PI: **Hemmert, Andrew***	Title: Rapid, automated, detection of viral and bacterial pathogens causing meningitis	
Received: 04/04/2012	FOA: PA10-123	Council: 10/2012
Competition ID: ADOBE-FORMS-B1	FOA Title: NIAID ADVANCED TECHNOLOGY SBIR (NIAID-AT-SBIR [R43/R44])	
1 R43 AI104029-01	Dual:	Accession Number: 3480123
IPF: 3190601	Organization: BIOFIRE DIAGNOSTICS, INC.	
Former Number:	Department: Research and Development	
IRG/SRG: ZRG1 IDM-V (12)B	AIDS: N	Expedited: N
Subtotal Direct Costs (excludes consortium F&A) Year 1: [redacted] Year 2: [redacted]	Animals: N Humans: Y Clinical Trial: N Current HS Code: 30 HESC: N	New Investigator: N Early Stage Investigator: N
Senior/Key Personnel:	*Organization:*	*Role Category:*
Mark Poritz Ph.D.	Idaho Technology Inc.	PD/PI
Anne Blaschke M.D.	University of Utah	Co-Investigator
Judy Daly Ph.D	Primary Children's Medical Center	Co-Investigator
Kimberly Hanson M.D.	University of Utah	Co-Investigator
Beth Lingenfelter	Idaho Technology, Inc.	Co-Investigator
Stephanie Thatcher	Idaho Technology Inc.	Co-Investigator

*** Dr. Poritz submitted the original grant application. In the course of the first year of funding, Dr. Hemmert took on increasing responsibility for the work. For the grant renewal Dr. Poritz proposed that Dr. Hemmert replace him as the Pl.**

OMB Number: 4040-0001
Expiration Date: 06/30/2011

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. * TYPE OF SUBMISSION
☐ Pre-application ☐ Application ☒ Changed/Corrected Application

2. DATE SUBMITTED: 04/04/2012

Applicant Identifier:

4. a. Federal Identifier: [redacted]

b. Agency Routing Identifier:

5. APPLICANT INFORMATION

*** Organizational DUNS:** [redacted]

* Legal Name: Idaho Technology Inc.
Department: Research and Development
Division:
* Street1: 390 Wakara Way
Street2:
* City: Salt Lake City
County / Parish:
* State: UT: Utah
Province:
* Country: USA: UNITED STATES
* ZIP / Postal Code: 84108-1214

Person to be contacted on matters involving this application
Prefix: Ms.
* First Name: Kaylynn
Middle Name:
* Last Name: Hansen
Suffix:
* Phone Number: [redacted]
Fax Number: [redacted]
Email: [redacted]

6. * EMPLOYER IDENTIFICATION *(EIN) or (TIN):* [redacted]

7. * TYPE OF APPLICANT: R: Small Business
Other (Specify):
Small Business Organization Type ☐ Women Owned ☐ Socially and Economically Disadvantaged

8. * TYPE OF APPLICATION:
☒ New ☐ Resubmission
☐ Renewal ☐ Continuation ☐ Revision

If Revision, mark appropriate box(es).
☐ A. Increase Award ☐ B. Decrease Award ☐ C. Increase Duration ☐ D. Decrease Duration
☐ E. Other (specify):

* Is this application being submitted to other agencies? Yes ☐ No ☒ What other Agencies?

9. * NAME OF FEDERAL AGENCY: National Institutes of Health

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:
TITLE:

11. * DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Rapid, automated, detection of viral and bacterial pathogens causing meningitis

12. PROPOSED PROJECT:
* Start Date: 01/01/2013
* Ending Date: 06/30/2014

*** 13. CONGRESSIONAL DISTRICT OF APPLICANT**: UT-002

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION
Prefix: Mr.
* First Name: Mark
Middle Name: Aaron
* Last Name: Poritz
Suffix: Ph.D.
Position/Title: Director of Biochemistry
* Organization Name: Idaho Technology Inc.
Department: Research and Development
Division:
* Street1: 390 Wakara Way
Street2:
* City: Salt Lake City
County / Parish:
* State: UT: Utah
Province:
* Country: USA: UNITED STATES
* ZIP / Postal Code: 84108-1214
* Phone Number: [redacted]
Fax Number: [redacted]
* Email: [redacted]

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	[redacted]
b. Total Non-Federal Funds	0.00
c. Total Federal & Non-Federal Funds	[redacted]
d. Estimated Program Income	0.00

16. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:

DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR

☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalities. (U.S. Code, Title 18, Section 1001)

☒ *** I agree**

**** The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.***

18. SFLLL or other Explanatory Documentation

Add Attachment | Delete Attachment | View Attachment

19. Authorized Representative

Prefix: Ms. * First Name: Kaylynn Middle Name:

* Last Name: Hansen Suffix:

* Position/Title: Director of Contract Administration

* Organization: Idaho Technology Inc.

Department: Accounting Division:

* Street1: 390 Wakara Way

Street2:

* City: Salt Lake City County / Parish:

* State: UT: Utah Province:

* Country: USA: UNITED STATES * ZIP / Postal Code: 84108-1214

* Phone Number: [redacted] Fax Number:

* Email: [redacted]

*** Signature of Authorized Representative**

Kaylynn Hansen

*** Date Signed**

04/04/2012

20. Pre-application

Add Attachment | Delete Attachment | View Attachment

424 R&R and PHS-398 Specific Table Of Contents

OMB Number: 4040-0010
Expiration Date: 08/31/2011

Project/Performance Site Location(s)

Project/Performance Site Primary Location ☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tr bal government, academia, or other type of organization.

Organization Name: Idaho Technology

DUNS Number: [redacted]

* Street1: 390 Wakara Way

Street2:

* City: Salt Lake City County: Salt Lake

* State: UT: Utah

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 84108-1214 * Project/ Performance Site Congressional District: UT-002

Project/Performance Site Location 1 ☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tr bal government, academia, or other type of organization.

Organization Name: ARUP Laboratories

DUNS Number: [redacted]

* Street1: 500 Chipeta Way

Street2:

* City: Salt Lake City County: Salt Lake

* State: UT: Utah

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 84108-1221 * Project/ Performance Site Congressional District: UT-002

Project/Performance Site Location a ☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tr bal government, academia, or other type of organization.

Organization Name: University of Utah

DUNS Number: [redacted]

* Street1: Office of Sponsored Projects

Street2: 75 South 2000 East, #211

* City: Salt Lake City County:

* State: UT: Utah

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 84108-8930 * Project/ Performance Site Congressional District: UT-002

Performance Sites

Project/Performance Site Location(s)

Project/Performance Site Location 3

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tr bal government, academia, or other type of organization.

Organization Name: Primary Children's Medical Center

DUNS Number: [redacted]

* Street1: 100 Mario Capecchi Dr.

Street2:

* City: Salt Lake City

County: Salt Lake

* State: UT: Utah

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 84113-1103

* Project/ Performance Site Congressional District: UT-002

Additional Location(s)

Add Attachment | Delete Attachment | View Attachment

RESEARCH & RELATED Other Project Information

1. * Are Human Subjects Involved? ☒ Yes ☐ No

1.a If YES to Human Subjects

Is the Project Exempt from Federal regulations? ☐ Yes ☒ No

If yes, check appropriate exemption number. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6

If no, is the IRB review Pending? ☒ Yes ☐ No

IRB Approval Date:

Human Subject Assurance Number: [redacted]

2. * Are Vertebrate Animals Used? ☐ Yes ☒ No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ☐ Yes ☐ No

IACUC Approval Date:

Animal Welfare Assurance Number

3. * Is proprietary/privileged information included in the application? ☐ Yes ☒ No

4.a. * Does this project have an actual or potential impact on the environment? ☐ Yes ☒ No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ☐ Yes ☐ No

4.d. If yes, please explain:

5. * Is the research performance site designated, or eligible to be designated, as a historic place? ☐ Yes ☒ No

5.a. If yes, please explain:

6. * Does this project involve activities outside of the United States or partnerships with international collaborators? ☐ Yes ☒ No

6.a. If yes, identify countries:

6.b. Optional Explanation:

7. * Project Summary/Abstract 1235-Meningitis SBIR Project Summary. Add Attachment | Delete Attachment | View Attachment

8. * Project Narrative 1236-Meningitis SBIR project narrativ Add Attachment | Delete Attachment | View Attachment

9. Bibliography & References Cited 1237-Menigitis SA and Research Plan 2 Add Attachment | Delete Attachment | View Attachment

10. Facilities & Other Resources 1238-SBIR Facilities for all 20120403 Add Attachment | Delete Attachment | View Attachment

11. Equipment 1239-ITI plus other Equip 20120404.pd Add Attachment | Delete Attachment | View Attachment

12. Other Attachments Add Attachments | Delete Attachments | View Attachments ☐

Meningitis and encephalitis are inflammatory, often infectious, processes of the central nervous system that can result in significant morbidity and mortality. Prompt, appropriate therapy is crucial, but determining the infectious etiology can be difficult and time-consuming. A wide-range of pathogens can be involved including both bacteria and viruses. Culture is the standard for diagnosis of bacterial Meningoencephalitis (ME), PCR of viral nucleic acid is the standard for "aseptic" causes. However the current methods are either 1) too slow to be clinically relevant; 2) technically complex; 3) limited in the number of targets or 4) not cleared by the FDA.

Idaho Technology (ITI) has developed a "lab in a pouch" PCR-based diagnostic system termed "FilmArray" that is rapid, easy to use, and can test for large panels of infectious agents simultaneously. A FilmArray pouch that can detect 15 respiratory pathogens was cleared by the FDA as a CLIA "moderate complexity" test. We propose to apply the FilmArray technology to the problem of ME diagnosis.

SA1: Develop a FilmArray Meningoencephalitis (FAME) panel: We will construct a FilmArray pouch that combines PCR assays from existing panels with five new assays to detect the following ME-causing organisms directly from cerebrospinal fluid (CSF): *Enterobacteriaceae, E. coli, Enterococcus species, H. influenza, L. monocytogenes, Mycoplasma pneumoniae, N. meningitidis, P. aeruginosa, Staphylococci species, S. aureus, Streptococcus species, S. agalactiae, S. pneumoniae, S. pyogenes, viridians streptococci,* Adenovirus, Enterovirus, Parechovirus, HSV1, HSV2, VZV, EBV, CMV, HHV-6.

SA2: Optimize nucleic acid extraction for virus and bacteria from CSF: CSF is one of the less complex sample matrices that have been processed on the FilmArray (when compared to nasal swabs, blood culture and stool). However, detecting bacteria, and virus, directly from CSF, may require the highest possible sensitivity. We will optimize the nucleic acid purification steps internal to the pouch as well as investigate simple steps to concentrate bacteria and viruses before the pouch

SA3: Test the FAME panel on 300 CSF samples: Our collaborators will test CSF samples from pediatric and adult patients with suspected ME. We will compare these results to their standard assays performed on the samples, supplemented with the results of the comparator assays described in SA1.

A successful outcome of this proposal will be a FilmArray pouch capable of detecting and identifying the common ME pathogens. It will be ready for the analytical and clinical trials necessary for a 510(k) submission to the FDA. This would be the subject of a future phase II submission.

Meningitis and encephalitis are life threatening inflammations of the brain and spinal cord which are often caused by infectious agents. Rapid, comprehensive, diagnosis of the virus or bacteria responsible for these conditions is critical for determining the most effective treatment. We will apply Idaho Technology's automated, multiplex nucleic acid test platform (the FilmArray) to the problem of meningoencephalitis diagnosis.

Facilities at Idaho Technology, Inc.

Idaho Technology Inc. (ITI) is a 21 year old privately held company. It was founded in Idaho Falls, Idaho but relocated to Salt Lake City, Utah 16 years ago. ITI owns three buildings and rents parts of two others in Research Park which is located one mile from the University of Utah, School of Medicine. These consist of a 23,000 ft^2 R&D and manufacturing facility, a 60,000 ft^2 manufacturing and administration facility, a 3,000 ft^2 software development suite, a 6,200 ft^2 FilmArray Functional Laboratory, and a recently acquired 16,800 ft^2 building. These facilities house approximately 300 employees.

ITI has engineering, computer, and software resources more than adequate for our research and development needs. Of more relevance to the present proposal is our FilmArray manufacturing capacity and our biosafety facilities. These are described below.

FilmArray Production Facilities

Our manufacturing facilities are registered with the FDA Center for Devices and Radiological Health as a Contract Manufacturer (Registration Number 3004905890) and are designed to comply with U.S. FDA Quality System Regulation (FDA 21 CFR Part 820 Medical Devices; Current Good Manufacturing Practice (cGMP) Final Rule; Quality System Regulation).

ITI's production facilities for FilmArray instruments are housed on the first floor of the 400 Wakara Way facility. The current production rate is approximately 20 instruments per month and is moving toward a production rate of >40 instruments per month. ITI's FilmArray pouch production facility is capable of 14,000 pouches/month at normal capacity and is moving toward a rate of 55,000 pouches/month in the next year.

Biosafety/containment rooms

ITI has 4 Bio-Safety Laboratories (level 2 containment). All are under negative pressure and secured by general building security with an additional "cam lock" requiring a code for entry. There are nine Class 2 bio-safety hoods. Existing protocols (a set of Standard Operating Procedures (SOPs) and Work Instruction Documents (WIDs)) for operating with cultures and samples containing Bio-Safety level 2 organisms are in place and updated as needed. Technicians who work in the Bio-Safety laboratories are required to participate in written, verbal, and hands on training and are closely supervised during their initial work in these spaces.

FilmArray Functional Laboratory

FilmArray pouches are run in a separate facility with its own key access, gowning area, BSL hood, and PCR dead air boxes. Approximately 35 FilmArray instruments are available for quality control and R&D testing of the pouch. The physical separation of the production and testing facilities serves to minimize contamination risk. The area is swabbed twice a week for contamination surveillance and is cleaned as needed. Data from these runs is automatically uploaded to the company-wide FilmArray database and is immediately available for viewing by scientists located in the other buildings.

Facilities at ARUP

As a nonprofit enterprise of the University of Utah (U of U) and its Department of Pathology, ARUP Laboratories functions both as the clinical laboratory for the University's Healthcare System as well as a national reference laboratory. ARUP is the largest esoteric clinical diagnostics laboratory in the United States, offering more than 2,000 tests and test combinations that span routine screening tests to highly complex genetics assays. ARUP handles over 8 million samples per year in these areas. As a result, ARUP is an invaluable resource for well characterized clinical specimens. In addition, ARUP has established a dedicated Research Institute devoted solely to clinical and experimental pathology. Within the Institute, the Clinical Microbiology section has documented success in collaborative research leading to the development/validation of novel molecular diagnostic tests for infectious diseases.

Facilities at University of Utah Women and Child Institute Molecular Microbiology Laboratory

Dr. Blaschke is the Director of the Molecular Microbiology Laboratory, part of the University of Utah's Women and Child Institute. The Laboratory is located in the University's Research Park. The 1400 square foot laboratory has a BSL-2 level accreditation with capability for processing of clinical specimens and common infectious pathogens. There is a dedicated room for specimen processing and microbiology. PCR and FilmArray analyses will be performed in a room separate from the main laboratory with restricted access to prevent amplicon contamination. The laboratory employs a full-time dedicated laboratory technician with expertise in nucleic acid extraction from clinical samples, microbiology and PCR assay design and analysis.

Equipment at Idaho Technology, Inc.

The equipment listed here is specific to production and testing of the FilmArray pouches.

FilmArray Production Facilities

Production of the FilmArray pouches is accomplished with a mixture of commercial equipment and custom designed tools and press. The commercial equipment includes: 4 Virtis Freeze Driers, 4 GeSiM Nanoplotters, 2 Biomek robots, Expidite 8909 DNA Synthesizers (3 units), Bioautomation HTP DNA synthesizer (1 unit), Hitachi 7000 series HPLC (5 units), ATR vacuum driers (5 units), Tecan Genios UV-VIS spectrophotometer and 1 Amersham Ultra Spec 2000 UV-Vis.

Biosafety/containment rooms

The 4 BSL2 labs have nine Class 2 bio-safety hoods, 1 Nano Drop Spectrophometer, and two -80C Freezers.

FilmArray Functional Laboratory

In addition to ~35 FilmArray instruments, the PCR laboratory has: 2 ITI LightScanner instruments, 2 ITI HR-1 instruments, 4 ITI Rapid Cyclers, 12 ITI JBAIDS real time PCR instruments, 2 Roche Light Cyclers, 6 BioRad block thermal cyclers and a microplate centrifuge.

Equipment at ARUP

For the purposes of this project, ARUP in consultation with Dr. Hanson, will provide: 1) standard laboratory resources such as bench space for the FilmArray instrumentation, incubators, refrigerators, freezers, centrifuges, and all other tools required for standard molecular biology research including in-house DNA sequencing capabilities; 2) space to maintain the CSF bio-repository using discarded and de-indentified ARUP specimens; 3) access to confirmatory testing/discrepancy analysis using a variety of well validated monoplex PCR assays that are used routinely for clinical care (i.e., Mycoplasma pneumoniae, Adenoviruses, Herpes simplex virus, Varicella Zoster, Epstein Barr Virus, Cytomegalovirus, Enteroviruses and Parechovirus).

Equipment at Molecular Microbiology Laboratory

Dr. Blascke's laboratory has a Class 2 bio-safety hood, refrigerators, -20C and -80 C freezers as well as a LC 32 real time PCR instrument and one FilmArray. The molecular biology equipment and supplies to perform nucleic acid sample preparation, PCR and basic microbiology is available.

OMB Number: 4040-0001
Expiration Date: 06/30/2011

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix: Mr. * First Name: Mark Middle Name: Aaron
* Last Name: Poritz Suffix: Ph.D.
Position/Title: Director of Biochemistry Department: Research and Development
Organization Name: Idaho Technology Inc. Division:
* Street1: 390 Wakara Way
Street2:
* City: Salt Lake City County/ Parish:
* State: UT: Utah Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 84108-1214
* Phone Number: [redacted] Fax Number: [redacted]
* E-Mail: [redacted]

Credential, e.g., agency login: [redacted]

*** Project Role:** PD/PI **Other Project Role Category:**

Degree Type: PhD
Degree Year: 1991

***Attach Biographical Sketch** 1247-Biosketch Poritz 2012040 Add Attachment Delete Attachment View Attachment
Attach Current & Pending Support Add Attachment Delete Attachment View Attachment

PROFILE - Senior/Key Person 1

Prefix: * First Name: Anne Middle Name:
* Last Name: Blaschke Suffix: M.D.
Position/Title: Assistant Professor of Pediatrics Department: Pediatrics
Organization Name: University of Utah Division: School of Medicine
* Street1: 295 Chipeta Way
Street2:
* City: Salt Lake City County/ Parish:
* State: UT: Utah Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 84158-1289
* Phone Number: [redacted] Fax Number:
* E-Mail: [redacted]

Credential, e.g., agency login: [redacted]

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: MD PhD
Degree Year: 2000

***Attach Biographical Sketch** 1248-Biosketch Blaschke 12031 Add Attachment Delete Attachment View Attachment
Attach Current & Pending Support Add Attachment Delete Attachment View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 2

Prefix: | * First Name: Judy | Middle Name:

* Last Name: Daly | Suffix: Ph.D

Position/Title: Director, Microbiology Laboratory | Department:

Organization Name: Primary Children's Medical Center | Division:

* Street1: 100 Mario Capecchi Dr.

Street2:

* City: Salt Lake City | County/ Parish: Salt Lake

* State: UT: Utah | Province:

* Country: USA: UNITED STATES | * Zip / Postal Code: 84113-1103

* Phone Number: [redacted] | Fax Number:

* E-Mail: [redacted]

Credential, e.g., agency login: [redacted]

*** Project Role:** Co-Investigator | **Other Project Role Category:**

Degree Type: PhD

Degree Year: 1980

***Attach Biographical Sketch** 1249-Biosketch JDaly with par | Add Attachment | Delete Attachment | View Attachment

Attach Current & Pending Support | Add Attachment | Delete Attachment | View Attachment

PROFILE - Senior/Key Person 3

Prefix: | * First Name: Kimberly | Middle Name: E

* Last Name: Hanson | Suffix: M.D.

Position/Title: Assistant Professor Medicine and Pathology | Department: Internal Medicine

Organization Name: University of Utah | Division: Infectious Diseases

* Street1: ARUP Laboratories

Street2: 500 Chipeta Way

* City: Salt Lake City | County/ Parish: Salt Lake

* State: UT: Utah | Province:

* Country: USA: UNITED STATES | * Zip / Postal Code: 84108-1221

* Phone Number: [redacted] | Fax Number:

* E-Mail: [redacted]

Credential, e.g., agency login: [redacted]

*** Project Role:** Co-Investigator | **Other Project Role Category:**

Degree Type: M.D./ M.H.S.

