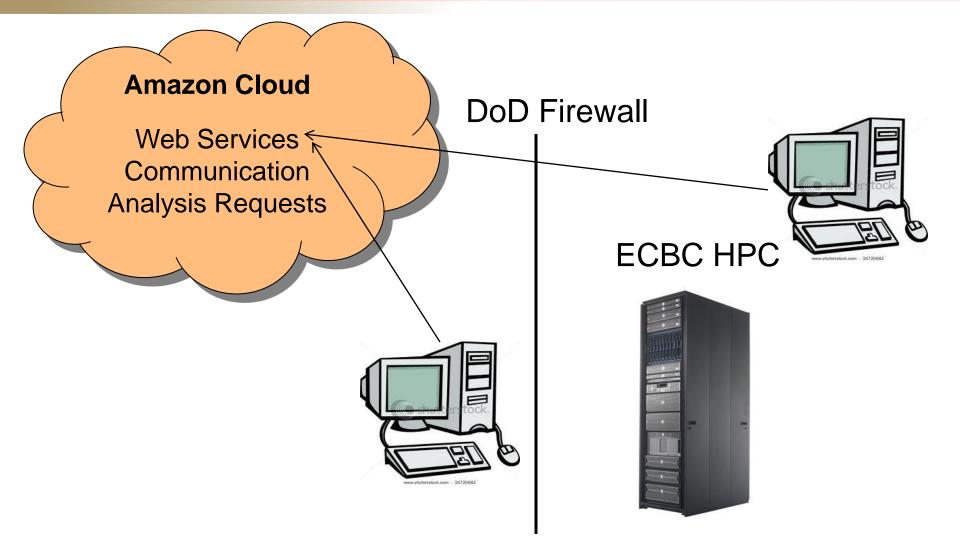
DoD Firewall

ECBC HPC



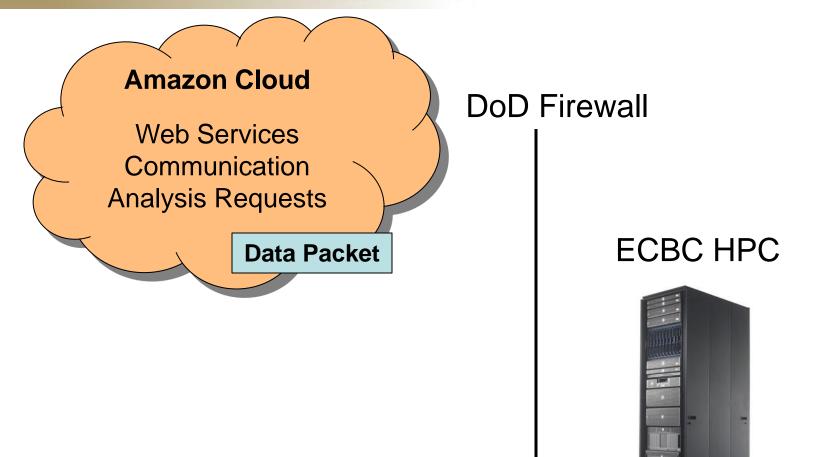






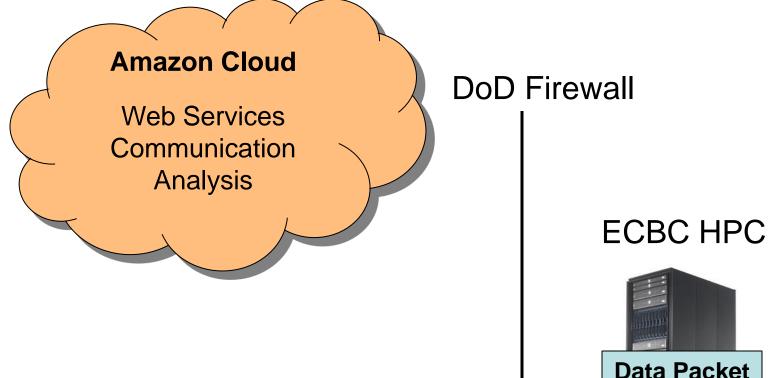














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 Where do biodetection capabilities need improvement?

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How can research efforts support reliable biodetection for biosurveillance?

 How can analytical and data security be maintained while creating a flexible informatics capability?





- Mechanism for DoD OCONUS facilities to share information between their personnel, regional hospitals, and US subject matter experts.
- Informatics resources should be developed in a way that provides a mechanism for analytical tool delivery in real time.
- Sequencing can be used for initial detection, but it is time consuming and expensive. Validation through traditional methods is required. Diagnosis completed by medical personnel.
- Decision makers make unambiguous decisions on ambiguous data. Scientific confidence must be communicated clearly.



Algorithm Prize



DTRA ALGORITHM PRIZE

The Challenge: Given raw sequence read data from a complex diagnostic sample, what algorithm can most rapidly and accurately process the data? DTRA is sponsoring an open competition with **\$1M** in awards available to the team(s) that can **best characterize an unknown sample**, with the least computational overhead. Prize details and sequencing datasets will be made available this Fall. Monitor **http://www.dtra.mil/Business.aspx** for updates.



Contributors



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ECBC Mission and Vision



	RESEARCH & TECHNOLOGY	ENGINEERING	OPERATIONS & INTEGRATION	
WARFIGHTER NEEDS			W	ARFIGHTER SOLUTIONS

LIFECYCLE CHEMICAL AND BIOLOGICAL SOLUTIONS

MISSION: Integrate lifecycle science, engineering and operations solutions to counter CB threats to U.S. forces and the nation.

VISION: To be the premier resource for Chemical, Biological, radiological, nuclear and Explosive (CBRNE) solutions, uniting and informing the national defense community.

Basic research through technology development, engineering design, equipment evaluation, production support, sustainment, field operations and disposal.

Technology Driven Warfighter Focused

EDGEWOOD CHEMICAL BIOLOGICAL CENTER

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