Degree Year: 1998/2006

***Attach Biographical Sketch** 1250-Biosketch Hanson Meningi | Add Attachment | Delete Attachment | View Attachment

Attach Current & Pending Support | Add Attachment | Delete Attachment | View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 4

Prefix: | * First Name: Beth | Middle Name:

* Last Name: Lingenfelter | Suffix:

Position/Title: Director of Regulated Products | Department:

Organization Name: Idaho Technology, Inc. | Division:

* Street1: 390 Wakara Way

Street2:

* City: Salt Lake City | County/ Parish: Salt Lake

* State: UT: Utah | Province:

* Country: USA: UNITED STATES | * Zip / Postal Code: 84108-1214

* Phone Number: [redacted] | Fax Number:

* E-Mail: [redacted]

Credential, e.g., agency login: [redacted]

*** Project Role:** Co-Investigator | **Other Project Role Category:**

Degree Type: MS

Degree Year: 1980

***Attach Biographical Sketch** 1251-Biosketch for Beth Linge | Add Attachment | Delete Attachment | View Attachment

Attach Current & Pending Support | Add Attachment | Delete Attachment | View Attachment

PROFILE - Senior/Key Person 5

Prefix: | * First Name: Stephanie | Middle Name:

* Last Name: Thatcher | Suffix:

Position/Title: Director of Systems Integration | Department: Research and Development

Organization Name: Idaho Technology Inc. | Division:

* Street1: 390 Wakara Way

Street2:

* City: Salt Lake City | County/ Parish: Salt Lake

* State: UT: Utah | Province:

* Country: USA: UNITED STATES | * Zip / Postal Code: 84108-1214

* Phone Number: [redacted] | Fax Number:

* E-Mail: [redacted]

Credential, e.g., agency login: [redacted]

*** Project Role:** Co-Investigator | **Other Project Role Category:**

Degree Type: MS

Degree Year: 1990

***Attach Biographical Sketch** 1252-Biosketch Thatcher 4Apr | Add Attachment | Delete Attachment | View Attachment

Attach Current & Pending Support | Add Attachment | Delete Attachment | View Attachment

Program Director/Principal Investigator (Last, First, Middle):

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Mark Aaron Poritz	Director of Biochemistry
eRA COMMONS USER NAME [redacted]	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Harvard College	A.B.	1983	Molecular Biology
UC San Francisco	Ph.D.	1991	Genetics
University of Geneva, Geneva, Switzerland	Visiting Scientist	5/1992	Cell Biology
Unversity of Wisconsin, Madison, WI	Damon Runyon Postdoctoral Fellow	9/1994	Bacterial Genetics
Harvard Medical School, Boston, MA	HHMI Postdoctoral Fellow	11/1996	Genomics

A. Personal Statement

I am molecular biologist at Idaho Technology, Inc. (ITI) with extensive experience in the application of PCR to gene cloning, library screening and, for the last 9 years at ITI, pathogen identification. In particular, as the PI for the NIAID funded grant: **U01 AI061611** "Differentiation of Common Respiratory Viruses and SARS" I led the team that developed the PCR chemistry of the FilmArray Respiratory pathogen panel. I continued that effort under a second NAIAD grant **1U01AI074419** "HT Film-Array: a system to assess respiratory viruses with emphasis on influenza" that is finishing this year. Early during the development of the FilmArray system, I started a collaboration with Dr. Blaschke of the Department of Pediatrics at the University of Utah School Of Medicine to develop a FilmArray panel to identify bacterial sepsis. The data we generated went into the application that resulted in the NIAID grant **1R43HL094743-01** "FilmArray Biothreat Pathogens: An Automated Multiplex PCR Diagnostic System" to my colleague Dr. Ota. This grant is funding the development of a blood culture bacterial identification panel that should enter clinical trials in the next few months. This data also helped Dr Blaschke secure a NIAID K award (**1K23-AI079401** "Rapid Molecular Testing for Neonatal Antibiotic-Resistant Pathogens"). Thus I have been closely involved in the development of both the respiratory and sepsis pathogen assays that will make up the core of the Meningoencephalitis project proposed here. For this reason I believe that I have the skills and background to carry out this project.

B. Positions and Honors

Positions and Employment

12/1996- 10/2002 Group Leader, Deltagen Proteomics Inc., Salt Lake City, UT
11/2002- 12/2009 Senior Scientist, Idaho Technology, Salt Lake City, UT
1/2010- Present Director of Biochemistry, Idaho Technology, Salt Lake City, UT

Reviewer for NIH Study Sections:

5/2004 RFA-AI-03-016: Challenge Grants: Biodefense and SARS product development
3/2005 RFA AI-04-043: Sepsis and CAP: Partnerships for Diagnostics Development
1/2006 RFA-AI-05-019: Cooperative Research Partnerships for Biodefense
4/2007 RFA AI06-029: Cooperative Research: Therapeutics and Diagnostics for Category B Pathogens

Program Director/Principal Investigator (Last, First, Middle):

1/2010	RFA-OD-09-003: NIH Challenge Grants in Health and Science Research
2/2010	RFA-AI-09-026: Diagnostics Partnerships
6/2010	NIAID SBIR: Non-HIV Infectious Agent Detection/Diagnostics, Food Safety, Sterilization/Disinfect
9/2010	RFA-AI-10-003: Partnerships for Biodefense
11/2010	NIAID SBIR: Non-HIV Infectious Agent Detection/Diagnostics, Food Safety, Sterilization/Disinfect
2/2011	RFA-AI-10-017: Partnerships for Next Generation Biodefense Diagnostics (R01)
3/2011	NIAID SBIR: Non-HIV Infectious Agent Detection/Diagnostics, Food Safety, Sterilization/Disinfect
9/2011	RFA-AI-11-014 Partnerships for Biodefense (R01)
11/2011	RFA-AI11-024 Improved Diagnostic Capabilities for Select Biodefense and Emerging Pathogens

C. Selected Peer-reviewed Publications

Poritz, M. A., A. J. Blaschke, C. L. Byington, L. Meyers, K. Nilsson, D. E. Jones, S. A. Thatcher, T. Robbins, B. Lingenfelter, E. Amiott, A. Herbener, J. Daly, S. F. Dobrowolski, D. H. Teng, and K. M. Ririe. "Filmarray, an Automated Nested Multiplex Pcr System for Multi-Pathogen Detection: Development and Application to Respiratory Tract Infection." PLoS One 6 (10): e26047, 2011. PMCID: PMC3198457

Blaschke AJ, Allison MA, Meyers L, Rogatcheva M, Heyrend C, Mallin B, Carter M, Lafleur B, Barney T, **Poritz MA**, Daly JA, Byington CL. Non-invasive sample collection for respiratory virus testing by multiplex PCR. J Clin Virol. 2011 Nov; 52 (3) :210-4. PubMed PMID:21855405; PubMed Central PMCID: PMC3196801.

Blaschke AJ, Heyrend C, Byington CL, Obando I, Vazquez-Barba I, Doby EH, Korgenski EK, Sheng X, **Poritz MA**, Daly JA, Mason EO, Pavia AT, Ampofo K. Molecular Analysis Improves Pathogen Identification and Epidemiologic Study of Pediatric Parapneumonic Empyema. (2010) Pediatr Infect Dis J. PMID: 21057372.

Ampofo K, Herbener A, Blaschke AJ, Heyrend C, **Poritz M**, Korgenski K, Rolfs R, Jain S, Carvalho Mda G, Pimenta FC, Daly J, Mason EO, Byington CL, Pavia AT. Association of 2009 pandemic influenza A (H1N1) infection and increased hospitalization with parapneumonic empyema in children in Utah. (2010) Pediatr Infect Dis J. *29*. PMID: 20407400.

Zhou L, Errigo RJ, Lu H, **Poritz MA**, Seipp MT, Wittwer CT. Snapback Primer Genotyping with Saturating DNA Dye and Melting Analysis, (2008) Clin Chem 54, 1648-56. PMID: 18676584

Yura T, Guisbert E, **Poritz M**, Lu CZ, Campbell E, Gross CA. Analysis of sigma32 mutants defective in chaperone-mediated feedback control reveals unexpected complexity of the heat shock response (2007) Proc Natl Acad Sci USA. *104*, 17638-43.

Poritz MA, Malmstrom S, Schmitt A, Kim MK, Zharkikh L, Kamb A, Teng DH. (2003) Isolation of a peptide inhibitor of human rhinovirus. Virology. *313*, 170-83.

Sandrock T, **Poritz M**, Kim M, Feldhaus MJ, Roth B, Caponigro G, Kamb A. (2002) Expression levels of transdominant peptides and proteins in Saccharomyces cerevisiae. Yeast. *19*, 1-7.

Sandrock TM, Risley B, Richards BT, **Poritz MA**, Austin HA, Yoo S, Kim MK, Roth B, Repetny K, Hsu F, Stump M, Teng DH, Kamb A. (2001) Exogenous peptide and protein expression levels using retroviral vectors in human cells. Mol Ther. *4*, 398-406.

Poritz MA, Malmstrom S, Kim MK, Rossmeissl PJ and Kamb A. (2001) Graded mode of transcriptional induction in yeast pheromone signalling revealed by single-cell analysis. Yeast.*14*, 1331-8.

Poritz, M. A., Bernstein, H. D., Strub, K., Zopf, D., Wilhelm, H. and Walter, P. (1990). An E. coli ribonucleoprotein containing 4.5S RNA resembles mammalian signal recognition particle. Science, *250*, 1111-1117.

Bernstein, H. D., **Poritz, M. A**., Strub, K., Hoben, P. J., Brenner, S. and Walter, P. (1989). Model for signal sequence recognition from amino-acid sequence of 54k subunit of signal recognition particle. Nature, *340*, 482-486.

Poritz, M., Strub, K. and Walter, P. (1988). Human SRP RNA and E. coli 4.5S RNA contain a highly homologous structural domain. Cell, *55*, 4-6.

D. Research Support

Ongoing Research Support

NIH, NIAID 1U01AI74419-01 Original PI: Dobrowolski 6/01/2007 – 5/2012
HT-Film-Array: a system to assess respiratory viruses with emphasis on influenza
Develop: 1) a multi-sample FilmArray instrument 2) a panel of assays that detect and subtype avian influenza 3) a software package that allows the instrument to report results across the internet to a central database or to other users 4) an automated manufacturing procedure for the FilmArray pouches to lower costs and raise production levels
Role: PI

NIH, NIAID, 1 R01 AI089489-01 (PI Rogatcheva), 7/2010 – 6/2013
An Automated Multi-target Diagnostic System for Gastrointestinal Pathogens
The challenge in diagnosing infectious diarrhea is the large number and diversity of the pathogens that are known to cause diarrhea, including viruses, bacteria and protozoa. We propose to develop the FilmArray Gastrointestinal Pathogen System, a rapid (<1 hour), automated, sensitive, objective and inexpensive test able to detect 22 diarrhea causing pathogens in a single step. This novel tool will overcome diagnostic difficulties, improve the treatment and reduce the cost of diarrheal illness for individual patients, and improve public health by rapid detection of outbreaks.
Role: Advisor

Completed Research Support

Air Force Surgeon General BAA log 09-25 (PI Poritz) 7/2010 – 7/2011
Military Utility Assessment of FilmArray System (EOS)
Supply 7 FilmArray instruments and 1000 Respiratory Panel pouches to the Air Force to perform an assessment off the system's utility in military hospital settings.

NIH, NIAID 1R43HL094743-01 (PI Ota) 7/2009 – 6/2011
FilmArray Biothreat Pathogens: An Automated Multiplex PCR Diagnostic System
1) Produce FilmArray biothreat assays that identify biowarfare agents and common pathogens. 2) Increase the number of organisms detected by building a 224-well 2nd stage PCR array. 3) Develop methods for FilmArray automated isolation of bacterial and viral DNA and RNA from nasal swabs and cerebral spinal fluid (CSF). 4) Develop software to facilitate the automated identification of pathogen(s) within a specimen. 5) Validate the FilmArray biothreat system with human samples, including nasal swabs, blood, and CSF at ITI and external laboratories.
Role: Advisor

NIH, NIAID R43 AI082843-01 Phase I SBIR (PI Poritz) 4/2009 – 6/2010
Characterization of Respiratory Pathogens in Transplant Patients
Test 300 respiratory samples from adult hematopoietic stem cell (HSCT) and solid organ (SOT) transplants patients followed at Brigham & Women's Hospital/Dana-Farber Cancer Institute using the FilmArray Respiratory Pathogen Panel. Compare the diagnostic performance of the FilmArray RP system to currently

used CLIA approved clinical diagnostic assays for respiratory pathogens in transplant patients, both HSCT and SOT, sampled by nasopharyngeal aspirate (NPA) and by bronchoalveolar lavage (BAL).

Role: PI

NIH, NIAID U01 AI061611-01 PI: Poritz 4/2005 – 5/2009

Differentiation of Common Respiratory Viruses and SARS

Design, build and test a portable real-time PCR machine with reagents for detecting a panel of common respiratory viruses including the SARS coronavirus. The testing component will involve a close collaboration with Primary Children's Medical Center at the University of Utah Medical School.

Role: PI

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Blaschke, Anne J.	Assistant Professor
eRA COMMONS USER NAME: [redacted]	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Brown University, Providence, RI	A.B.	1987-1991	Biology, with Honors
University of California, San Diego School of Medicine, La Jolla, CA	M.D.	1991-1993 1997-2000	Medicine
University of California, San Diego School of Medicine, La Jolla, CA	Ph.D.	1993-1997	Biology, Neuroscience
University of Utah/Primary Children's Medical Center, Salt Lake City, UT	Residency	2000-2003	General Pediatrics
Boston University School of Medicine, Boston, MA	Fellowship	2003-2004	Pediatric Infectious Diseases
University of Utah/Primary Children's Medical Center, Salt Lake City, UT	Fellowship	2004-2006	Pediatric Infectious Diseases

A. Personal Statement

The goal of the proposed research is to pilot the development of Idaho Technology, Inc. (ITI)'s FilmArray system for use in the detection of organisms causing meningoencephalitis from spinal fluid samples. Specifically, we plan develop a new FilmArray pouch that contains assays that have already been developed (from the existing the FilmArray Respiratory Pathogens Panel and the FilmArray Blood Culture ID panel) and a few new assays, (primarily for members of the Herpesviridae family). We will test this pouch on clinical samples from patients suspected to have meningoencephalitis. I have the experience, expertise and motivation to carry out the proposed work as a collaborator with Dr. Poritz. I have worked with Dr. Poritz and ITI for the past 6 years on the development of the FilmArray system. My work has focused mainly on the Blood Culture ID panel, which identifies sepsis-causing pathogens, including those most commonly found in patients with meningoencephalitis. I have collaborated with ITI on several NIH-funded studies, and I am the PI of my own K23 grant to study the utility of the Blood Culture ID panel for the detection and identification of sepsis-causing pathogens directly from whole blood in neonates. In addition, I have used assays from the Blood Culture panel to study the use of PCR in the identification of pathogens from culture-negative specimens from children. This application builds on my successful collaboration with ITI and our demonstration of the utility of multi-pathogen molecular testing to improve the diagnosis of infectious disease in children.

B. Positions and Honors

Employment

1993-1997 Pre-doctoral Fellow, Biology Graduate Program, University of California, San Diego, Advisor: Jerold Chun, MD, PhD, full-time
2000-2003 Residency in Categorical Pediatrics, University of Utah/Primary Children's Medical Center, Residency Program Director: Ron Bloom, MD, full-time
2003-2004 Fellow, Pediatric Infectious Diseases, Boston University, Program Director: Steven Pelton, MD, full time
2003-2004 Instructor, Department of Pediatrics, Boston Medical Center, Boston, MA
2003-2004 Staff Physician, East Boston Neighborhood Health Center, Boston, MA
2004-2006 Fellow, Pediatric Infectious Diseases, University of Utah/Primary Children's Medical Center, Program Director: Andrew Pavia, MD, full-time

2006-2008 Instructor and Attending Physician in Pediatrics, Division of Pediatric Infectious Diseases, University of Utah/Primary Children's Medical Center, Division Chief: Andrew Pavia, MD, Department Chair: Edward Clark, MD, non-tenured, full-time

2008-present Assistant Professor and Attending Physician in Pediatrics, Division of Pediatric Infectious Diseases, University of Utah/Primary Children's Medical Center, Division Chief: Andrew Pavia, MD, Department Chair: Edward Clark, MD, tenure-track, full-time

Honors

1987 National Merit Finalist Scholarship
1990-1991 Undergraduate Teaching and Research Award, Brown University
1991-2000 Medical Scientist Training Program Fellowship, National Institutes of Health
1994-1995 Medical Student Research Fellowship, Pharmaceutical Manufacturers Association
1994 Award for Excellence in Teaching, UCSD Biology Department
1999-2000 Pediatric Pharmacology Fellowship, UCSD Pediatric Pharmacology Research Unit
2005-2007 Primary Children's Medical Center Foundation Scholar
2006-2008 Primary Children's Medical Center Foundation Grant Awardee
2006-2008 Trainee, Child Health Research Career Development Award, (K12) National Institutes of Health
2006 IDSA Fellow's Travel Grant Awardee, 44th Meeting of the Infectious Disease Society of America
2007-2009 Pediatric Clinical and Translational Research Scholar
2009 IDSA Seasonal and Pandemic Influenza: A Turning Point Travel Grant Awardee

Professional Societies

2000-present American Academy of Pediatrics (AAP)
2003-present Infectious Diseases Society of America (IDSA)
2003-present Pediatric Infectious Disease Society (PIDS)
2006-present American Society for Microbiology (ASM)
2009-present Society for Pediatric Research (SPR)

C. Peer-Reviewed Publications (Selected from 21)

Most relevant to the current application (in chronologic order)

1. Petti CA, Simmon KE, Bender J, **Blaschke A**, Webster KA, Conneely MF, Schreckenberger PC, Origitano TC, Challapalli M. (2008). Culture-negative intracerebral abscesses in children and adolescents from Streptococcus anginosus group infection: a case series. *Clinical Infectious Diseases, 46*(10): 1578-1580. PMID: 18419492.
2. **Blaschke AJ**, Korgenski EK, Daly JA, LaFleur B, Pavia AT, Byington CL. (2009). Extended-spectrum □-lactamase-producing pathogens in a children's hospital: a five-year experience. *American Journal of Infection Control,* 37(6): 435-41. PMCID: PMC2743748
3. Byington CL, Hulten KG, Ampofo K, Sheng X, Pavia AT, **Blaschke AJ**, Pettigrew M, Korgenski K, Daly J, Mason EO. (2010). Molecular Epidemiology of Pediatric Pneumococcal Empyema 2001-2007. *Journal of Clinical Microbiology,* 48(2): 520-5. PMCID: PMC2815589
4. **Blaschke AJ**, Pulver LS, Korgenski EK, Savitz LA, Daly JA, Byington CL. (2010). Clindamycin-resistant group B Streptococcus and failure of intrapartum prophylaxis to prevent early-onset disease. *J Pediatr,* 156(3), 501-3. PMCID: PMC3153078
5. Ampofo K, Herbener A, **Blaschke AJ**, Heyrend C, Poritz M, Korgenski K, Rolfs R, Jain S, Carvalho M, Pimenta FC, Daly J, Mason EO, Byington CL, Pavia AT. (2010). Association of 2009 pandemic influenza A (H1N1) infection and increased hospitalization with parapneumonic empyema in children in Utah. *The Pediatric Infectious Disease Journal*, 29(10): 905-9. *PMCID: PMC3153298*
6. **Blaschke AJ**, Heyrend C, Byington CL, Obando I, Vazquez-Barba I, Doby EH, Korgenski EK, Sheng X, Poritz MA, Daly JA, Mason EO, Pavia AT, Ampofo K. (2010). Molecular analysis improves pathogen identification and epidemiologic study of pediatric parapneumonic empyema. *The Pediatric Infectious Disease Journal*, 30(4): 289-94. PMID: 21057372.
7. **Blaschke, AJ**. Interpreting Assays for the Detection of Streptococcus pneumonia. *Clinical Infectious Diseases*, 2011. 52(Suppl 4): S331-7. PMID 21460292
8. **Blaschke AJ**, Allison MA, Meyers L, Rogatcheva M, Heyrend C, Malin B, Carter M, Lafleur B, Barney T, Poritz MA, Daly JA, Byington CL. (2011). Non-invasive sample collection for respiratory virus testing by multiplex PCR. *J Clin Virol*, 52(3): 210-4. PMID: 21855405

9. Ampofo K, Pavia AT, Stockmann CR, **Blaschke AJ**, Weng HY, Korgenski KE, Daly J, Byington CL. (2011). Evolution of the epidemiology of pneumococcal disease among Utah children through the vaccine era. *Pediatric Infectious Disease Journal*, epub Octobe 14, 2011. PMID: 22005513
10. Poritz MA, **Blaschke AJ**, Byington CL, Meyers L, Nilsson K, Jones DE, Thatcher SA, Robbins T, Ligenfelter B, Amiott E, Herbener A, Daly J, Dobrowolski SF, Teng DH, Ririe KM. (2011). FilmArray, an automated nested multiplex PCR system for multi-pathogen detection: development and application to respiratory tract infection. *PLoS One*, 6(10): e26047. PMCID: PMC3198457

D. Research Support

Ongoing Research Support

5K23AI079401 (PI: Blaschke) 3/1/2009 – 2/28/2013
National Institute of Allergy and Infectious Disease
Rapid Molecular Testing for Neonatal Antibiotic-Resistant Pathogens
The goal of this study is to develop rapid molecular testing using FilmArray to detect and identify pathogens causing sepsis in infants in the neonatal intensive care unit.
Role: PI

U18IP000491 (PI: Ampofo) 8/24/2011 – 8/23/2013
Centers for Disease Control and Prevention
Epidemiology and Etiology of Hospitalized Pneumonia in Children
The goal of this study is to investigate the pathogen-based epidemiology of hospitalized pneumonia in children using modern molecular tools for diagnosis
Role: Co-Investigator

Completed Research Support

5U01AI082184 (PI: Ota; Idaho Technology, Inc.) 8/1/2009 – 7/31/2011
National Institute of Allergy and Infectious Disease
FilmArray Biothreat Pathogens: An Automated Multiplex PCR Diagnostic System
The goal of this study is to develop a FilmArray system for the identification of the most common pathogens causing bacterial and fungal sepsis in patients undergoing blood culture.
Role: Subcontract, Co-Investigator

STARS-Kids Foundation grant (PI: Simon/Blaschke) 3/01/2009-12/31/2011
Seeking Techniques Advancing Research in Shunts (STARS)
Molecular quantification of CSF bacterial pathogens for patients undergoing CSF shunt infection treatment
The goal of this study is to use molecular quantification of bacteria in the CSF of patients with shunt infection to help inform antibiotic therapy.
Role: Co-PI

5U18IP000303 (PI: Ampofo) 7/1/2009 – 6/30/2011
Centers for Disease Control and Prevention
Epidemiology and Etiology of Hospitalized Pneumonia in Children
The goal of this study is to investigate the pathogen-based epidemiology of hospitalized pneumonia in children using modern molecular tools for diagnosis
Role: Co-Investigator

5U01AI074419 (PI: Poritz; Idaho Technology, Inc.) 8/1/2007-7/31/2010
National Institute of Allergy and Infectious Disease
HT Film-Array: a system to assess respiratory viruses with emphasis on influenza.
The goal of this project was to develop a FilmArray system for the diagnosis and subtyping of influenza, including avian and pandemic strains.
Role: Subcontract, Co-Investigator

5U01-A1061611 (PI: Poritz; Idaho Technology, Inc.) 4/1/2005 – 3/31/2009
National Institute of Allergy and Infectious Diseases
PCR Identification of Respiratory Viruses including SARS

The goal of this project was to develop a FilmArray system for the diagnosis of common respiratory viruses.
Role: Subcontract, Co-Investigator

5K12HD001410 (PI: Clark) 7/1/2006 – 2/28/2009
National Institute of Child Health and Human Development
Child Health Research Career Development Award
The goal of this project was to develop molecular testing to detect and identify common pathogens causing sepsis in infants.
Role: Trainee

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Judy A. Daly, Ph.D.	**Professor of Pathology** **Director – Microbiology Laboratories** **Primary Children's Medical Center** **University of Utah**
eRA COMMONS USER NAME [redacted]	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Stetson University, Deland, FL	BS Magna Cum Laude	1970-1974	Biology
University of No. Carolina SOM, Chapel Hill, NC – Dept. of Bacteriology & Immunology	MS	1974-1978	Transplantation Immunology
University of No. Carolina SOM, Chapel Hill, NC – Dept. of Bacteriology & Immunology	PhD	1978-1980	Bacteriology and Immunology
University of No. Carolina SOM, Chapel Hill, NC – Dept. of Bacteriology & Immunology	Postdoctoral Research Fellow	1981	Bacteriology and Immunology
University of Utah, Salt Lake City, UT	Clinical Microbiology Postdoctoral Fellow	1981-1983	AAM/CPEP Approved Fellowship in Medical Public Health Laboratory Microbiology

Personal Statement

I am a Professor of Pathology at the University of Utah and Director of the Clinical Microbiology Laboratory, Primary Children's Medical Center (PCMC). I have been collaborating with ITI since 2005 as part of their existing "SARS and respiratory virus detection' grant as well as their more recently funded avian influenza and GI pathogen grants. As part of these grants my laboratory has been supplying samples for the development and validation of their virus and bacterial assays; in addition two film array instruments were recently placed in my laboratory for clinical testing and two instruments were placed for developmental testing. I have an ongoing collaboration with Dr. Anne Blaschke, a co-investigator on this proposal, on her K-12 funded study of febrile neonates, which is also a collaboration with ITI. I have a specific interest in the development of molecular testing for the clinical microbiology laboratory, and have been impressed with ITI throughout the tenure of our projects together. As the Director of the Clinical Microbiology Laboratory at PCMC, I will provide the resources of our laboratory to facilitate the collection and transfer of Cerebrospinal fluid clinical specimens to Dr. Blascke for testing with the FilmArray FAME pouch. Primary Children's Medical Center is the sole children's hospital in the Intermountain West, drawing patients from a five state region. We are in an exceptional position to support the proposed studies. This proposal strengthens our collaborations with ITI into the area of meningoencephalitis diagnosis and direct-from-specimen testing of CSF. I look forward to contributing to the development of the proposed system.

Professional Experience:

1. Graduate Teaching Research Assistantship, Department of Bacteriology and Immunology, University of North Carolina — 1974-1975
2. Graduate Research Assistantship, Department of Bacteriology and Immunology, University of North Carolina, School of Medicine — 1975-1980
3. Postdoctoral Fellowship, Department of Bacteriology and Immunology (Advisor: P.F. Sparling, M.D.), University of North Carolina School of Medicine — 1981
4. AAM/CPEP – Accredited Postdoctoral Fellowship in Public Health and Medical Laboratory Microbiology, University of Utah School of Medicine — 1981-1983
5. Assistant Professor (clinical), Department of Pathology, University of Utah School of Medicine, Microbiology Laboratories, Primary Children's Medical Center, Salt Lake City, UT — 1983-1990
6. Associate Professor (clinical), Department of Pathology, University of Utah School of Medicine, Microbiology Laboratories, Primary Children's Medical Center, Salt Lake City, UT — 1990-1996
7. Consultant, IHC Microbiology Laboratory Services, Intermountain Health Care Corporation, Salt Lake City, UT — 1991-present
8. Consultant, Pharmacology Program, Primary Children's Medical Center, Salt Lake City, UT — 1983-1992
9. Clinical Faculty, Pathology, Weber State University, School of Allied Health Sciences — 1986-present
10. Professor (clinical), Department of Pathology, University of Utah School of Medicine, Director, Microbiology Laboratories, Primary Children's Medical Center, Salt Lake City, UT — 1996-present

Honors and Awards:

1.	Tassel (National Women's Leadership Honorary)	1972-1973
2.	Mortar Board (National Women's Academic and Leadership Honorary)	1974
3.	Phi Society (National Academic Honorary)	1970-1974
4.	Who's Who in American Colleges and Universities	1974
5.	Beta Beta Beta (National Honorary Biology Society)	1974
6.	Stetson University, BS Biology, Graduate Magna Cum Laude	1974
7.	National Institutes of Health Predoctoral Fellowship	1975-1978
8.	Zeta Tau Alpha Founder's Grant Award	1975-1979
9.	Annual Meeting Student Travel Grant, American Society for Microbiology Foundation	1979
10.	Predoctoral Research Fellow, Department of Bacteriology and Immunology, University of North Carolina, Chapel Hill, North Carolina	1978-1980
11.	Predoctoral Research Fellow, Department of Bacteriology and Immunology, University of North Carolina, Chapel Hill, North Carolina	1981
12.	Clinical Microbiology Postdoctoral Fellow, Department of Bacteriology and Immunology, University of Utah School of Medicine, Salt Lake City, Utah, (AAM/CPEP Approved Program in Medical Public Health Laboratory Microbiology)	1981-1983
13.	Outstanding Employee, Primary Children's Medical Center, Salt Lake City, Utah	1990
14.	ASM Foundation for Microbiology Lecturer	1990-1991
15.	Fellow, American Academy of Microbiology	1994
16.	Elected to Council Policy Committee, American Society for Microbiology	1998-present
17.	Chair's Award American Society of Clinical Pathologists	1995
18.	Elected Chair, Division C, American Society for Microbiology	1996-1997
19.	Elected Secretary, American Society for Microbiology	1998-present
20.	ATP Alumni Award, Institute of Health Care Delivery Research, Institute for Health Care Improvement	2002, 2004
21.	Spokesperson, American Society for Microbiology Clean Hands Campaign	1998-present

Member:

1.	Consultant, Microbiology Examination Committee, Board of Registry, American Society of Clinical Pathologists	1987-1988
2.	Vice-chairman, Microbiology Examination Committee, Board of Registry, American Society of Clinical Pathologists	1989-1991
3.	Chairman, Microbiology Examination Committee, Board of Registry, American Society of Clinical Pathologists	1992-1994
4.	Consultant, Microbiology Devices Panel, Center for Devices and Radiological Health, Food and Drug Administration	1987-1988
5.	Member, Microbiology Devices Panel, Center for Devices and Radiological Health, Food and Drug Administration	1989-1994
6.	Member, Speakers' Bureau, Burroughs Wellcome Company	1997-1991
7.	President, Intermountain Regional Branch, American Society for Microbiology	1988-1989
8.	Member, Nominating Committee, Committee for Division C Officers, American Society for Microbiology	1988
9.	Alternate Councilor, Division C, American Society for Microbiology	1990-1992
10.	Member, Becton-Dickinson/Sonnenwirth Award Selection Committee, American Society for Microbiology	1990-1994
11.	Member, ASM Foundation for Microbiology Lectures Program, American Society for Microbiology	1990-1991
12.	Councilor, Division C, American Society for Microbiology	1992-1994
13.	Member, Program Advisory Committee, Medical Laboratory Technician Program, Salt Lake Community College	2989-1991
14.	Chairman, Program Advisory Committee, Medical Laboratory Technician Program, Salt Lake Community College	1992-1999
15.	Member, College Advisory Council, Salt Lake Community College	1992-1995
16.	Member, Continuing Medical Education Committee, University of Utah School of Medicine	1992-present
17.	Chairman, College Advisory Council, Salt Lake Community College	1995-1999
18.	Member, Council Policy Committee, American Society for Microbiology	1995-1997
19.	Member, Finance Committee, American Society for Microbiology	1995-present
20.	Member, Nominating Committee for President, American Society for Microbiology	1995-1997
21.	Member, Committee on Continuing Education, Board of Education and Training, American Society for Microbiology	1994-1996
22.	Vice-Chairman, Committee on Continuing Education, Meetings Board, American Society for Microbiology	1996-1998
23.	Member, Microbiology Guidance Team, Intermountain Health Care	1996-present
24.	Member, Clinical Pathology Guidance Team	1997-present

25.	Elected Chair, Division C, American Society for Microbiology	1996-1997
26.	Member, Becton Dickinson and Company Award in Clinical Microbiology Nominating Committee, American Academy of Microbiology, American Society for Microbiology	1998-2002
27.	Member, ASM Founders Distinguished Service Award Selection Committee, American Society for Microbiology	1998-present
28.	Member, Council Policy Committee, American Society for Microbiology	1998-present
29.	Elected Secretary, American Society for Microbiology	1998-present
30.	Member, Finance Committee, American Society for Microbiology	1998-present
31.	Member, American Academy of Microbiology NRM Proctorship	1999-present
32.	Advisory, Clinical Laboratory Standards Institute, Committee on Quality Subcommittee on Quality Control for Microbiology Systems	2006-present
33.	Member, Communications Committee, American Society for Microbiology	2007-present
34.	Member, Institutional Biosafety Committee, University of Utah	2007-present
35.	Member, Headquarters Advisory Committee, American Society for Microbiology	2008-present
36.	Member, Subcommittee on Development and Use of Quality Indicators, Clinical and Laboratory Standards Institute	2007-present
37.	Member, Subcommittee on User Verification of Microbial Identification and Antimicrobial Susceptibility Testing Systems, Clinical and Laboratory Standards Institute	2008-present
38.	Member, Subcommittee on Quality Management Systems, Clinical Laboratory Standards Institute	2009-present
39.	Member, Working Group on Process Improvement, Clinical Laboratory Standards Institute	2009-present
40.	Member, CME Advisory Board	2009-present
41.	Member, Clinical Laboratory Improvement Advisory Committee of the Centers for Disease Control and Prevention	2009-2013
42.	Member, Document Development Committee on Leadership and Management Roles and Responsibilities, Clinical Laboratory Standards Institute	2009-present
43.	Member, Utah Healthcare-Associated Infections Governance Committee	2010-present

Federal Government Public Advisory Committee Service:

1.	Health and Human Services, Centers for Disease Control, Clinical Laboratory Improvement Advisory Committee	2009-2013

Recent Publications: (selected from over 199 publications in reverse order)

1. Rubach, M.P., J.M. Bender, S. Mottice, K. Hanson, H.Y.C. Weng, K. Korgenski, J.A. Daly, A.T. Pavia. Increasing Incidence of Invasive *Haemophilus influenzae* Disease in Adults, Utah, USA. Sept. 2011. Emerg. Infect Dis. 17(9):1645-50.
2. 2. Blaschke, A.J., M.A. Allison, L. Meyers, M. Rogatcheva, C. Heyrend, B. Mallin, M. Carter, B. LaFleur, T. Barney, M.A. Poritz, J.A. Daly, C.L. Byington. Non-invasive sample collection for respiratory virus testing by multiplex PCR. J Clin Virol. 2011 Aug 18. [Epub ahead of print, e26047]
3. 3. Poritz, M.A., A.J. Blaschke, C.L. Byington, L. Meyers, K. Nilsson, D.E. Jones, S.A. Thatcher, T. Robbins, B. Lingenfelter, El Amiott, A. Herbener, J.Daly, S.F. Dobrowolski, D.H. Teng, K.M. Ririe. 2011. FilmArray, an Automated Nested Multi-Pathogen Detection: Application to Upper Respiratory Trace Infection. PloS One. 2011,6(10):e26047. Epub 2011 Oct 19. Erratum in: PloS One. 2011;6(11). Doi:10.1371/annotation/468cfdcd-184c-42f7-a1d0-3b72a2f6a558.
4. Ampofo, K., J. Bender, X. Sheng, K. Korgenski, J. Daly, A.T. Pavia, C.L. Byington. 2008. Seasonal Invasive Pneumococcal Disease in Children; The Role of Preceding Respiratory Viral Infection. Pediatrics 122:229-237.
5. Blaschke, A.J., K. Korgenski, J.Daly, A.T. Pavia, C.L. Byington. 2007. Emergence of Extended-Spectrum β-Lactamase Producing Pathogens in a Children's Hospital: Rates, Incidence and Factors Associated with Infection or Colonization. Clin Infect Dis. Aug 15;45(4):483-6.
3. Ampofo, K., P.H. Gesteland, J. Bender, M. Mills, J.A. Daly, C. Byington, A. Pavia, and R. Srivastava. 2006. Epidemiology, complications and cost of hospitalization in children with laboratory confirmed influenza infection. Pediatrics. Dec;118(6):2409-17.
4. Byington, C.L., E.K. Korgenski, J.A. Daly, K. Ampofo, A.T. Pavia, and E.O. Mason. 2006. Pediatric pneumococcal para-pneumonic empyema: impact of the pneumococcal conjugate vaccine. *Ped Infec Dis J*. 2006 Mar;25(3):250-254.
5. Byington, C.L., M.H. Samore, G.J. Stoddard, S. Barlow, J.A. Daly, E.K. Korgenski, S. Firth, D. Glover, J. Jensen, E.O. Mason, C. Schult, and A.T. Pavia. 2005. Temporal Trends for Invasive Disease due to Streptococcus Pneumoniae in Children in the Intermountain West: Evidence for serogroup replacement. Author's reply *Clin Infect Dis* 41:1822-3.
6. Byington, C.L., M.H. Samore, G.J. Stoddard, S. Barlow, J.A. Daly, E.K. Korgenski, S. Firth, D. Glover, J. Jensen, E.O. Mason, C. Schult, and A.T. Pavia. 2005. Temporal Trends for Invasive Disease due to Streptococcus Pneumoniae in Children in the Intermountain West: Evidence for serogroup replacement. Clin Infect Dis, Jul 1:41(1) 21-9.
7. Aldous, W.K., K. Gerber, E.W. Taggart, J. Rupp, J. Wintch, and J.A. Daly. 2005. A Comparison of the Thermo Electron RSV OIA test to Viral Culture and Direct Fluorescent Assay Testing for Respiratory Syncytial Virus. J Clin Virol 32(3):224-8.
8. Aldous, W.K., K. Gerber, E.W. Taggart, J. Thomas, D. Sidwell, and J.A. Daly. 2004. A Comparison of Binax NOW to Viral Culture and Direct Fluorescent Assay Testing for Respiratory Syncytial Virus. Diag Microbiol Infect Dis 49(4):265-8.

9. Veasy, L.G., J.A. Daly, L. Miner, J. Bale, K. Korgenski, L.Y. Tani, H. Hill. 2004. The temporal association of mucoid strains of Streptococcus Pyogenes with a high incidence of rheumatic fever. Pediatrics 113:e168-172.
10. Rocholl, C., K. Gerber, J.A. Daly, A.T. Pavia, and C.L. Byington. 2004. Adenoviral Infections in Children: the Impact of Rapid Diagnosis. Pediatrics 113:e51-e56.
11. Miner, L.J., S.J. Petheram, J.A. Daly, E.K. Korgenski, K.S. Selin, S.D. Firth, L.G. Veasy, H.R. Hill, J.F. Bale. Post-streptococcal syndrome study team. 2004. Molecular characterization of Streptococcus progenes isolates collect during periods of increased acute rheumatic fever activity in Utah. Pediatr Infect Dis J. 23:56-61.
12. Cloud, J.L., W.C. Hymas, A. Turlak, A. Croft, U. Reischl, J.A. Daly, K.C. Carroll. 2003. Description of a multiplex Bordetella Pertussis and Bordetella Parapertussis light cycler PCR assay with inhibition control. Diagn Microbiol Infect Dis 46:189-95.
13. Carroll, K.C., K. Adamson, K. Korgenski, A. Croft, R. Hankemeier, J.A. Daly, C.H. Park. 2003. Comparison of a commercial reversed passive latex agglutination assay to an enzyme immunoassay for the detection of Shiga toxin-producing E. coli. Eur J Microbiol Infect Dis 22:689-692.
14. Byington, C.L., K.K. Rittichier, K.E. Bassett, H. Castillo, T.S. Glasgow, J.A. Daly, A.T. Pavia. 2003. Serious bacterial infection in febrile infants younger than 90 days of age: the importance of ampicillin-resistant pathogens. Pediatrics 111:964-968.
15. Byington, C.L., H. Castillo, K. Gerber, J.A. Daly, J.C. Christenson, A.T. Pavia. 2002. The impact of rapid viral diagnostic testing on antibiotic use in a children's hospital. Arch Pediatr Adolesc Med. 156:1230-1234.
16. J.C. Smoot, K.D. Barbain, J. Van Gompel, L.M. Smoot, M.S. Chaussee, G.L. Sylva, D.E. Sturdivant, S.M. Ricklefs, S.F. Porcella, L.D. Parkins, S.B. Beres, D.S. Campbell, Q. Zhang, V. Kapur, J.A. Daly, L.G. Veasy and J.M. Musser. 2002. Geonomic sequence and comparative cicroarray analysis of serotype M18 group A Streptococcus Strains associated with acute rheumatic fever outbreaks. Proc. Natl Acad Sci USA. 99:4668-4673.
17. Smoot, J.C., E.K. Korgenski, J.A. Daly, L.G.Veasy, and J.M. Musser. 2002. Molecular analysis of Group A Streptococcus type emm18 isolates temporally associated with acute rheumatic fever outbreaks in Salt Lake City, Utah. J. Clin Microbiol. 40:1805-1810.
18. Byington, C.L., L.Y. Spencer, T.A. Johnson, A. Pavia, D. Allen, E.O. Mason, S. Kaplan, K.C. Carroll, J.A. Daly, J.C. Christenson and M.H. Samore. 2002. An epidemiologic investigation of a sustained high rate of pediatric parapneumonic empyema: risk factors and microbiologic association. Clin Infect Dis 34:434-440.
19. Hindiyeh, M., S. Jensen, S. Hohmann, H. Bennett, C. Edwards, W. Aldeen, A. Croft, J.A. Daly, S. Mottice and K.C. Carroll. 2000. Rapid detection of Campylobacter jejuni in stool specimens by an enzyme immunoassay and surveillance for Campylobacter upsaliensis in the greater Salt Lake City area. J Clin Microbiol. 38:3076-3079.
20. Christenson, J.C., E.K. Korgenski, and J.A. Daly. 2000 In Vitro susceptibility Result comparison of meropenem versus imipenem and cefepime versus ceftazidime on Pseudomonas aeruginosa isolates from cystic fibrosis patients. J Antimicrob Chemother. 45:1-3.
21. Novicki, T.J., J.A. Daly, S.L. Mottice, and K.C. Carroll. 2000. A comparison of sorbitol MacConkey agar and a novel, two step method which utilizes ELISA toxin testing and a chromogenic agar to detect and isolate enterohemorrhagic Escherichia coli. J Clin Microbiol. 38:547-551.
22. Christenson, J.C., C. Byington, E.K. Korgenski, E.E. Adderson, C. Bruggers, R.H. Adams, E. Jenkins, S. Hohmann, K. Carroll, J.A. Daly, and A.T. Pavia, 1999. A Pseudo-Outbreak of Bacillus cereus Infections among Oncology Patients at a Children's Hospital. J Infect Control. 27:543-546.
23. Christenson, J.C., E.K. Korgenski, E. Jenkins and J.A. Daly. 1998. Detection of vancomycin-resistant enterococci colonization in a children's hospital. Am J Infect Control 26:569-571.

Current and Completed Research Support:

1. Thrasher Award 02814-2: Rheumatic fever and Streptococcal surveillance program in Utah 1998-2001
   $20,000 – Principal Investigator
2. NIAID-DIR-RML-01-55: Group A Streptococcus-Resurgence of Rheumatic Fever and Invasive 2002-2005
   Disease in the Intermountain West. $2,797.705 – Co-Investigator
3. NIAID U01-A1061611-01: PCR Identification of Respiratory Viruses including SARS. 2005-2009
   $4,000,000 – Co-Investigator
4. NIAID U01-A1082184-01: Film Array Biothreat Pathogens: An Automated Multiplex PCR Diagnostic
   System. $3, 011, 439 – Co-investigator 2009-2011
5. Centers for Disease Control and Prevention: Measuring Effectiveness of a New 13-Valent Pneumococcal
   Conjugate Vaccine. $112,924 – Co-investigator 2009-2011
6. NIH 1 R01 A1089489-01: An Automated Multi-Target Diagnostic System for Gastrointestinal
   Pathogens. $3,366,210 – Co-investigator 2010-2013

BIOGRAPHICAL SKETCH

NAME	**POSITION TITLE**
Kimberly E. Hanson, M.D., M.H.S.	Assistant Professor of Medicine and Pathology
eRA COMMONS USER NAME [redacted]	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Northwestern University, Evanston IL	BA	9/90-6/94	Anthropology
Northwestern University, Chicago IL	MD	9/94-6/98	Medicine
Duke University, Durham NC	MHS	7/03-7/06	Health Sciences Research

A. Personal Statement

Meningitis and encephalitis are devastating diseases. These infections are among the ten most common infectious causes of death worldwide each year and neurologic sequelae are common among survivors. The ability to promptly initiate appropriate therapy is critical for favorable clinical outcomes. However, early diagnosis is complicated by low levels of antigenic markers that signal disease onset and/or prior receipt of antibiotics which limit the utility of culture. The ultimate goal of this project is to develop a simple, rapid, and affordable laboratory test that will serve as a cornerstone for the confident diagnosis of acute central nervous system (CNS) infection. I will serve as a co-investigator on the project. My training in conjunction with real-world experience as the director of a large medical microbiology laboratory uniquely qualifies me to help lead the proposed research. The foundation of my expertise stems from formal training in Adult Infectious Diseases and Clinical Microbiology. To strengthen my research capabilities, I also obtained a Master's degree in Health Sciences Research. This coursework included instruction in study design, research management, biostatistical analysis, and the protection of human/animal subjects. With this skill set in hand, I have successfully completed a number of team-oriented research projects involving the development and/or clinical validation of novel diagnostic tests for infectious diseases. The current SBIR builds nicely on my prior work. I also remain actively involved in patient care, specializing in the diagnosis and management of transplant related infectious diseases. CNS infections are a important potential complication of immunosuppression. As a physician I have a firsthand appreciation of the critical need for new and improved meningitis/encephalitis diagnostics. Furthermore, as a microbiologist, I have an extensive understanding of the test characteristics and assay validation steps required to establish clinical utility.

B. Positions and Honors

Positions and Employment

1998-2001	Internal Medicine Resident, Dartmouth-Hitchcock Medical Center
2001-2002	Chief Medical Resident, Dartmouth-Hitchcock Medical Center
2002-2004	Infectious Diseases Fellow, Duke University Medical Center
2004-2005	Medical Microbiology Fellow, Duke University Medical Center
2005-2008	Instructor, Medicine and Pathology, Duke University Medical Center
2005-2008	Associate Director, Duke Molecular Microbiology Laboratory
2008- Present	Assistant Professor, Medicine and Pathology, University of Utah
2008- Present	Director, Immunocompromised Host Service, University of Utah Health Sciences Center
2008- 2010	Section Head, Mycology, Mycobacteriology and Virology, ARUP Laboratories
2010-Present	Medical Director, Clinical Microbiology, ARUP Laboratories

Academic Honors

1991	N-Club Award for Outstanding Student Athlete, Northwestern University
1991-1994	Academic All BigTen Conference, Women's Volleyball
1994	Honors Graduate, Northwestern University
2004	Infectious Diseases Fellowship**,** Alpha Omega Alpha
2005	Fellow Research Award, 43rd Infectious Diseases Society of America Meeting
2007-2010	NIH Loan Repayment Award

Professional Societies

2002-Present	Member, American Society of Transplantation
2003-Present	Member, Infectious Diseases Society of America
2004-Present	Member, American Society of Microbiology

C. Peer-Reviewed Publications (15 of 15 with relevance to the field)

1. Mirrett S, **Hanson KE**, and Reller LB. Controlled Clinical Comparison of VersaTREK® versus BacT/ALERT® Blood Culture Systems. *Journal of Clinical Microbiology* 2007; 45(2): 299-302.
2. Alexander BD, Byrne TC, Smith KL, **Hanson KE**, Anstrom KJ, Perfect JR, Reller LB. Comparative Evaluation of Etest and Sensititre YeastOne Panels against the Clinical and Laboratory Standards Institute M27-A2 Reference Broth Microdilution Method for Antifungal Susceptibility Testing of *Candida* to Seven Antifungal Agents. *Journal of Clinical Microbiology* 2007; 45 (3): 698-706.
3. **Hanson KE**, Alexander BD, Woods C, Petti C, and Reller LB. Validation of Laboratory Screening Criteria for Herpes Simplex Virus Testing on Cerebrospinal Fluid. *Journal of Clinical Microbiology* 2007; 45 (3): 721-724.
4. **Hanson KE**, Reller B, Kurtzberg J, Horwitz M, Long G, and Alexander BD. Comparison of the Roche CMV UL54 Analyte Specific Reagent and Qiagen RealArt™ CMV LC PCR Reagent, with Digene Hybrid Capture® System CMV DNA Test (version 2.0) using AcroMetrix OptiQuant™ CMV DNA Quantification Panels and Specimens from Allogeneic Stem Cell Transplant Recipients. *Journal of Clinical Microbiology* 2007; 45 (6): 1972-1973.
5. Reddy AJ, Zaas AK, **Hanson KE**, and Palmer SM. A single Center Experience with Ganciclovir Resistant Cytomegalovirus in Lung Transplant Recipients: Treatment and Outcome. *J Heart Lung Transplant*. 2007; 26(12):1286-92.
6. Hobeika A, Osada T, Serra D, Peplinski S, **Hanson KE**, Tanaka Y, Niedzwiecki D, Chao N, Rizzieri D, Lyerly H, Clay T, Morse M. Detailed analysis of cytomegalovirus (CMV)-specific T cells expanded for adoptive immunotherapy of CMV infection following allogeneic stem cell transplantation for malignant disease. *Cryotherapy* 2008;10(3):289-302.
7. **Hanson KE**, Reckleff J, Hicks L, Castellano C, and Hicks CB. Unsuspected HIV Infection in Patients Presenting with Acute Meningitis. *Clinical Infectious Diseases* 2008 Aug 1; 47(3):433-4.
8. Jazrawi A, Jones M, Kfoury AG, Fisher PW, Gilbert EM, Bader F, Pombo D, **Hanson KE**, Stehlik J. Tuberculosis in a Solid Organ Transplant Recipient: Modern-day Implications. *J of Heart and Lung Transplant.* 2009 Feb; 28(2):191-3.
9. Waddle EA, **Hanson KE,** Jhaveri R. Follow-up analysis of serious bacterial infections in children with fever without localizing signs: how do the National Institute for Clinical Excellence guidelines perform with the emergence of non-vaccine pneumococcal serotypes? *Arch Dis Child.* 2009 Mar; 94(3):247.
10. Cloud JL, **Hanson KE**, Bauman SK, Ashwood ER. Extent of inter-laboratory discrepancies for polyclonal Histoplasma antigen enzyme immunoassay cannot be determined without a large split-sample study. *Diagn Microbiol Infect Dis*. 2010 Feb; 66(2):233-4.
11. Couturier BA, Bender JM, Schwarz MA, Pavia AT, **Hanson KE**, She RC. Oseltamivir Resistant Influenza A 2009 H1N1 in Immunocompromised Patients**.** *Influenza Other Resp Viruses.* 2011 Jul; 4 (4): 199-204.
12. Syed S, Aderinboye O, **Hanson KE**, Spitzer E. Cervical lymphadenitis due to Mycobacterium Florentinum. Emerging Infectious Diseases. Emerg Infect Dis. 2010 Sep;16(9):1486-7.
13. Rubach MP, Bender JM, Mottice S, **Hanson KE**, Weng HY, Korgenski K, Daly JA, Pavia AT. Increasing incidence of invasive Haemophilus influenzae disease in adults, Utah, USA. *Emerg Infect Dis.* 2011 Sep; 17(9):1645-50.

14. Slechta ES, Hohmann SL, Simmon K, **Hanson KE**. (2011). Internal transcribed spacer region sequence analysis using SmartGene IDNS software for the identification of unusual clinical yeast isolates. *Med Mycol*. (Epub ahead of print).

15. Couturier MR, Slechta ES, Goulston C, Fisher MA, **Hanson KE**. (2012). Leptotrichia bacteremia in patients receiving high dose chemotherapy. *J Clin Microbiol*. (Epub ahead of print).

D. Research Support

Current Funding

1 R21 AI085476-01 **6/1/2010 – 5/31/2012** **$417,391**

Principal Investigator: Marc D. Porter, PhD

Project Title: SERS Assay Development for Invasive Aspergillosis (IA)

The aim of this project is to develop a surface enhanced Raman spectroscopy (SERS) platform for the detection of *Aspergillus* antigens in a variety of biologic matrices.

Role: co-PI Effort: 10%

1 U18FDA004034-02 **09/17/10 - 09/30/11** **$725,000**

Principal Investigator: Marc D. Porter, PhD

Project Title: Development and Validation of POC Tests for TB

The ultimate goal of this project is to develop an accurate an inexpensive laboratory test for the point of care diagnosis of TB using serum and urine specimens.

Role: co-PI Effort: 10%

1 R21 1R21AI092231-01 **12/14/2010 – 11/30/2012** **$413, 383**

Principal Investigator: Marc D. Porter, PhD

Project Title: Production and Characterization of Stage Specific *Aspergillus* Antigens

This project entails producing and characterizing recombinant *Aspergillus* antigens for use as mouse immunogens. The ultimate goal is the generation of growth stage-specific monoclonal antibodies to be used in a multiplexed Aspergillus immunoassay.

Role: co-PI Effort: 5%

Completed Research

Pfizer GA88517X **6/18/2007 – 12/18/2011** **$363,286**

Principal Investigator: Kimberly Hanson, MD

Project Title: "Randomized Comparison of β-D-Glucan Surveillance with Preemptive Anidulafungin versus Standard Care for the Management of Invasive Candidiasis in Surgical Intensive Care Unit Patients"

This is an investigator initiated prospective randomized trial assessing the utility and safety of a preemptive antifungal treatment strategy in high-risk surgical ICU patients.

Role: PI Effort: 15%

1KL2-RR-024127-01 (Duke Clinical Translational Sciences Institute)

Principal Investigator: Robert Califf, MD

Project Title: "Novel Diagnostic Tests for the Management of CMV Infection after Transplantation"

The focus of this project was the development of a novel diagnostic method for the detection of drug resistant CMV infection after transplantation.

Role: Clinical Research Trainee, 07/2005 to 07/2008

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Beth Lingenfelter	Director of Regulated Products
eRA COMMONS USER NAME (credential, e.g., agency login)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
University of Utah	BS	05/1985	Medical Technology
University of Illinois at Chicago	M.S.	05/1990	Medical Laboratory Science

A. Personal Statement

In my position as Director of Regulated Products at Idaho Technology, I have gained extensive experience in regulatory submissions including overseeing all aspects of 10 successful 510(k) clearances (see publication section for a complete list). All of Idaho Technology's previous 510(k) clearances are highly relevant to this project as they were for molecular diagnostic devices aimed at the detection of human pathogens and involved working closely with the Microbiology section of FDA's Office of In Vitro Diagnostic Device Evaluation and Safety (OIVD). In 2011 we obtained 510(k) clearances' for the FilmArray instrument and a FilmArray Respiratory Panel. Obtaining FDA clearance for the Respiratory Panel is very similar to this project to develop a meningoencephalitis specific panel as it involves a multiplex system that detects a broad range of pathogens related to a specific set of patient symptoms. The experience gained with FDA clearances' for multiplex devices resulted in the FDA OVID directly contacting us to provide public comments on a concept paper titled 'Advancing Regulatory Science for Highly Multiplexed Microbiology and Medical Counter Measure Devices', which I provided at a public meeting held by FDA in October 2011. My department's extensive experience with overseeing successful regulatory submissions for highly multiplexed molecular diagnostics and my established relationship with the FDA OVID Microbiology Section will enable us to give useful input during the development of the FAME panel. We have a vested interest in monitoring the development process because it is our group that will perform the clinical and analytical evaluation in a future Phase II submission.

B. Positions and Honors

Positions and Employment

2008-present	Director of Regulated Products, Idaho Technology, Inc. Salt Lake City, UT.
2004-2008	Manager of Regulatory Affairs, Idaho Technology, Inc. Salt Lake City, UT.
2001-2004	Director of Quality Assurance and Regulatory Affairs, Idaho Technology, Inc., Salt Lake City, UT.
1996-2001	Director of Quality Assurance and Regulatory Affairs, Myriad Genetic Laboratories, Inc., Salt Lake City, UT.
1996-1991	Instructor (Clinical), School of Medicine, Department of Pathology, Medical Laboratory Science Program, University of Utah, Salt Lake City, UT.
1991-1989	Supervisor - Immunohematology Reference Laboratory, Intermountain Health Care (IHC) Blood Services, Salt Lake City, UT.
1989-1988	Immunohematology Reference Laboratory Technologist, Life Source, Chicago, IL.
1988-1986	Transfusion Service Technologist, University of Illinois Hospital, Chicago, IL. Transfusion Service Technologist, Associated Regional and University Pathologists (ARUP), Salt Lake City, UT.

Professional Training and Certifications

1989 Specialist in Blood Banking (SBB #3595), American Association of Blood Banks and the American Society for Clinical Pathologists.
1985 Medical Technologist (MT#165476), American Society for Clinical Pathologists.

C. Selected Peer-Reviewed Publications and Regulatory Submissions

Selected Peer-Reviewed Publications

Poritz, M. A., A. J. Blaschke, C. L. Byington, L. Meyers, K. Nilsson, D. E. Jones, S. A. Thatcher, T. Robbins, **B. Lingenfelter**, E. Amiott, A. Herbener, J. Daly, S. F. Dobrowolski, D. H. Teng, and K. M. Ririe. "Filmarray, an Automated Nested Multiplex PCR System for Multi-Pathogen Detection: Development and Application to Respiratory Tract Infection." PLoS One 6 (10): e26047, 2011.

Frank, T.S., Deffenbaugh, A.M., Reid, J.E., Hulick, M., Ward, B.E., **Lingenfelter, B**, Gumpper, K.L., Scholl, T., Tavtigian, S.V., Pruss, D.R., and Critchfield, G.C., "Clinical Characteristics of individuals with germline mutations in BRCA1 and BRCA 2: Analysis of 10,000 individuals. J Clin Oncol 20 (6): 1480-90, 2002.

Regulatory Submissions and Clearences

2011 JBAIDS Q Fever Detection Kit (K103207)
2011 Modification of FilmArray Respiratory Panel, addition Parainfluenza 1, 2 and 4 (K110764)
2011 FilmArray Respiratory Panel and instrument (K103175)
2011 JBAIDS Influenza A and B Detection Kit (K111775)*
2011 JBAIDS Influenza A subtyping Kit (K111778)*
2010 JBAIDS Influenza A/H5 Detection Kit (K100287)*
2007 JBAIDS Plague Detection Kit (K072631)
2007 JBAIDS Tularemia Detection Kit (K072547)
2007 Modification to JBAIDS Anthrax Detection Kit, addition of new sample purification method (K071188)
2005 JBAIDS Anthrax Detection System and JBAIDS instrument (K051713)

* The sponsor of the 510(k) for these products is the US Army Surgeon General, however, under contract with the Department of Defense, Idaho Technology was responsible for all aspects of obtaining FDA clearance for these products.

D. Research Support

Ongoing Research Support

NIH, NIAID, 1 R01 AI089489-01 (PI Rogatcheva), 7/2010 – 6/2013
An Automated Multi-target Diagnostic System for Gastrointestinal Pathogens
The challenge in diagnosing infectious diarrhea is the large number and diversity of the pathogens that are known to cause diarrhea, including viruses, bacteria and protozoa. We propose to develop the FilmArray Gastrointestinal Pathogen System, a rapid (<1 hour), automated, sensitive, objective and inexpensive test able to detect 22 diarrhea causing pathogens in a single step. This novel tool will overcome diagnostic difficulties, improve the treatment and reduce the cost of diarrheal illness for individual patients, and improve public health by rapid detection of outbreaks.
Role: Key Personnel

DOD Contract # HDTRA1-09-C-0068 PI: Kristen Kanack 09/30/2009-09/29/2013
Acceleration of Deployment of an Infectious Disease and Biothreat Advanced Diagnostic Device with CLIA Waiver

The purpose of this requirement is to accelerate the deployment of an infectious disease diagnostic device with FDA CLIA waiver. Infectious disease continues to be a formidable opponent for both garrison and deployed troops. There is currently no technology for pathogen identification that can identify numerous pathogens simultaneously, has integrated sample preparation, occurs in less than three hours, or is CLIA – waived for ease of use by novice laboratory personnel. Currently identified as a moderately complex device, completing the work for a CLIA waiver would allow the device to be used with minimal training (to non-laboratory personnel) in any setting.
Role: Key Personnel

DOD Contract # DASG60-03-C-0094 09/23/2003-04/30/2013
Joint Biological Agent Identification and Diagnostic System (JBAIDS)
This system can rapidly identify biological warfare agents and pathogens in a variety of clinical and environmental samples that may be encountered in field and hospital laboratories. JBAIDS will enhance force protection by providing health care providers with accurate information upon which to base diagnosis and treatment and upon which to notify commanders of biological warfare threats and pathogens of operational concern in their areas of protection. JBAIDS can be defined as the platform test equipment hardware and associated internal software, reagent kits for biological warfare agents, processing protocols, computer and protective case.
Role: PI for specific aims related to FDA clearance of JBAIDS platform and reagent kits

Past Research Support

DOD Contract # FA7014-08-C-0004 PI: Beth Amiott 03/21/2008-03/20/2011
Real-Time RT-PCR Diagnosis of Influenza A Virus on the FilmArray
The aim of this project is to expedite FDA clearance of the FilmArray RP system so that it can be used for clinical diagnostic purposes (Aim 1). To help ensure that the FilmArray can be effectively utilized by the military, a shipping case that meets MIL-STD-810E will be designed and validated (Aim 2) and a software module will be developed to allow data transfer to military health care systems, such as the Armed Forces Health Longitudinal Technology Application (AHLTA) (Aim 3). Finally, a plan to achieve CLIA waived status for the FilmArray will be developed (Aim 4).
Role: Key Personnel

DOD Contract # W9113M-10-C-0028 02/19/2010-06/18/2011
Influenza Assay Development for the Joint Biological Agent Identification and Diagnostic System
The purpose of this effort is to develop in vitro diagnostic (IVD) assays for the detection of Influenza A, influenza B, and Influenza A subtypes for U.S. military force protection. Specifically, the company shall develop and validate real-time reverse transcriptase polymerase chain reaction (rRT-PCR) assays to aid in the clinical diagnosis of influenza A and B using the Joint Biological Agent Identification and Diagnostic System (JBAIDS) analyzer. The panel of assays shall be designed to identify clinical specimens that are positive for Influenza A or B, followed by subtyping the influenza A hemagglutinin. This suite of assays shall aid in military force protection by quickly identifying and differentiating influenza A and B infections enabling immediate and decisive action to reduce the spread of the virus to other military personnel. Additionally, the hemagglutinin subtyping assays shall aid in identifying trends in influenza outbreaks and test for strains of influenza A with the potential for pandemic and epidemiologic consequences.
Role: Key Personnel

Program Director/Principal Investigator (Last, First, Middle):

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contr butors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Stephanie Anne Thatcher	Director of Systems Integration
eRA COMMONS USER NAME (credential, e.g., agency login) n/a	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Nevada, Las Vegas	B.S.	1994	Chemistry, minor in Mathematics
University of Utah	M.S.	2000	Biology

A. Personal Statement

For the last 8 years I have directed the group that develops the nucleic acid purification protocols for all of ITI's different pathogen detection systems. In particular my team developed the FilmArray sample purification protocols for Nasal Swabs, Blood culture, Stool and several others sample matrices. This has given me the knowledge and experience to carry out the work described in SA 2 of this grant application – to optimize the protocol for purification of pathogens from CSF as part of the FilmArray FAME panel.

B. Positions and Honors

1994 American Chemical Society Undergraduate Award in Analytical Chemistry, UNLV
1994 American Institute of Chemists Award for outstanding senior in Chemistry, UNLV
1999-2000 NIH Genetics Training Grant, University of Utah
2000-2011 Research Scientist, Sample Purification Group Lead, Idaho Technology, Inc.
2011-present Director, Systems Integration, Idaho Technology, Inc.

C. Selected peer-reviewed publications

1. Roeder AD, Hermann GJ, Keegan BR, **Thatcher SA**, Shaw JM. (1998) Mitochondrial inheritance is delayed in *Saccharomyces cerevisiae* cells lacking the serine/threonine phosphatase PTC1. Mol. Biol. Cell. 9(4): 917-30.

2. **Thatcher S**, Bennett C, Tolman J, Upwall A, Fowden S, Chen Y, Ngan V, Millward H, Tuck K, Teng D. (2005) A new set of DNA and RNA purification kits for bacteria and viruses from a variety of sample types. ASM General Meeting. (meeting presentation)

3. Poritz M, Meyers L, Lewis A, Nilsson K, Murphy P, Hamilton M, Vaughn M, **Thatcher S**, Hulsberg J, Mudrow R, Smith B, Fisher J, Jones D, Estes C, Teng D, Crisp R, Abbott R, Dobrowolski S, Blaschke A, Korgenski K, Daly J, Byington C, Ririe K. (2008) Analysis of 250 Pediatric NPA Samples for 21 Respiratory Pathogens Using an Automated, Nested Multiplex PCR Platform. (meeting presentation)

4. Henriquez M, Fawson C, Burdick M, Gundry C, Merx S, Fowden S, Valesquez A, Jeffs S, Hulsberg J, Uzzell G, Teng D, **Thatcher S**. (2009) The Platinum Path Kit: A Single Nucleic Acid Purification Kit for a Variety of Sample Types, a Tool for Bioterrorism Preparedness. ASM General Meeting abstract. (meeting presentation)

Program Director/Principal Investigator (Last, First, Middle):

5. Poritz, M. A., A. J. Blaschke, C. L. Byington, L. Meyers, K. Nilsson, D. E. Jones, **S. A. Thatcher**, T. Robbins, B. Lingenfelter, E. Amiott, A. Herbener, J. Daly, S. F. Dobrowolski, D. H. Teng, and K. M. Ririe. "Filmarray, an Automated Nested Multiplex Pcr System for Multi-Pathogen Detection: Development and Application to Respiratory Tract Infection." PLoS One 6 (10): e26047, 2011. PMCID: PMC3198457

D. Research Support

DOD Chemical and Biologics Operations Branch 03/30/07-06/30/09
DASG60-03-C-0094 P00049. Joint Biological Agent Identification and Diagnostics System (JBAIDS)
JBAIDS Extraction Kit Consolidation RDT&E Effort

A funded DOD proposal for development of a consolidated sample purification kit with magnetic bead technology. Protocols developed utilize one kit for 17 clinical and environmental matrices, including stool, that require less equipment and time. Kit developed for potential use with automation in the future and additional human sample types that may be required.

NIH, NIAID 1R43HL094743-01 (PI Ota) 7/2009 – 6/2011
FilmArray Biothreat Pathogens: An Automated Multiplex PCR Diagnostic System
1) Produce FilmArray biothreat assays that identify biowarfare agents and common pathogens. 2) Increase the number of organisms detected by building a 224-well 2nd stage PCR array. 3) Develop methods for FilmArray automated isolation of bacterial and viral DNA and RNA from nasal swabs and cerebral spinal fluid (CSF). 4) Develop software to facilitate the automated identification of pathogen(s) within a specimen. 5) Validate the FilmArray biothreat system with human samples, including nasal swabs, blood, and CSF at ITI and external laboratories.

Role: Lead for nucleic acid purification

OMB Number: 4040-0001
Expiration Date: 06/30/2011

Previous Period

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Idaho Technology Inc.

Delete Entry *** Start Date:** 01/01/2013 *** End Date:** 12/31/2013 **Budget Period** 1

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Mr.	Mark	Aaron	Poritz	Ph.D.	PD/PI		[redacted]			[redacted]	[redacted]	[redacted]
2.	Ms.	Stephanie		Thatcher	MS	Scientist		[redacted]			[redacted]	[redacted]	[redacted]
3.	Ms.	Beth		Lingenfelter	MS	Regulatory		[redacted]			[redacted]	[redacted]	[redacted]
4.													
5.													
6.													
7.													
8.													
9.	**Total Funds requested for all Senior Key Persons in the attached file**												
												Total Senior/Key Person	[redacted]

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Scientist I	[redacted]			[redacted]	[redacted]	[redacted]
1	Scientist I	[redacted]			[redacted]	[redacted]	[redacted]
1	RA 1	[redacted]			[redacted]	[redacted]	[redacted]
1	RA 2	[redacted]			[redacted]	[redacted]	[redacted]
4	**Total Number Other Personnel**					**Total Other Personnel**	[redacted]

Total Salary, Wages and Fringe Benefits (A+B) [redacted]

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: [redacted]

* Budget Type: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Idaho Technology Inc.

Delete Entry * Start Date: 01/01/2013 * End Date: 12/31/2013 Budget Period 1

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.	Total funds requested for all equipment listed in the attached file	
	Total Equipment	

Additional Equipment: Add Attachment Delete Attachment View Attachment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	
	Total Travel Cost	

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

Next Period

* ORGANIZATIONAL DUNS: [redacted]

* Budget Type: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Idaho Technology Inc.

Delete Entry * Start Date: 01/01/2013 * End Date: 12/31/2013 Budget Period 1

F. Other Direct Costs	Funds Requested ($)
1. Materials and Supplies	[redacted]
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	[redacted]

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
1.	Modified Total Direct Costs	[redacted]	[redacted]	[redacted]
2.				
3.				
4.				
	Total Indirect Costs			[redacted]

Cognizant Federal Agency DCAA, Joni Youngberg, [redacted]

(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	Funds Requested ($)

K. * Budget Justification 1241-SBIR Budget Justification ITI 201 Add Attachment Delete Attachment View Attachment

(Only attach one file.)

OMB Number: 4040-0001
Expiration Date: 06/30/2011

Previous Period

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS: [redacted]

* Budget Type: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Idaho Technology Inc.

Delete Entry * Start Date: 01/01/2014 * End Date: 06/30/2014 Budget Period 2

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Mr.	Mark	Aaron	Poritz	Ph.D.	PD/PI		[redacted]			[redacted]	[redacted]	[redacted]
2.	Ms.	Stephanie		Thatcher		Scientist		[redacted]			[redacted]	[redacted]	[redacted]
3.	Ms.	Beth		Lingenfelter		Regulatory		[redacted]			[redacted]	[redacted]	[redacted]
4.													
5.													
6.													
7.													
8.													

9. Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person [redacted]

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Scientist 1	0.60			[redacted]	[redacted]	[redacted]
1	Scientist 1	0.60			[redacted]	[redacted]	[redacted]
1	RA 1	1.50			[redacted]	[redacted]	[redacted]
1	RA 2	1.50			[redacted]	[redacted]	[redacted]
4	**Total Number Other Personnel**					**Total Other Personnel**	[redacted]

Total Salary, Wages and Fringe Benefits (A+B) [redacted]

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS: [redacted]

* Budget Type: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Idaho Technology Inc.

Delete Entry * Start Date: 01/01/2014 * End Date: 06/30/2014 Budget Period 2

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.	Total funds requested for all equipment listed in the attached file	
	Total Equipment	

Additional Equipment: Add Attachment Delete Attachment View Attachment

D. Travel **Funds Requested ($)**

1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	
	Total Travel Cost	

E. Participant/Trainee Support Costs **Funds Requested ($)**

1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / Total Participant/Trainee Support Costs	

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 2

Next Period

* ORGANIZATIONAL DUNS: [redacted]

* Budget Type: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Idaho Technology Inc.

Delete Entry * Start Date: 01/01/2014 * End Date: 06/30/2014 Budget Period 2

F. Other Direct Costs	Funds Requested ($)
1. Materials and Supplies	[redacted]
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	[redacted]
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	[redacted]

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
1. Modified Total Direct Costs	[redacted]	[redacted]	[redacted]
2.			
3.			
4.			
Total Indirect Costs			[redacted]

Cognizant Federal Agency DCAA, Joni Youngberg, [redacted]

(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	Funds Requested ($)

K. * Budget Justification 1241-SBIR Budget Justification ITI 201 Add Attachment Delete Attachment View Attachment

(Only attach one file.)

BUDGET JUSTIFICATION (Idaho Technology)

Personnel

Mark Poritz, PhD (3.6 cal mos, 20% FTE for 18 months)

Dr. Poritz is a Director of Biochemistry at Idaho Technology Inc. He has been involved the development of the FilmArray instrument and the initial development of both the RP and BCID pouches. Dr. Poritz will be supervise the new assay development and FAME pouch design (SA1). He will coordinate the distribution of FAME pouches to the collaborators. He will also be responsible for analyzing FilmArray data and organization of data review with co-investigators.

Stephanie Thatcher, MS (1.5 mos , 10% FTE for year1, 5% in year 2)

Ms. Thatcher is Director of Systems Integration at ITI. She has been involved nucleic acid sample preparation for both previous generations of ITI instruments as well as for the FilmArray. Ms. Thatcher will supervise the nucleic acid sample purification and sample enrichment (SA2)

Beth Lingenfelter, MS (0.9 cal mos, 5% FTE for 18 months)

Ms. Lingenfelter is Director of Regulated Products at ITI. She has supervised the submission of ten successful 510(k) submissions to the FDA. Ms. Lingenfelter will monitor the data coming from FAME pouch development and give input as to what further studies are warranted.

2 Scientists (8.4 mos , 30% FTE for year1, 10% in year 2)

2 scientists will do the FAME panel development work (SA1) and the optimization of nucleic acid purification (SA2) with the aid of the RAs.

2 Research Associates (21 mos , 75% FTE for year1, 25% in year 2)

The RAs will be responsible for assay development (SA1) and sample testing at ITI (SA1 and SA2).

ITI resources

Approximately 500 FilmArray pouches will be necessary to complete SA1-3. Idaho Technology will provide these pouches at its own cost and will not be charging the cost to the grant.
At any one time there are more than 30 FilmArray instruments available for general use by different projects at ITI; thus a FilmArray instrument has not been budgeted specifically for this project.

The budget does include reagents required for bench top PCR to develop the new assays that will go into the FAME panel as well as the reagents to optimize the pre enrichment step of SA2.

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		[redacted]
Section B, Other Personnel		[redacted]
Total Number Other Personnel	8	
Total Salary, Wages and Fringe Benefits (A+B)		[redacted]
Section C, Equipment		
Section D, Travel		
1. Domestic		
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		[redacted]
1. Materials and Supplies	[redacted]	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	[redacted]	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		[redacted]
Section H, Indirect Costs		[redacted]
Section I, Total Direct and Indirect Costs (G + H)		[redacted]
Section J, Fee		

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: University of Utah

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

A. Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Anne	J	Blaschke	MD	PI-Subaward		0.01			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** **0.00**

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	
						Total Salary, Wages and Fringe Benefits (A+B)	**0.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: University of Utah

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	**Funds Requested ($)**
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: University of Utah

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

F. Other Direct Costs	Funds Requested ($)
Total Other Direct Costs	

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	0.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
		Total Indirect Costs	

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	0.00

J. Fee	Funds Requested ($)

K. * Budget Justification	File Name: 1244-SBIR Budget Justification Blascke 20120404 mp.pdf (Only attach one file.)	Mime Type: application/pdf

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: University of Utah

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

A. Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Anne	J	Blaschke	MD	PI-Subaward		[redacted]			[redacted]	[redacted]	[redacted]

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** [redacted]

B. Other Personnel

* Number of Personnel		* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates							
	Graduate Students							
	Undergraduate Students							
	Secretarial/Clerical							
1	Research Technician		[redacted]			[redacted]	[redacted]	[redacted]
1	**Total Number Other Personnel**					**Total Other Personnel**		[redacted]

Total Salary, Wages and Fringe Benefits (A+B) [redacted]

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: University of Utah

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: University of Utah

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	[redacted]
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	[redacted]

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Modified Total Direct Costs	[redacted]	[redacted]	[redacted]
		Total Indirect Costs	[redacted]

Cognizant Federal Agency DHHS, Wallace Chan, (415) 437-7820

(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	**Funds Requested ($)**
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 1244-SBIR Budget Justification Blascke 20120404 mp.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)	
Section A, Senior/Key Person		[redacted]
Section B, Other Personnel		[redacted]
Total Number Other Personnel	1	
Total Salary, Wages and Fringe Benefits (A+B)		[redacted]
Section C, Equipment		
Section D, Travel		
1. Domestic		
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		[redacted]
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services	[redacted]	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		[redacted]
Section H, Indirect Costs		[redacted]
Section I, Total Direct and Indirect Costs (G + H)		[redacted]
Section J, Fee		

BUDGET JUSTIFICATION (Dr. Blaschke, University of Utah)

Personnel

Anne J. Blaschke, MD, PhD (0.6 cal mos, 10% FTE for months 12 to 18)

Dr. Blaschke is a pediatric infectious diseases physician at the University of Utah and has a history of collaboration with ITI. Dr. Blaschke is an expert in molecular diagnostic testing and has worked extensively with ITI to develop the FilmArray assays to detect bacterial pathogens. She will assist with the design of the analytical testing and clinical evaluation components. She will also assist ITI in performing data analysis for the clinical evaluation components from PCMC.

Research Technician (0.6 cal mos, 10% FTE for months 12 to 18)

A Research Technician from Dr. Blaschke's laboratory will assist with analyzing CSF specimens collected at PCMC

Other Services

Kent Korgenski, Data Analyst (0.3 cal mos, 5% FTE for months 12 to 18)

Mr. Korgenski will abstract data from Intermountain Healthcare's Enterprise Data Warehouse (EDW) on the subjects enrolled at PCMC. Although Mr. Korgenski is an Intermountain Healthcare employee, he is contractually paid by the Department of Pediatrics. His time on this project working with Dr. Blaschke will be paid through this contractual agreement.

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: PCMC / IHC

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Ms.	Judy	Anne	Daly	PhD	PI Subaward		[redacted]			[redacted]	[redacted]	[redacted]

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** **0.00**

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	
						Total Salary, Wages and Fringe Benefits (A+B)	[redacted]

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: PCMC / IHC

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	**Funds Requested ($)**
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: PCMC / IHC

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

F. Other Direct Costs	Funds Requested ($)
Total Other Direct Costs	

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
		Total Indirect Costs	

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	Funds Requested ($)

K. * Budget Justification	File Name: 1245-SBIR Budget Justification Daly 20120404 mp.pdf (Only attach one file.)	Mime Type: application/pdf

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: PCMC / IHC

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Ms.	Judy	Anne	Daly	PhD	PI Subaward		[redacted]			[redacted]	[redacted]	[redacted]

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** [redacted]

B. Other Personnel

* Number of Personnel		* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates							
	Graduate Students							
	Undergraduate Students							
	Secretarial/Clerical							
1	Lab Technician		[redacted]			[redacted]	[redacted]	[redacted]
1	**Total Number Other Personnel**					**Total Other Personnel**		[redacted]
						Total Salary, Wages and Fringe Benefits (A+B)		[redacted]

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: PCMC / IHC

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	**Funds Requested ($)**
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: PCMC / IHC

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

F. Other Direct Costs	Funds Requested ($)
Total Other Direct Costs	

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
		Total Indirect Costs	

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	Funds Requested ($)

K. * Budget Justification	File Name: 1245-SBIR Budget Justification Daly 20120404 mp.pdf (Only attach one file.)	Mime Type: application/pdf

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)	
Section A, Senior/Key Person		[redacted]
Section B, Other Personnel		[redacted]
Total Number Other Personnel	1	
Total Salary, Wages and Fringe Benefits (A+B)		[redacted]
Section C, Equipment		
Section D, Travel		
1. Domestic		
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		[redacted]
Section H, Indirect Costs		
Section I, Total Direct and Indirect Costs (G + H)		[redacted]
Section J, Fee		

BUDGET JUSTIFICATION (Dr. Judy Daly, PCMC/IMC)

Personnel

Judy Daly, Ph.D. (0.3 cal mo. 5.0% FTE for months 12 to 18)

Dr. Daly is the Director of the Microbiology Laboratory at Primary Children's Medical Center (PCMC), Salt Lake City, Utah. Dr Daly will supervise the specimen collection for the pediatric samples. Dr Daly will also supervise the technician who will prepare samples for transport to Dr. Blaschke's laboratory and to ITI.

Laboratory Technician TBD (0.6 cal mo. 10% FTE for months 12 to 18)

The Laboratory Technician will accept, label and store samples for transport to Dr. Blascke's laboratory and to ITI. CSF samples will be divided, labeled and stored for transport to ITI.

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: ARUP Laboratories

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Ms.	Kimberly		Hanson	MD	PI-Subaward		[redacted]			[redacted]	[redacted]	[redacted]

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** [redacted]

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	

Total Salary, Wages and Fringe Benefits (A+B) [redacted]

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: ARUP Laboratories

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: ARUP Laboratories

*** Start Date:** 01-01-2013 *** End Date:** 12-31-2013 **Budget Period: 1**

F. Other Direct Costs	Funds Requested ($)
Total Other Direct Costs	

G. Direct Costs	Funds Requested ($)
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
		Total Indirect Costs	

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	Funds Requested ($)

K. * Budget Justification	File Name: 1246-SBIR Budget Justification ARUP 20120404.pdf (Only attach one file.)	Mime Type: application/pdf

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: ARUP Laboratories

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Ms.	Kimberly		Hanson	MD	PI-Subaward		[redacted]			[redacted]	[redacted]	[redacted]

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** [redacted]

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	
						Total Salary, Wages and Fringe Benefits (A+B)	[redacted]

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: ARUP Laboratories

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	**Funds Requested ($)**
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** [redacted]

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: ARUP Laboratories

*** Start Date:** 01-01-2014 *** End Date:** 06-30-2014 **Budget Period: 2**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	[redacted]
2. Publication Costs	
3. Consultant Services	[redacted]
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	[redacted]

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	[redacted]

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Modified Total Direct Costs	[redacted]	[redacted]	[redacted]
		Total Indirect Costs	[redacted]

Cognizant Federal Agency DHHS, Wallace Chan, (415) 437-7820

(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	**Funds Requested ($)**
Total Direct and Indirect Institutional Costs (G + H)	[redacted]

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 1246-SBIR Budget Justification ARUP 20120404.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)
Section A, Senior/Key Person	[redacted]
Section B, Other Personnel	
Total Number Other Personnel	
Total Salary, Wages and Fringe Benefits (A+B)	[redacted]
Section C, Equipment	
Section D, Travel	
1. Domestic	
2. Foreign	
Section E, Participant/Trainee Support Costs	
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
6. Number of Participants/Trainees	
Section F, Other Direct Costs	[redacted]
1. Materials and Supplies	[redacted]
2. Publication Costs	
3. Consultant Services	[redacted]
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other 1	
9. Other 2	
10. Other 3	
Section G, Direct Costs (A thru F)	[redacted]
Section H, Indirect Costs	[redacted]
Section I, Total Direct and Indirect Costs (G + H)	[redacted]
Section J, Fee	

BUDGET JUSTIFICATION (Dr. Hanson, ARUP)

Personnel

Kimberly Hanson, MD, MHS (0.6 calendar months, 5% FTE for months 12 to 18)

Dr. Hanson is an adult infectious diseases physician at the University of Utah and serves as the Director of Clinical Microbiology within ARUP Laboratories. Dr. Hanson's research expertise is in the development and implementation of novel molecular diagnostic techniques for infectious diseases. She will assist with study design, maintain a study-specific CSF bio-repository at ARUP, oversee the analytical testing of banked CSF specimens with the FilmArray Meningitis assay, assist with data management and study results interpretation. She will also directly supervise the work of the research technician described below.

Research Technician (1.4 calendar months, 12% FTE for months 12 to 18)

A research technician, hired as a consultant from ARUP Laboratories, will maintain a CSF study repository (*i.e.* review routine ARUP microbiology results, retrieve positive CSF specimens at the time they would otherwise be discarded, link the sample to the routine microbiology results, completely de-identify the specimen and then log the specimen in to the study repository). The Research Technician will also be responsible for retrieving specimens of interest from the bio-repository and performing FilmArray testing on 150 specimens. FilmArray results will be entered in to a password protected study database.

SBIR/STTR Information

OMB Number: 4040-0001
Expiration date: 06/30/2011

*** Program Type (select only one)**

☒ SBIR ☐ STTR

☐ Both *(See agency-specific instructions to determine whether a particular agency allows a single submission for both SBIR and STTR)*

*** SBIR/STTR Type (select only one)**

☒ Phase I ☐ Phase II

☐ Fast-Track *(See agency-specific instructions to determine whether a particular agency participates in Fast-Track)*

Questions 1-7 must be completed by all SBIR and STTR Applicants:

☒ Yes ☐ No	* 1a. Do you certify that at the time of award your organization will meet the eligibility criteria for a small business as defined in the funding opportunity announcement?
	* 1b. Anticipated Number of personnel to be employed at your organization at the time of award. 350
☐ Yes ☒ No	* 2. Does this application include subcontracts with Federal laboratories or any other Federal Government agencies? * If yes, insert the names of the Federal laboratories/agencies:
☐ Yes ☒ No	* 3. Are you located in a HUBZone? To find out if your business is in a HUBZone, use the mapping utility provided by the Small Business Administration at its web site: http://www.sba.gov
☒ Yes ☐ No	* 4. Will all research and development on the project be performed in its entirety in the United States? If no, provide an explanation in an attached file. * Explanation: Add Attachment Delete Attachment View Attachment
☐ Yes ☒ No	* 5. Has the applicant and/or Program Director/Principal Investigator submitted proposals for essentially equivalent work under other Federal program solicitations or received other Federal awards for essentially equivalent work? * If yes, insert the names of the other Federal agencies:
☒ Yes ☐ No	* 6. Disclosure Permission Statement: If this application does not result in an award, is the Government permitted to disclose the title of your proposed project, and the name, address, telephone number and e-mail address of the official signing for the applicant organization, to organizations that may be interested in contacting you for further information (e.g., poss ble collaborations, investment)?
	* 7. Commercialization Plan: If you are submitting a Phase II or Phase I/Phase II Fast-Track Application, include a Commercialization Plan in accordance with the agency announcement and/or agency-specific instructions. * Attach File: Add Attachment Delete Attachment View Attachment

SBIR/STTR Information

SBIR-Specific Questions:

Questions 8 and 9 apply only to SBIR applications. If you are submitting ONLY an STTR application, leave questions 8 and 9 blank and proceed to question 10.

☒ Yes ☐ No	* 8. Have you received SBIR Phase II awards from the Federal Government? If yes, provide a company commercialization history in accordance with agency-specific instructions using this attachment. * Attach File: 1234-Fewer than 15 SBIR Phase I [Add Attachment] [Delete Attachment] [View Attachment]
☒ Yes ☐ No	* 9. Will the Project Director/Principal Investigator have his/her primary employment with the small business at the time of award?

STTR-Specific Questions:

Questions 10 and 11 apply only to STTR applications. If you are submitting ONLY an SBIR application, leave questions 10 and 11 blank.

☐ Yes ☐ No	* 10. Please indicate whether the answer to BOTH of the following questions is TRUE: (1) Does the Project Director/Principal Investigator have a formal appointment or commitment either with the small business directly (as an employee or a contractor) OR as an employee of the Research Institution, which in turn has made a commitment to the small business through the STTR application process; AND (2) Will the Project Director/Principal Investigator devote at least 10% effort to the proposed project?
☐ Yes ☐ No	* 11. In the joint research and development proposed in this project, does the small business perform at least 40% of the work and the research institution named in the application perform at least 30% of the work?

Idaho Technology has received fewer than 15 SBIR Phase II awards from the Federal Government during the last five fiscal years

PHS 398 Cover Page Supplement

OMB Number: 0925-0001

1. Project Director / Principal Investigator (PD/PI)

Prefix: Mr.
* First Name: Mark
Middle Name: Aaron
* Last Name: Poritz
Suffix: Ph.D.

2. Human Subjects

Clinical Trial? ☒ No ☐ Yes

* Agency-Defined Phase III Clinical Trial? ☐ No ☐ Yes

3. Applicant Organization Contact

Person to be contacted on matters involving this application

Prefix: Ms.
* First Name: Kaylynn
Middle Name:
* Last Name: Hansen
Suffix:

* Phone Number: [redacted]
Fax Number: [redacted]
Email: [redacted]

* Title: Director of Contract Administration

* Street1: 390 Wakara Way
Street2:
* City: Salt Lake City
County/Parish: Salt Lake
* State: UT: Utah
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 84108-1214

PHS 398 Cover Page Supplement

4. Human Embryonic Stem Cells

* Does the proposed project involve human embryonic stem cells? ☒ No ☐ Yes

If the proposed project involves human embryonic stem cells, list below the registration number of the specific cell line(s) from the following list: http://stemcells.nih.gov/research/registry/. Or, if a specific stem cell line cannot be referenced at this time, please check the box indicating that one from the registry will be used:

Cell Line(s): ☐ Specific stem cell line cannot be referenced at this time. One from the registry will be used.

OMB Number: 0925-0001

PHS 398 Research Plan

1. Application Type:

From SF 424 (R&R) Cover Page. The response provided on that page, regarding the type of application being submitted, is repeated for your reference, as you attach the appropriate sections of the Research Plan.

*Type of Application:

☒ New ☐ Resubmission ☐ Renewal ☐ Continuation ☐ Revision

2. Research Plan Attachments:

Please attach applicable sections of the research plan, below.

1. Introduction to Application (for RESUBMISSION or REVISION only)		Add Attachment	Delete Attachment	View Attachment
2. Specific Aims	1242-Menigitis SA and Resea	Add Attachment	Delete Attachment	View Attachment
3. *Research Strategy	1243-Menigitis SA and Resea	Add Attachment	Delete Attachment	View Attachment
4. Inclusion Enrollment Report		Add Attachment	Delete Attachment	View Attachment
5. Progress Report Publication List		Add Attachment	Delete Attachment	View Attachment

Human Subjects Sections

6. Protection of Human Subjects	1253-Meningitis SBIR protec	Add Attachment	Delete Attachment	View Attachment
7. Inclusion of Women and Minorities	1254-Meningitis SBIR Human	Add Attachment	Delete Attachment	View Attachment
8. Targeted/Planned Enrollment Table	1255-Meningitis SBIR Human	Add Attachment	Delete Attachment	View Attachment
9. Inclusion of Children	1256-Meningitis SBIR Human	Add Attachment	Delete Attachment	View Attachment

Other Research Plan Sections

10. Vertebrate Animals		Add Attachment	Delete Attachment	View Attachment
11. Select Agent Research		Add Attachment	Delete Attachment	View Attachment
12. Multiple PD/PI Leadership Plan		Add Attachment	Delete Attachment	View Attachment
13. Consortium/Contractual Arrangements		Add Attachment	Delete Attachment	View Attachment
14. Letters of Support	1257-Merged Blaschke_LOS_Men	Add Attachment	Delete Attachment	View Attachment
15. Resource Sharing Plan(s)		Add Attachment	Delete Attachment	View Attachment

16. Appendix Add Attachments | Remove Attachments | View Attachments

List of Research Plan Attachments

Specific Aims

Meningitis and encephalitis are inflammatory, often infectious, processes of the central nervous system (CNS) that can result in significant morbidity and mortality for those affected. Prompt, appropriate therapy is crucial, but determining the infectious etiology can be difficult and time-consuming. A wide-range of pathogens can be involved, including both bacteria and viruses, and therapy varies between etiologies. At present, culture is the gold standard for diagnosis of bacterial meningoencephalitis (ME), while amplification of viral DNA by the polymerase chain reaction (PCR) is the standard for many viral ("aseptic") causes. Though employed in clinical laboratories, most real-time PCR assays for viruses causing ME are not FDA cleared and may require considerable skill or resources to perform. New technologies for rapid detection of pathogens that cause acute ME are critical for accurate diagnosis and facilitation of effective treatment for these life-threatening infections.

Idaho Technology (ITI) has developed the FilmArray, an easy to use "lab in a pouch" PCR-based diagnostic system that can rapidly and simultaneously test for large panels of infectious agents. We propose to apply the FilmArray technology to the problem of ME diagnosis.

SA1: Develop a FilmArray Meningoencephalitis (FAME) panel (0-18 months)

We will combine assays from existing FilmArray panels with five new viral assays (in bold below) to construct a panel that can detect the following ME-causing organisms directly from cerebrospinal fluid (CSF):

Bacteria: *Enterobacteriaceae, Escherichia coli, Haemophilus influenzae, Neisseria meningitidis, Pseudomonas aeruginosa, Enterococcus* species*, Listeria monocytogenes, Mycoplasma pneumoniae, Staphylococcus* species (including *S. aureus*), and *Streptococcus* species (including *S. agalactiae, S. pneumoniae, S. pyogenes, viridians streptococci*)
Viruses: Enterovirus, **Parechovirus**, HSV1, HSV2, **VZV, EBV, CMV, HHV-6**

For each FAME panel assay, we will implement a corresponding published, or in-house developed singleplex real-time PCR assay. This will allow us to compare the sensitivity of the FAME pouch to that of established PCR assays when tested on CSF spiked with dilutions of organism(s). Those assays in the pouch that perform less well than conventional assays will be modified or replaced. **Milestones:** Development of a FilmArray pouch comprised of assays for the pathogens listed with demonstration of sensitive and specific pathogen detection in spiked CSF samples.

SA2: Optimize nucleic acid extraction for virus and bacteria from CSF (0-18 months)

CSF is one of the less complex sample matrices that have been processed on the FilmArray (when compared to nasal swabs, blood culture media, stool and even soil). Detection of bacteria, and virus directly from CSF without previous biological amplification in culture, however, may require further optimization of system sensitivity. To achieve this we will optimize the nucleic acid purification steps in the pouch and investigate simple steps to concentrate bacteria and viruses from 1 to 2 ml of CSF to the 0.1 ml injected into the pouch. **Milestones:** 1) Demonstration that FAME pouch performs equally with buffer and CSF, 2) Development of a protocol that lowers the limit of detection (LoD) by at least five-fold but does not add more than 1 hour to the total test time.

SA3: Test the FAME panel on CSF from pediatric and adult patients (12-18 months)

Our medical collaborators will perform a preclinical evaluation of the FAME pouch by testing up to 300 CSF samples from a population of pediatric and adult patients with suspected ME. We will compare the results of FAME panel testing to clinical standard-of-care testing supplemented with additional PCR assays described in SA1. **Milestone**: Demonstration of clinical sensitivity and specificity at least equal to existing clinical practice.

A successful outcome of this proposal will be a FilmArray pouch capable of rapid and accurate detection and identification of common ME pathogens. A future phase II proposal would focus on analytical and clinical performance evaluations of the FAME panel. The results of these studies will be included in a 510(k) application to the Food and Drug Administration (FDA) for clearance of the FAME panel for use as an in vitro diagnostic.

Dr. Poritz informs us that this section and the following were drafted largely by the Co-Investigators: Dr. Blaschke, Dr. Hanson and Dr. Daly. This demonstrates the importance of involving collaborators with different areas of expertise in the drafting of the application as well as performing the work.

Significance

Meningoencephalitis

Infections of the central nervous system (CNS) are important medical, neurological and sometimes neurosurgical emergencies that can result in serious morbidity and mortality. The two primary syndromes of CNS infection are “meningitis” (inflammation of the meninges or the covering of the brain) and “encephalitis” (inflammation of the brain tissue itself). Symptoms of meningitis include stiff neck and headache; a laboratory diagnosis of meningitis is made by detecting an elevated number of white blood cells in the cerebral spinal fluid (CSF). Persons with encephalitis have the signs and symptoms of meningitis, but in addition have alterations in consciousness. While it may sometimes be clinically useful to distinguish meningitis from encephalitis, there is overlap in the syndromes and causative pathogens. For this reason, the all-inclusive term “meningoencephalitis” (ME) will be used here.

Acute meningoencephalitis typically presents with clinical symptoms that evolve over hours to days. The epidemiology of acute ME is complex. Both bacterial and viral pathogens can cause acute ME and a rapid, organism-specific diagnosis is essential for appropriate management. Bacterial meningitis is considered to be one of the “top 10” causes of infection-related death worldwide and a large proportion of survivors are left with significant neurologic or other impairment from the disease [1]. Prior to widespread vaccination the most common cause of bacterial ME was *Haemophilus influenzae* type B and this pathogen remains a significant problem in unimmunized populations. In addition to immunization status, the pathogen profile of bacterial ME also varies by age. Neonates and young infants are affected primarily by vaginal flora such as *Escherichia coli* and *Streptococcus agalactiae* (group B *Streptococcus*) while in older children and adults *Neisseria meningitidis* and *Streptococcus pneumoniae* are the most common pathogens. *S. pyogenes* (group A *Streptococcus*) and *Mycoplasma pneumoniae* are additional causes of ME in both adults and children, while *Listeria monocytogenes* disproportionally affects adults aged 50 years or older.

Advances in medical therapy have also led to changes in the pathogenesis of bacterial ME. Individuals with alterations in CNS anatomy leading to an inability to circulate CSF often have devices in place to facilitate CSF drainage from the ventricles of the brain. These “ventricular shunts” are placed surgically and have a relatively high incidence of infection [2,3]. Individuals who have undergone neurosurgical procedures are also at risk [4]. Pathogens involved in these infections include skin flora such as *Staphylococcus aureus*, coagulase-negative *staphylococci* (CONS), the viridians group streptococci and hospital-acquired organisms such as *Pseudomonas aeruginosa* and *Enterococci*.

While bacteria are the most feared causes of ME, viruses are actually more common, with the number of cases of viral meningitis each year exceeding the total number of meningitis cases caused by all other etiologies combined [5]. Enterovirus (EV, [6,7]) and Parechovirus [8,9,10] are two different genera of the picornaviruses family that have been commonly implicated in ME. Herpes simplex virus (HSV) is a more serious cause of acute ME and requires emergent therapy [6,7]. Additional human Herpesviruses (i.e., varicella zoster virus (VZV), cytomegalovirus (CMV), Epstein-Barr virus (EBV) and human herpes virus 6 (HHV-6)) are also considerations in the appropriate clinical setting [6,7,11]. Less frequent viral causes of acute ME include the common respiratory pathogens influenza, parainfluenza and adenovirus as well as the arboviruses. Among the mosquito-borne encephalitis viruses, the greatest public health threat in North America are posed by the West Nile (WNV), St. Louis encephalitis, Eastern Equine encephalitis and La Crosse encephalitis viruses [12]. However, diagnosis can be made by demonstration of IgM antibody in CSF and it is not clear that these pathogens are present in the US at rates that justify their inclusion in a ME diagnostic.

A rapid and accurate etiologic diagnosis is essential for optimal clinical outcomes [7]. Bacterial meningitis and HSV encephalitis are immediately life threatening and must be quickly distinguished from the more common aseptic (viral) meningoencephalides. Given the range of possible pathogens, and the substantial overlap in clinical presentation of bacterial versus viral CNS infection, empiric antimicrobial therapy for acute ME must be broad-spectrum and often involves multiple agents. Inappropriate initial treatment for bacterial meningitis increases mortality and serious sequelae [7,13]. In contrast to bacterial or HSV infection, most other causes of viral acute ME do not require therapy or no effective antiviral treatment is available. Quickly distinguishing these causes from bacterial or HSV infection can lead to significant decreases in inappropriate and unnecessary antimicrobial therapy and potentially reduce ancillary diagnostic testing and length of emergency department or hospital stay [14,15].

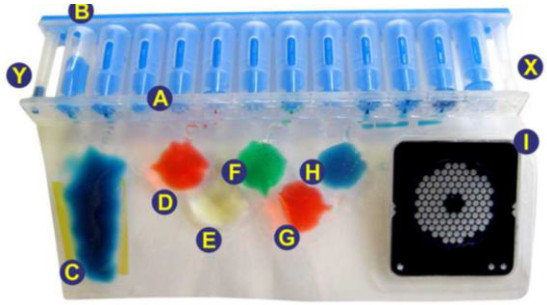
Current Laboratory Diagnosis of ME

CSF sampling through lumbar puncture (LP) is mandatory for any patient in whom acute ME is suspected. Examination of the CSF white cell count, glucose and protein concentrations are useful for differentiating bacterial from viral causes of acute ME; however, some patients may have atypical or non-discriminatory CSF profiles. Culture has long been considered the diagnostic "gold standard" for the diagnosis of CNS infection and is required for antimicrobial susceptibility testing. The sensitivity of CSF bacterial culture is variable (range, 62-85%) and is influenced by prior antibiotic treatment [16]. In addition, most viruses do not grow well in routine cell culture and many clinical laboratories discourage the routine use of CSF viral culture for the majority of acute ME patients [17].

CSF Gram stain and nucleic acid amplification tests (NAATs) are additional diagnostic tools that aid in establishing an etiologic diagnosis. The yield of CSF Gram stain, however, varies considerably for different organisms, is affected by host factors (i.e., adults vs. children) and may be reduced in antibiotic pretreated patients [16]. NAATs, specifically PCR, have been shown to bring added value to bacterial Gram stain and culture. In one study of bacterial meningitis, 43% patients with *H. influenzae*, 27% with *S. pneumoniae* and 37% with *N. meningitidis* were diagnosed only by use of PCR [18]. Application of PCR methods to the analysis of CSF samples has also resulted in significantly higher rates of viral identification, in much shorter periods of time than can be achieved with either culture or using serology [19,20]. PCR testing is now the diagnostic modality of choice for viral acute ME.

Despite the clear benefits associated with the routine application of molecular techniques for the diagnosis of acute ME there are currently only a few standardized, commercially available PCR assays for the detection of bacteria and/or viruses from CSF. Those that are available typically target only a single pathogen at a time or are complex and costly, requiring skilled laboratory personnel. One example, from Cepheid (Sunnyvale, CA) is an easy to use, fully integrated PCR assay for EV from CSF [21,22]. This system is rapid and a positive EV result can be used to directly affect patient management. However, EV negative specimens require additional testing to identify the etiologic agent of disease. Given the number and genetic diversity of potential ME pathogens, several independent PCR tests often need to be combined to cover the spectrum of causative agents, which drives up both cost and time to diagnosis. Current multiplex technologies (i.e. suspension bead arrays or chip-based microarrays) are amendable to the simultaneous detection of multiple ME pathogens, but require specialized expertise and equipment for development, are labor intensive and prone to laboratory contamination [23]. Clinical laboratories are therefore forced to send specialized molecular testing to a reference laboratory, which delays the turn-around-time to results and severely limits clinical utility.

Fig 1: FilmArray pouch



Food color is used to indicate blisters. **C-E**: Nucleic acid purification, **F-G**: RT and 1st stage PCR, **I**: Array of 1µl wells for 2nd stage PCR.

Idaho Technology's FilmArray platform

Idaho Technology (ITI) has developed the FilmArray, a fully-integrated, automated "lab-in-a-pouch" system that performs nucleic acid purification, reverse transcription, nested multiplex PCR amplification and target detection for up to 28 targets in about one hour. The system consists of the instrument and a self-contained, disposable reagent pouch (Figure 1; see [24] for a detailed description of the pouch and instrument). Target identification occurs in an array of 102 small volume second stage PCR reactions (**I** in Figure 1). Amplification products are differentiated and identified by high-resolution DNA melting analysis.

ITI has five FilmArray pouches for different infectious clinical syndromes in production or development. These include: Respiratory Pathogen (**RP**) [24,25,26,27,28], Blood Culture Identification (**BCID**), Gastrointestinal Pathogen (**GI**), Sexually Transmitted Infection (**STI**) and Biothreat (**BT**). The pathogens identified by the first four of these pouches are listed in Table 1. The RP pouch received FDA clearance for detection of 15 analytes (underlined in Table 1) in May 2011 and a follow-on 510(k) for clearance of all additional panel organisms (except Bocavirus) is currently under FDA review. If successful, the expanded FilmArray RP panel will be the first FDA-cleared multiplex NAAT to detect both viral and bacterial respiratory tract pathogens.

Table 1: List of FilmArray Pouches in production or development and their assays:

RP: Adenovirus**;** Bocavirus**;** Coronavirus (229E**,** HKU1**,** OC43**,** NL63); Influenza A (H1, H1-2009, H3); Influenza B; Human Metapneumovirus; Parainfluenza Virus (1, 2, 3, 4); RSV; Rhinovirus/Enterovirus; *Bordetella pertussis*; *Chlamydophila pneumoniae*; *Mycoplasma pneumoniae*

BCID: *Acinetobacter baumannii* complex; *Enterobacteriaceae* (including *Enterobacter cloacae* complex*, Klebsiella pneumoniae, Klebsiella oxytoca*, *Escherichia coli, Serratia marcescens*, and *Proteus* spp.); *Enterococc*i; *Listeria monocytogenes; Haemophilus influenzae; Neisseria meningitidis; Pseudomonas aeruginosa*; Staphylococci (*S. aureus* and select CoNS); Streptococci (*S. pyogenes, S. agalactiae, S. pneumoniae* and select viridans group species); Candida (*C. albicans*, *C. glabrata*, *C. krusei*, *C. parapsiolosis*, *C. tropicalis*); Antibiotic resistance genes: *mecA*; *vanA*/*vanB*; bla_{KPC}

GI: Adenovirus F 40/41; Astrovirus ;Norovirus; Rotavirus; Sapovirus; *Aeromonas* spp.; *Campylobacter* spp.; *C. difficile* (inc. NAP1); ETEC; EPEC; STEC/EHEC; STEC 0157:H7 serotype; EIEC; EAEC; *Vibrio* (spp., *V. cholerae*); *Shigella* (spp.; *S. dysenteriae*); *Salmonella* spp.; *Yersinia enterocolitica; Plesiomonas shigelloides*; *Cryptosporidium* spp.; *G. lamblia; E. histolytica; Cyclospora cayetanensis*

STI: HSV 1; HSV 2; *C. trachomatis; H. ducreyi*; *M. genitalium; N. gonorrhoeae; T. pallidum; T. vaginalis; U. parvum; U. urealyticum;*

The BCID panel (with the intended use of identifying a broad range of sepsis causing organisms from blood culture bottles) and the GI panel (detection of virus, bacteria and protozoa directly from stool) are in final development. Performance evaluations for 510(k) submission of both panels will occur in the next year.

FilmArray RP and BCID pouches detect ME-causing viruses and bacteria in CSF

To establish the feasibility of using existing FilmArray assays to detect relevant bacteria and viruses in CSF, we tested CSF samples in the BCID and RP pouches. The samples had been collected over the past five years from pediatric patients at Primary Children's Medical Center (PCMC, Salt Lake City, UT) under an IRB approved protocol written by Dr. Blaschke for discarded CSF. At the time of collection, these samples were tested for the presence of bacteria by conventional culture and for EV by a reverse-transcription PCR assay [29]. The remaining portion was frozen at -80º C.

Twelve CSF samples were originally positive for bacterial pathogens by culture. A comparison of the culture and FilmArray (BCID) tests for bacterial pathogens is shown in Table 2; discordant FilmArray results are indicated with bold text. The FA BCID pouch correctly detected 9 of 12 (75%) of the organisms identified by culture; one was misidentified and two were missed. In each case of a missed organism the CSF indices (white blood cell count, protein and glucose) were normal at the time of sampling, suggesting the possibility that the level of bacteria in these samples was particularly low. FilmArray tests 100µl of CSF while culture uses 1 ml or more; see SA2 below on how to increase the effective volume tested in the pouch.

An additional 16 CSF samples, originally positive for EV by PCR, were tested on the FilmArray RP panel. Ten of these were identified as strong positive for human Rhinovirus / Enterovirus (HRV/EV), another 3 were weakly positive and 3 were negative for an overall yield of 63% strongly positive and 81% positive. No false positive or other unexpected results were observed. Based on the RP panel clinical trial, the specificity of this assay is high.

These data show that existing FilmArray PCR assays and sample preparation protocols, developed for other indications, have moderate sensitivity and specificity for the detection of bacterial and viral pathogens in CSF. It is possible that the lower sensitivity of the HRV/EV assay is due to primer design targeted specifically to picornaviruses of the respiratory tract; further PCR and sequencing of EV positive CSF will determine if primer redesign is necessary. Age, storage, and handling of the frozen CSF specimens could also have influenced the sensitivity of detection [20,22].

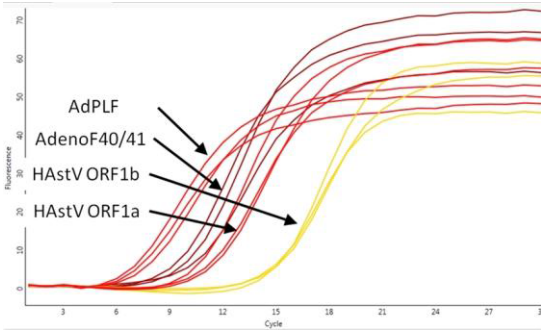
Table 2: BCID testing of culture positive CSF

Sample	Culture Result	FA result
6*	*S. aureus*	*S. aureus*
295*	*S. aureus*	*S. aureus*
296*	*S. aureus*	*S. aureus*
50	*E. coli*	*E. coli*
318	*E. coli*	**Negative**
1263	*E. cloacae*	*Enterobacteriaceae/ E. cloacae*
1416	*E. faecalis*	*Enterococcus*
1555	Viridans	***Enterococcus***
946	Viridans group	**Negative**
1812	*H. influenzae*	*H. influenzae*
1479	*N. meningitidis*	*N. meningitidis*
1714	*P. aeruginosa*	*P. aeruginosa*

* CSF from a ventricular shunt

The goal of the present application is to combine the relevant assays from the BCID and RP panels, with additional assays for Parechovirus and Herpesvirus, into a ME specific FilmArray panel with sample handling and pouch chemistry optimized for the extraction of pathogen nucleic acid from CSF.

Fig 2: Virus detection from stool in the GI pouch



FilmArray nucleic acid purification is robust

ITI has a dedicated sample preparation group and has developed commercially available kits for DNA and RNA extraction from bacteria and viruses for 17 sample types. More specifically, the FilmArray platform has been adapted to process a variety of difficult sample matrices including blood, blood culture, swabs, sputum, soil and stool. Figure 2 shows amplification curves resulting from injection of a stool sample from a pediatric patient into a developmental version of the FilmArray GI pouch. This sample was negative by conventional testing. The curves indicate the presence of Adenovirus and Astrovirus (two assays for each virus). Additional PCR assays and amplicon sequencing confirmed the presence of both organisms. This experiment shows that the FilmArray can purify both RNA and DNA viruses from stool, traditionally considered a difficult sample matrix.

FilmArray nested PCR easily accommodates high multiplexing

The GI pouch is the most highly multiplexed FilmArray pouch currently developed, with over 100 primers in the first stage PCR (see target list in Table 1). The experiment in Figure 2 and other GI pouch runs have demonstrated sensitivity similar to that of singleplex PCR assays. These data, along with the extensive clinical and analytical performance evaluations for the FDA-cleared RP pouch provide evidence that the nested format and the mechanical hot start of the FilmArray protocol (see discussion in [24]) overcome much of the assay optimization difficulties associated with traditional multiplex PCR [30,31]. We believe that it will be possible to combine existing assays from the RP and BCID pouches into the FAME pouch (SA1) and achieve performance comparable to that of singleplex assays, without extensive modification of the multiplex PCR.

Innovation

The proposed study will develop a comprehensive panel for a rapid, direct-from-specimen, PCR-based diagnostic test based on the FilmArray platform that will detect, and identify the primary viral and bacterial pathogens of acute ME. This panel has the potential to significantly benefit patients with acute ME, to reduce morbidity and mortality, and to decrease the use of unnecessary or inappropriate antimicrobial therapy.

Although other established commercial platforms (e.g. Luminex, Cepheid and Prodesse [22,32,33,34,35,36,37] are capable of multiplexed organism identification, they either require a sample preparation step, specialized training, a controlled environment or they are more limited in the number of targets identified. FilmArray has advantages over current diagnostic methods because it is rapid, user-friendly, fully automated, self-contained and has the potential to be available near point-of-care.

Approach

The goal of this phase I application is to develop the FAME pouch, determine the need for pre-enrichment steps, optimize the sample purification protocol and perform an initial evaluation of the clinical sensitivity and specificity of the system. A successful outcome of this phase I application will be a FilmArray pouch and protocol that is ready for full clinical and analytical evaluation. This will provide the data necessary for an FDA 510(k) submission and will be the heart of a Phase II application for the FAME pouch.

SA1: Develop a FilmArray meningoencephalitis pouch (0-18 months)

Table 3 lists the panel of assays that will go into the initial FAME pouch. It is derived from consultation with our collaborators (Drs. Blaschke and Hanson) and a review of the literature (references cited above). Other targets could be added to this list e.g. Adenovirus and West Nile Virus. This panel is a reasonable starting point; the final composition will be evaluated periodically during the development process by a Scientific Advisory Board (SAB), a panel of laboratory and medical experts convened by ITI. Early in the assay design phase, the SAB will convene to make recommendations about panel size and composition. Obviously larger panels may result in fewer negative results but will increase the development and regulatory risk.

For all but five of the organisms listed (bold text), we already have FilmArray pouches with the appropriate nested multiplex assays. During development of these panels, effort was made to keep the first and second stage PCR cycling conditions constant so that assays could be moved between panels as needed.

New FAME assay development will follow the protocols that have been successful for the development of the nested multiplex assays of the FilmArray panels shown in Table 1. We have found that the standard issues of primer design (minimally degenerate primers chosen against conserved regions of the bacterial or virus family, T_ms around 60 ºC etc) are necessary and sufficient to make candidate assays [24]. We then compare the performance of an outer PCR by itself (singleplex) or together with the other outer primers (multiplex) in a block thermocycler with the crossing points (C_ps) of the inner, nested, PCR as a readout of the first stage PCR reaction. Primers are altered as necessary to achieve equivalent performance. The nested format of the PCR and the different wells of the array allow us to design and assess multiple sets of outer and inner primers for pathogens of particular interest. For assays that target highly diverse viruses, such as EV, primers will be evaluated with respect to their match to relevant serotypes and sequences recovered from CSF samples ([38,39], and our own sequence data) and compared to existing RT-PCR assays [20,40,41,42,43].

Table 3: FAME pouch assays

Enterobacteriaceae
*Escherichia coli**
*Enterococcus**
*Haemophilus influenzae**
Listeria monocytogenes
Mycoplasma pneumoniae
*Neisseria meningitidis**
*Pseudomonas aeruginosa**
St*aphylococcus*
*Staphylococcus aureus**
Streptococcus (including viridans)
Streptococcus agalactiae
Streptococcus pneumoniae
Streptococcus pyogenes
Enterovirus*
Parechovirus
HSV1
HSV2
VZV
EBV
CMV
HHV(6)

* Targets identified in Table 1. A genus level assay does not identify an individual species.

We will also develop one or more "comparator" PCR assays for the new viruses in the panel, using the literature as a guide [44,45,46,47,48,49,50,51]. These assays will use hydrolysis or hybridization probe chemistry and will be run in standard real-time PCR instruments. We have already constructed such assays for the RP panel and some BCID analytes. We will get a preliminary idea of the sensitivity and specificity of the FAME pouch by testing it on CSF spiked with dilutions of cultured target organism (bacteria and viruses). We can run the same spiked samples through standard culture (for bacteria) or conventional assays (for virus) described above for comparison. The FAME assays that perform less well than conventional assays will be modified (primers moved 5' or 3' where possible) or replaced.

Milestones for SA1:.Development of a FilmArray pouch with ~23 assays for the pathogens listed, which shows sensitivity and specificity for pathogen detection in spiked CSF comparable to that of existing assays. **Risks:** The nested PCR assays that have been successfully developed for the FilmArray suggest that we can meet this goal. It may take several iterations of the assays but this is only a timeline risk. The main risk falls later, in SA3, where we evaluate clinically relevant sensitivity.

SA2: Optimize sample preparation for virus and bacteria from CSF (0-18 months)

ITI has a wealth of experience in using the FilmArray to purify nucleic acids from gram positive and negative bacteria, as well as from RNA/DNA viruses. Because CSF is most similar in viscosity and total nucleic acid load to nasopharyngeal swabs (NPS) in viral transport medium, FAME panel development will be initiated with the NPS protocol developed for the RP panel (see preliminary data in Table 2). Human CSF samples (primarily discarded ventricular shunt fluid provided by our collaborators or purchased) will be spiked with cultured isolates of ME pathogens (Table 3) and the FilmArray sample purification steps (bead beating time, collections on magnetic beads etc, see ref [24]) will be varied. The C_ps of the amplification curves can be used to monitor protocol performance and effective removal of potential PCR inhibitors from samples. The effect of the CSF sample matrix can be evaluated by comparing purification and PCR efficiency between equivalent samples prepared in buffer versus CSF.

Preliminary data (Table 2 and text) show that without any optimization, the FilmArray had 75 to 80% clinical sensitivity with the frozen CSF samples tested. If it is necessary to increase sensitivity beyond that achieved by system protocol optimization, we will investigate methods to concentrate pathogens before injection into the pouch (100 µl can be injected into the FilmArray pouch compared to the 1-2 mL of CSF available for culture). If it is the level of bacteria that is limiting, we will determine whether a short centrifugation is sufficient to pellet bacteria [52,53], if virus, we will explore protocols for precipitation with polyethylene glycol and NaCl [53,54,55,56,57]. These methods should enrich the sample 5 to 10x (assuming a 50% yield).

Milestones: 1) Demonstration that FAME pouch performance is the same with bacteria and virus spiked into buffer and into CSF sample matrix, 2) Development of a protocol for pre-enriching the sample that lowers the LoD by five-fold but does not add significant test time. **Risks**: 1) If protein in CSF is inhibitory we have had some success with adding protease to the sample. If there is not enough nucleic acid in the sample we can add carrier. Otherwise we are following in the steps of previous purification protocols that have proven to be quite efficient. 2) Virus precipitation protocols are straight forward and easy to test. We recognize that these protocols add time, complexity and biohazard issues to the FilmArray workflow but they are not outside the capabilities of a moderate complexity microbiology laboratory. If the level of enrichment does not justify the extra effort, it will not be used.

SA3: Test the panel on CSF from pediatric and adult patients (12-18 months)

Testing contrived samples during the development of a diagnostic platform is important; however the key test of such a system is its performance with real patient samples in the environment as close as possible to the clinical laboratory. To this end, ITI will place FilmArray instruments and FAME pouches with our collaborators: Dr. Blaschke (at the University of Utah) and Dr Hanson (at ARUP). Dr. Blaschke's laboratory will analyze de-identified, discarded, pediatric CSF samples provided by the clinical microbiology laboratory at PCMC (Dr. Daly Letter of Support). Standard testing for these samples includes bacterial culture and/or EV PCR. Dr. Hanson will collect de-identified discarded CSF samples sent to ARUP for standard bacterial culture and/or PCR (EV, Parechovirus, HSV, VZV, EBV, CMV, HHV6 and *M. pneumoniae*). We expect to collect 100 to 150 samples each at PCMC and ARUP. The increased clinical costs of collecting 'fresh' CSF (which requires informed consent) is not justified during this development stage of the project so the samples will be frozen residual specimens reserved under the appropriate IRB-approved protocols. We will run comparator PCR assays (developed in SA1) as needed to confirm the FAME result and/or resolve discrepant results.

Milestone: Demonstration of clinical sensitivity and specificity at least equal to existing clinical practice or published assays. **Risks**: A clinical sensitivity requirement of at least 90% for each analyte is anticipated for FDA clearance of the FAME panel (the FDA-cleared EV assay from Cepheid achieved 96.3% sensitivity from CSF samples). Preliminary data (Table 2 and EV results) suggests a reasonable level of clinical sensitivity (75-80%) with non-optimized assays and protocols, which will be enhanced through the activities of SA1and SA2.

Project Potential (Preparation for Phase II)

The data collected in SA3 will indicate the likelihood of success for the FAME pouch. Based on previous pouches we expect that the majority of assays will show adequate clinical sensitivity to proceed. For those that do not, we will investigate the option of isolated assay redesign to rescue performance (successfully achieved for several RP, BCID and GI assays). Required redesign would occur after phase I and in preparation for phase II activities.

As there is a large unmet medical need for a comprehensive ME diagnostic, ITI will commit the internal resources necessary to transform phase I work into a product ready for serious consideration in a phase II application. Pursuant to our Quality System, risk analysis, product development planning, and establishment of a clinical and scientific advisory board will occur at the beginning of the project. A phase II proposal would outline analytical testing to demonstrate the accuracy, reproducibility and robustness of the FAME panel (including studies to determine assay limit of detection, inclusivity, cross-reactivity, sample and reagent storage conditions, and exposure to potential interfering substances). The proposal would also include an extensive clinical evaluation of specimens collected and tested in the intended use setting and compared to appropriate reference or comparator methods. Studies would be designed so that the data could used to support submission and review of the FAME panel by the FDA as an in vitro diagnostic, for the eventual use by the medical community to improve ME patient care and management.

PROTECTION OF HUMAN SUBJECTS

Institutional Review Board (IRB) services and oversight are obtained from the University of Utah. ITI currently has multiple projects under the supervision of the University of Utah IRB including three that are relevant here: 1) Collection of Anonymized Samples for Use in Product Development, PI Lingenfelter; 2) Testing of Residual Banked Specimens for Evaluation of the FilmArray Respiratory Panel, PI Lingenfelter; 3) Accuracy and Ease of Use Assessment for the Film Array RP System In a Non-laboratory Setting, PI Lingenfelter. In addition Dr. Blaschke has an ongoing IRB approved protocol, Real-Time Multiplex PCR for Diagnosis of Bacterial and Viral Infections in Children, that covers the patient population described in this application: pediatric patients with a diagnosis of meningoencephalitis.

Clinical samples from two different sources (ARUP and PCMC) during the course of the work proposed here. Those from ARUP do not require IRB approval because they fall under Exemption 4. Those from PCMC will require an IRB protocol.

Explanation of ARUP exemption 4:

For preclinical assay development, we will obtain residual human CSF specimens submitted to ARUP Laboratories for microbiologic testing as a part of routine clinical care. It is anticipated that these specimens will be reflective of the larger, national population at risk for meningoencephalitis (i.e. a population that includes women, children and minorities).

IRB approved protocols are currently in place at ARUP that allows us to reclaim and bank a portion of the original CSF specimen that remains after the requested diagnostic test(s) have been performed. These residual specimens are initially labeled and stored only with the ARUP accession number. Accession numbers are considered Protected Health Information (PHI) because the number can be used to link the specimen to private identifiers such as patient name and state of residence. However, we will use the accession number only to obtain and record the ARUP microbiologic test results, date of sample collection, and to assess how the specimen was handled prior to freezing in the bank. No PHI will be recorded and we will not have reliable access to patient age, sex or race/ethnicity. When the specimen is logged in to the study repository, we will permanently remove the accession number from the sample and recode the container with a randomly generated specimen ID number that in no way resembles PHI. The study ID number will be linked only to the routine culture and/or PCR results. Complete and permanent de-identification of the specimen prior to FilmArray testing qualifies as Exempt Human Research.

The remaining human subjects sections cover the research proposed for PCMC

A. Risks to Subjects

A1. Human Subjects Involvement and Characteristics

All three Specific Aims will require samples collected from patients with suspected ME. Samples will be representative of the general population served by the Primary Children's Medical Center and University of Utah hospitals. Samples will be collected and stored in the Microbiology Laboratory at Primary Children's Medical Center, Salt Lake City, Utah and the University of Utah Hospital Adult ICU. All samples will be collected under the supervision of the University of Utah IRB.

Children are included in this study because they are one of the primary populations diagnosed with ME. Pediatric CSF samples will be collected from children diagnosed with ME. CSF samples will be divided into two samples. One half will be tested by culture and PCR (for EV) in the Microbiology Laboratory at Primary Children's Medical Center and one half will be stored for testing by FilmArray.

Results from the FilmArray system will not be available in real time and will not be provided to clinicians. Therefore, it is anticipated that this portion will be deemed low risk by the IRB and consent will be waived.

A2. Sources of Materials

Materials (clinical samples and data) will be obtained specifically for the purposes of this research. All clinical and data collection will be performed with IRB approval and comply with the Health Insurance Portability and Accountability Act (HIPAA). Clinical data to be collected from research subjects, and used for research purposes only, include clinical history, specifically microbiologic data necessary to compare FilmArray FAME Panel results to those of conventional culture and PCR, as well as records necessary for the correlation of clinical findings with infectious diagnosis.

A3. Potential Risks

There will be no added physical risks to the patients from sample collection as no extra material will be collected.

B. Adequacy of Protection against Risks

B1. Specific Aims 1 and 2: Waiver of Consent

All investigators will comply with HIPAA. Confidentiality will be protected by limiting access to the research data and by de-identification of samples tested at ITI.

B2. Specimen De-identification

Idaho Technology has a long history of collecting samples from volunteers and is covered under the existing IRB noted above (Collection of Anonymized Sample for use in Product Development and Clinical Trials) For both Specific Aims samples will be collected in association with patient PHI, which will be used only to identify the appropriate electronic medical record and associated clinical and laboratory data. Chart abstractions will be performed monthly and following abstraction of the medical record, the data will be de-identified.

Records containing PHI will be destroyed after chart abstraction. For PCR analyses, each specimen will be given a unique numeric identifier. Specimens for PCR testing at ITI will be identified only by this number and will be stored in a secure location at ITI. The results of the PCR testing will be shared electronically via a secure e-mail connection provided by the University of Utah and will be stored in a password protected database. A separate database will be kept that links the unique identifiers to the patient data. All analyses will be performed on data sets created without identifiers that would allow linkage of individual patients to their records.

C. Potential Benefits of the Proposed Research to the Subjects and Others

There will be no benefit to the individual patient. From a society perspective, the benefits could include the improved ability to rapidly diagnose the etiologic agent in meningoencephalitis patients and institute appropriate therapy in a timely manner. Benefits could also include improved antibiotic treatment.

D. Importance of the Knowledge to be Gained

The studies proposed will provide data critical to the development of new diagnostic technology for the rapid and timely detection and identification of pathogens causing meningoencephalitis. The data from these studies may allow a more accurate correlation between symptoms and pathogens which would be beneficial for the diagnosis and treatment of this disease in children and adults.

Inclusion of Women and Minorities

Female infants and children will be represented among the random de-identified samples from Primary Children's Medical Center. The minority population in Utah is heavily weighted toward those of Hispanic descent. African Americans and those of Asian descent only represent ~3.5% of the population in the greater Salt Lake City area. No selection by gender ethnicity will be made.

Targeted/Planned Enrollment Table

This report format should NOT be used for data collection from study

Study Title:

Total Planned Enrollment:

TARGETED/PLANNED ENROLLMENT: Number of Subjects			
Ethnic Category	**Sex/Gender**		
	Females	**Males**	**Total**
Hispanic or Latino	30	30	60
Not Hispanic or Latino	120	120	240
Ethnic Category: Total of All Subjects *	150	150	300
Racial Categories			
American Indian/Alaska Native	3	3	6
Asian	15	15	30
Native Hawaiian or Other Pacific Islander	15	15	30
Black or African American	3	3	6
White	114	114	228
Racial Categories: Total of All Subjects *	150	150	300

* The “Ethnic Category: Total of All Subjects” must be equal to the “Racial Categories: Total of All Subjects.”

Inclusion of children

CSF from children with suspected meningoencephalitis at PCMC will be tested using the FilmArray FAME panel in Dr. Blaschke's laboratory (see Facilities). PCMC serves the needs of children in the states of Utah, Idaho, Wyoming, Nevada and Montana. The hospital is equipped to treat children with complex illness and injury and is recognized as one of the top children's hospitals in the United States.

References

1. Grimwood K, Anderson P, Anderson V, Tan L, Nolan T (2000) Twelve year outcomes following bacterial meningitis: further evidence for persisting effects. Arch Dis Child 83: 111-116.
2. Langley JM, Gravel D, Moore D, Matlow A, Embree J, et al. (2009) Study of cerebrospinal fluid shunt-associated infections in the first year following placement, by the Canadian Nosocomial Infection Surveillance Program. Infect Control Hosp Epidemiol 30: 285-288.
3. Prusseit J, Simon M, von der Brelie C, Heep A, Molitor E, et al. (2009) Epidemiology, prevention and management of ventriculoperitoneal shunt infections in children. Pediatr Neurosurg 45: 325-336.
4. Erman T, Demirhindi H, Gocer AI, Tuna M, Ildan F, et al. (2005) Risk factors for surgical site infections in neurosurgery patients with antibiotic prophylaxis. Surg Neurol 63: 107-112; discussion 112-103.
5. Irani DN (2008) Aseptic meningitis and viral myelitis. Neurol Clin 26: 635-655, vii-viii.
6. Lewis P, Glaser CA (2005) Encephalitis. Pediatr Rev 26: 353-363.
7. Tunkel AR, Glaser CA, Bloch KC, Sejvar JJ, Marra CM, et al. (2008) The management of encephalitis: clinical practice guidelines by the Infectious Diseases Society of America. Clin Infect Dis 47: 303-327.
8. Harvala H, Robertson I, Chieochansin T, McWilliam Leitch EC, Templeton K, et al. (2009) Specific association of human parechovirus type 3 with sepsis and fever in young infants, as identified by direct typing of cerebrospinal fluid samples. J Infect Dis 199: 1753-1760.
9. Wolthers KC, Benschop KS, Schinkel J, Molenkamp R, Bergevoet RM, et al. (2008) Human parechoviruses as an important viral cause of sepsislike illness and meningitis in young children. Clin Infect Dis 47: 358-363.
10. Harvala H, Robertson I, McWilliam Leitch EC, Benschop K, Wolthers KC, et al. (2008) Epidemiology and clinical associations of human parechovirus respiratory infections. J Clin Microbiol 46: 3446-3453.
11. Glaser CA, Gilliam S, Schnurr D, Forghani B, Honarmand S, et al. (2003) In search of encephalitis etiologies: diagnostic challenges in the California Encephalitis Project, 1998-2000. Clin Infect Dis 36: 731-742.
12. (2011) West Nile virus disease and other arboviral diseases--United States, 2010. MMWR Morb Mortal Wkly Rep 60: 1009-1013.
13. Lu CH, Huang CR, Chang WN, Chang CJ, Cheng BC, et al. (2002) Community-acquired bacterial meningitis in adults: the epidemiology, timing of appropriate antimicrobial therapy, and prognostic factors. Clin Neurol Neurosurg 104: 352-358.
14. Archimbaud C, Chambon M, Bailly JL, Petit I, Henquell C, et al. (2009) Impact of rapid enterovirus molecular diagnosis on the management of infants, children, and adults with aseptic meningitis. J Med Virol 81: 42-48.
15. Robinson CC, Willis M, Meagher A, Gieseker KE, Rotbart H, et al. (2002) Impact of rapid polymerase chain reaction results on management of pediatric patients with enteroviral meningitis. Pediatr Infect Dis J 21: 283-286.
16. Brouwer MC, Tunkel AR, van de Beek D (2010) Epidemiology, diagnosis, and antimicrobial treatment of acute bacterial meningitis. Clin Microbiol Rev 23: 467-492.
17. Polage CR, Petti CA (2006) Assessment of the utility of viral culture of cerebrospinal fluid. Clin Infect Dis 43: 1578-1579.
18. Parent du Chatelet I, Traore Y, Gessner BD, Antignac A, Naccro B, et al. (2005) Bacterial meningitis in Burkina Faso: surveillance using field-based polymerase chain reaction testing. Clin Infect Dis 40: 17-25.
19. Lakeman FD, Whitley RJ (1995) Diagnosis of herpes simplex encephalitis: application of polymerase chain reaction to cerebrospinal fluid from brain-biopsied patients and correlation with disease. National Institute of Allergy and Infectious Diseases Collaborative Antiviral Study Group. J Infect Dis 171: 857-863.
20. Pozo F, Casas I, Tenorio A, Trallero G, Echevarria JM (1998) Evaluation of a commercially available reverse transcription-PCR assay for diagnosis of enteroviral infection in archival and prospectively collected cerebrospinal fluid specimens. J Clin Microbiol 36: 1741-1745.
21. Kost CB, Rogers B, Oberste MS, Robinson C, Eaves BL, et al. (2007) Multicenter beta trial of the GeneXpert enterovirus assay. J Clin Microbiol 45: 1081-1086.
22. Nolte FS, Rogers BB, Tang YW, Oberste MS, Robinson CC, et al. (2011) Evaluation of a rapid and completely automated real-time reverse transcriptase PCR assay for diagnosis of enteroviral meningitis. J Clin Microbiol 49: 528-533.

23. Miller MB, Tang YW (2009) Basic concepts of microarrays and potential applications in clinical microbiology. Clin Microbiol Rev 22: 611-633.
24. Poritz MA, Blaschke AJ, Byington CL, Meyers L, Nilsson K, et al. (2011) FilmArray, an automated nested multiplex PCR system for multi-pathogen detection: development and application to respiratory tract infection. PLoS One 6: e26047.
25. Hayden RT, Gu Z, Rodriguez A, Tanioka L, Ying C, et al. (2012) Comparison of two broadly multiplexed PCR systems for viral detection in clinical respiratory tract specimens from immunocompromised children. J Clin Virol 53: 308-313.
26. Pierce VM, Elkan M, Leet M, McGowan KL, Hodinka RL (2012) Comparison of the Idaho Technology FilmArray system to real-time PCR for detection of respiratory pathogens in children. J Clin Microbiol 50: 364-371.
27. Loeffelholz MJ, Pong DL, Pyles RB, Xiong Y, Miller AL, et al. (2011) Comparison of the FilmArray Respiratory Panel and Prodesse real-time PCR assays for detection of respiratory pathogens. J Clin Microbiol 49: 4083-4088.
28. Rand KH, Rampersaud H, Houck HJ (2011) Comparison of two multiplex methods for detection of respiratory viruses: FilmArray RP and xTAG RVP. J Clin Microbiol 49: 2449-2453.
29. Hymas WC, Aldous WK, Taggart EW, Stevenson JB, Hillyard DR (2008) Description and validation of a novel real-time RT-PCR enterovirus assay. Clin Chem 54: 406-413.
30. Henegariu O, Heerema NA, Dlouhy SR, Vance GH, Vogt PH (1997) Multiplex PCR: critical parameters and step-by-step protocol. Biotechniques 23: 504-511.
31. Markoulatos P, Siafakas N, Moncany M (2002) Multiplex polymerase chain reaction: a practical approach. J Clin Lab Anal 16: 47-51.
32. Seme K, Mocilnik T, Komlos KF, Doplihar A, Persing DH, et al. (2008) GeneXpert enterovirus assay: one-year experience in a routine laboratory setting and evaluation on three proficiency panels. J Clin Microbiol 46: 1510-1513.
33. Kehl SC, Henrickson KJ, Hua W, Fan J (2001) Evaluation of the Hexaplex assay for detection of respiratory viruses in children. J Clin Microbiol 39: 1696-1701.
34. Liao RS, Tomalty LL, Majury A, Zoutman DE (2009) Comparison of viral isolation and multiplex real-time reverse transcription-PCR for confirmation of respiratory syncytial virus and influenza virus detection by antigen immunoassays. J Clin Microbiol 47: 527-532.
35. Fuenzalida L, Fabrega J, Blanco S, Del Mar Martinez M, Prat C, et al. (2010) Usefulness of two new methods for diagnosing metapneumovirus infections in children. Clin Microbiol Infect 16: 1663-1668.
36. Pabbaraju K, Wong S, Tokaryk KL, Fonseca K, Drews SJ (2011) Comparison of the Luminex xTAG respiratory viral panel with xTAG respiratory viral panel fast for diagnosis of respiratory virus infections. J Clin Microbiol 49: 1738-1744.
37. Gadsby NJ, Hardie A, Claas EC, Templeton KE (2010) Comparison of the Luminex Respiratory Virus Panel fast assay with in-house real-time PCR for respiratory viral infection diagnosis. J Clin Microbiol 48: 2213-2216.
38. Bailly JL, Mirand A, Henquell C, Archimbaud C, Chambon M, et al. (2009) Phylogeography of circulating populations of human echovirus 30 over 50 years: nucleotide polymorphism and signature of purifying selection in the VP1 capsid protein gene. Infect Genet Evol 9: 699-708.
39. Oberste MS (2008) Comparative genomics of the coxsackie B viruses and related enteroviruses. Curr Top Microbiol Immunol 323: 33-47.
40. Fujimoto T, Yoshida S, Munemura T, Taniguchi K, Shinohara M, et al. (2008) Detection and quantification of enterovirus 71 genome from cerebrospinal fluid of an encephalitis patient by PCR applications. Jpn J Infect Dis 61: 497-499.
41. Hong J, Kang B, Kim A, Hwang S, Ahn J, et al. (2011) Development of a highly sensitive real-time one step RT-PCR combined complementary locked primer technology and conjugated minor groove binder probe. Virol J 8: 330.
42. Jacques J, Carquin J, Brodard V, Moret H, Lebrun D, et al. (2003) New reverse transcription-PCR assay for rapid and sensitive detection of enterovirus genomes in cerebrospinal fluid specimens of patients with aseptic meningitis. J Clin Microbiol 41: 5726-5728.
43. Verstrepen WA, Kuhn S, Kockx MM, Van De Vyvere ME, Mertens AH (2001) Rapid detection of enterovirus RNA in cerebrospinal fluid specimens with a novel single-tube real-time reverse transcription-PCR assay. J Clin Microbiol 39: 4093-4096.

44. Boriskin YS, Rice PS, Stabler RA, Hinds J, Al-Ghusein H, et al. (2004) DNA microarrays for virus detection in cases of central nervous system infection. J Clin Microbiol 42: 5811-5818.
45. Calvario A, Bozzi A, Scarasciulli M, Ventola C, Seccia R, et al. (2002) Herpes Consensus PCR test: a useful diagnostic approach to the screening of viral diseases of the central nervous system. J Clin Virol 25 Suppl 1: S71-78.
46. Markoulatos P, Georgopoulou A, Siafakas N, Plakokefalos E, Tzanakaki G, et al. (2001) Laboratory diagnosis of common herpesvirus infections of the central nervous system by a multiplex PCR assay. J Clin Microbiol 39: 4426-4432.
47. Quereda C, Corral I, Laguna F, Valencia ME, Tenorio A, et al. (2000) Diagnostic utility of a multiplex herpesvirus PCR assay performed with cerebrospinal fluid from human immunodeficiency virus-infected patients with neurological disorders. J Clin Microbiol 38: 3061-3067.
48. Pineiro L, Vicente D, Montes M, Hernandez-Dorronsoro U, Cilla G (2010) Human parechoviruses in infants with systemic infection. J Med Virol 82: 1790-1796.
49. Nix WA, Maher K, Pallansch MA, Oberste MS (2010) Parechovirus typing in clinical specimens by nested or semi-nested PCR coupled with sequencing. J Clin Virol 48: 202-207.
50. Nix WA, Maher K, Johansson ES, Niklasson B, Lindberg AM, et al. (2008) Detection of all known parechoviruses by real-time PCR. J Clin Microbiol 46: 2519-2524.
51. Benschop K, Molenkamp R, van der Ham A, Wolthers K, Beld M (2008) Rapid detection of human parechoviruses in clinical samples by real-time PCR. J Clin Virol 41: 69-74.
52. Gray LD, Fedorko DP (1992) Laboratory diagnosis of bacterial meningitis. Clin Microbiol Rev 5: 130-145.
53. Kohyama J, Kajiwara M, Shimohira M, Iwakawa Y, Okawa H (1994) Human cytomegalovirus DNA in cerebrospinal fluid. Arch Dis Child 71: 414-418.
54. Kimpton CP, Corbitt G, Morris DJ (1990) Comparison of polyethylene glycol precipitation and ultracentrifugation for recovery of cytomegalovirus from urine prior to detection of DNA by dot-blot hybridisation. J Virol Methods 28: 141-145.
55. Rodriguez RA, Thie L, Gibbons CD, Sobsey MD (2012) Reducing the effects of environmental inhibition in quantitative real-time PCR detection of adenovirus and norovirus in recreational seawaters. J Virol Methods.
56. Sanchez G, Elizaquivel P, Aznar R (2012) A single method for recovery and concentration of enteric viruses and bacteria from fresh-cut vegetables. Int J Food Microbiol 152: 9-13.
57. Jaykus LA, De Leon R, Sobsey MD (1996) A virion concentration method for detection of human enteric viruses in oysters by PCR and oligoprobe hybridization. Appl Environ Microbiol 62: 2074-2080.

UNIVERSITY OF UTAH
HEALTH CARE | Pediatric Infectious Diseases

Andrew T. Pavia, MD
Chief, Division of Pediatric
Infectious Diseases

March 19, 2012

Re: SBIR Application: Rapid, Comprehensive Detection of Pathogens Causing Meningoencephalitis

To the Review Committee:

It is my pleasure to write this letter in support of Idaho Technology, Inc. (ITI)'s SBIR application "Rapid, Comprehensive Detection of Pathogens Causing Meningoencephalitis" submitted by Dr. Mark Poritz, PhD. I am a Board Certified Pediatrician and Pediatric Infectious Diseases specialist at the University of Utah School of Medicine with expertise in the development of molecular testing for infectious pathogens and the study of bacterial infection in children. I have been collaborating with ITI for a number of years in development of the FilmArray platform and its pathogen panels for infectious disease.

The goal of the proposed research is to pilot the development of Idaho Technology, Inc. (ITI)'s FilmArray system for use in the detection of viruses and bacteria causing meningoencephalitis from cerebral spinal fluid samples. I have collaborated with ITI for the past 6 years on both the development of their FDA approved FilmArray Respiratory Panel and their FilmArray bacterial identification panel. Both panels will be used to evaluate specimens in this proposal. As a primary developer of the bacterial identification panel I have first hand understanding of the process involved in panel design and optimization.

I am the Director of the Molecular Microbiology Laboratory, part of the Women and Child Institute at the University of Utah. For Specific Aim 3 of the project, we will run cerebral spinal fluid samples on the FilmArray in our laboratory.

The current application builds on my successful collaborative endeavors with ITI, including studies of respiratory viral infection and sepsis. I am excited to pursue the demonstration of the utility of multi-pathogen molecular testing for meningoencephalitis diagnostics, a project whose success has the potential to significantly improve therapy and outcomes in patients with infection of the central nervous system.

I look forward to contributing to the development of this new application of the FilmArray and to its future clinical applications.

Sincerely,

[redacted]

Anne J. Blaschke, MD, PhD
Assistant Professor
Director, Molecular Microbiology Laboratory, Women and Child Institute
Department of Pediatrics
Division of Pediatric Infectious Diseases
University of Utah School of Medicine
Salt Lake City, UT 84132

Division of Infectious Diseases
P.O. Box 581289
Salt Lake City, Utah 84158 (mailing)

295 Chipeta Way, 2S010
Salt Lake City, Utah 84108 (campus)
Phone 801-581-6791
Fax 801-585-3781
PedsID@hsc.utah.edu

The University of Utah
Department of Pathology

Intermountain
Primary Children's
Medical Center

JUDY A. DALY, Ph.D.
Professor of Pathology
University of Utah

Director, Microbiology Laboratories
Primary Children's Medial Center

March 19, 2012

Re: SBIR Application: Rapid, Comprehensive Detection of Pathogens Causing Meningoencephalitis

Members of the Review Committee:

I am pleased to write this letter supporting the above-named SBIR application being submitted by Mark A. Poritz, PhD and Idaho Technology, Inc. (ITI). I am a Professor of Pathology at the University of Utah and Director of the Clinical Microbiology Laboratory, Primary Children's Medical Center (PCMC). I have been collaborating with ITI on NIH-funded projects since 2005, supplying samples for the development and validation of their virus and bacterial assays. In addition I have overseen the placement of FilmArray instruments in my laboratory for developmental testing. I have a specific interest in the development of molecular testing for the clinical microbiology laboratory, and have been impressed with ITI throughout the tenure of our projects together.

As the Director of the Clinical Microbiology Laboratory at PCMC, I will provide the resources of our laboratory for the collection of clinical specimens, including cerebral spinal fluid samples both positive and negative for the common bacterial and viral pathogens analyzed in this system. Primary Children's Medical Center is the sole children's hospital in the Intermountain West, drawing patients from a five state region. We are in an exceptional position to support the proposed studies.

This proposal strengthens our collaborations with ITI into the area of viral and bacterial identification and direct-from-specimen testing of spinal fluid. I look forward to contributing to the development of the proposed system.

Sincerely,

[redacted]

Judy A. Daly, Ph.D.
Professor, Pathology
University of Utah
Director, Microbiology Laboratories
Primary Children's Medical Center

100 North Mario Capecchi Drive
Salt Lake City, Utah 84113-1100
Phone (801) 662-2148
Fax (801) 662-1393
judy.daly@imail.org

ARUP LABORATORIES | Institute for Clinical and Experimental Pathology®

INSTITUTE FOR CLINICAL AND EXPERIMENTAL PATHOLOGY®
500 Chipeta Way, Salt Lake City, Utah 84108-1221
phone: (801) 583-2787 | toll free: (800) 242-2787
fax: (801) 584-5207 | www.aruplab.com

AN ENTERPRISE OF THE UNIVERSITY OF UTAH AND ITS DEPARTMENT OF PATHOLOGY

To: Mark Poritz
Idaho Technologies, Inc.
390 Wakara Way
Salt Lake City, Utah 84108 USA
ph. 801-736-6354
fax 801-588-0507

Re: SBIR proposal, April 2012

Dear Dr. Poritz,

This letter is written to document our strong interest and commitment to participate in the SBIR proposal entitled "Rapid, Automated Detection of Bacterial and Viral Meningitis Pathogens". As you know, ARUP Laboratories is a national leader in clinical and anatomic pathology and has an established track record of collaborative research with Idaho Technologies, Inc.

Dr. Kimberly Hanson and I are very enthusiastic about this project and its potential to serve as a vehicle for addressing present-day challenges in the early and confident diagnosis of infectious meningoencephalitis. Dr. Hanson is the Director of the Clinical Microbiology Section within ARUP Laboratories and is an Assistant Professor of Medicine and Pathology at the University's Health Sciences Center. A portion of her salary, in addition to that of a research technologist, is requested in the ARUP/Department of Pathology subcontract. As part of our contribution to the project, ARUP will also provide research and development space for FilmArray testing and the maintenance of the study's CSF bio-repository.

Again, we look forward to working with you and Dr. Hanson on this project. Good luck. We're ready to get started!

Sincerely,

[redacted]

Harry R. Hill, M.D.
Professor of Pathology, Pediatrics, and Medicine
Executive Director, ARUP Institute for Clinical and Experimental Pathology

PHS 398 Checklist

OMB Number: 0925-0001

1. Application Type:

From SF 424 (R&R) Cover Page. The responses provided on the R&R cover page are repeated here for your reference, as you answer the questions that are specific to the PHS398.

* Type of Application:

☒ New ☐ Resubmission ☐ Renewal ☐ Continuation ☐ Revision

Federal Identifier: GRANT11101648

2. Change of Investigator / Change of Institution Questions

☐ Change of principal investigator / program director

Name of former principal investigator / program director:

Prefix:
* First Name:
Middle Name:
* Last Name:
Suffix:

☐ Change of Grantee Institution

* Name of former institution:

3. Inventions and Patents (For renewal applications only)

* Inventions and Patents: Yes ☐ No ☐

If the answer is "Yes" then please answer the following:

* Previously Reported: Yes ☐ No ☐

4. * Program Income

Is program income anticipated during the periods for which the grant support is requested?

☐ Yes ☒ No

If you checked "yes" above (indicating that program income is anticipated), then use the format below to reflect the amount and source(s). Otherwise, leave this section blank.

*Budget Period	*Anticipated Amount ($)	*Source(s)

5. * Disclosure Permission Statement

If this application does not result in an award, is the Government permitted to disclose the title of your proposed project, and the name, address, telephone number and e-mail address of the official signing for the applicant organization, to organizations that may be interested in contacting you for further information (e.g., possible collaborations, investment)?

☒ Yes ☐ No