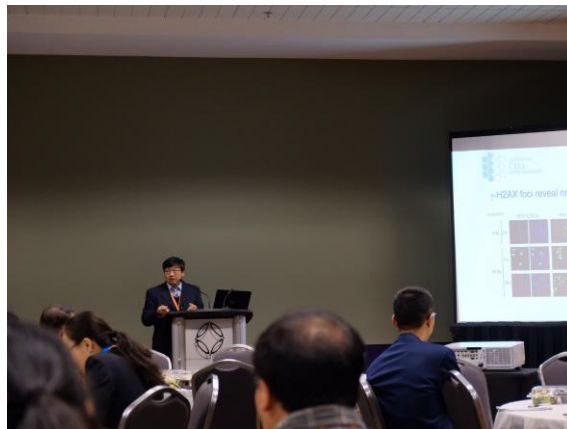


2018 AACT-SIG Career Development Workshop

The AACT Career Development Workshop was held on March 13, 2018 in San Antonio, TX during the SOT Annual Meeting. The 2018 AACT President-Elect, Dr. Sherwin Yan, chaired the workshop. The three speakers with diverse backgrounds shared their experiences and insights in pursuing different career paths other than academia as toxicologists.

The first speaker, Dr. Quanshun Zhang works on in vitro method development and validation at Institute for In Vitro Sciences. He started his talk by introducing the hermeneutic circle of biology and microphysiological systems he is currently working with, followed by a discussion of his career path from academia to industry. He emphasized the importance of our scientific knowledge and training. He advised that we first understand one's foundation (identifying the area that you could contribute the most), and build from there to develop a career.



The second speaker, Dr. Jian Song also has a successful career path. After years in academia as a research fellow in Georgetown University and NIH, he joined a small contract research organization (CRO) as a study director. Then he joined L'Oreal, and worked as a Director for Asia Pacific Product Safety Evaluation in China from 2011 to 2016. Afterwards, he returned to the U.S. and joined L Brands as a Director for Global Product Safety Science. He shared the five major differences between working for academia vs. industry based on his experiences, such as salary and benefit, flexibility, teamwork, opportunity, and external credit. For each transition he made, Dr. Song discussed the risks and challenges in details, as well as opportunities he faced at the time. He reiterated the critical role of communication with cross-functional partners in industry. Dr. Song finished his talk with a roadmap of his career path, and encouraged each audience to navigate a career success.



The third speaker, Dr. George Chang from the FDA, started his talk by asking audience to stand up and make self-introductions to someone new. He then shared the best practices in business, such as exchanging business cards and shaking hands. Dr. Chang focused his talk on soft skills including preparing a short yet effective introduction, tailoring the CV to tell a story, and doing an analysis for oneself to know one's own strengths and weaknesses. Dr. Chang summarized his advices into "3Ps to learn, 4Cs to excel, and 5 characteristics to have". 3P stands for People, Process, and Politics; 4C stands for Character, Competence, Commitment, and Communication; and 5 characteristics he valued highly are to lead people, to lead changes, to know the business process, results oriented, and to facilitate collaboration.



All three speakers provided powerful and inspiring presentations that audience could learn a lot. You can find their presentation slides on AACT web site <http://www.toxicology.org/groups/sig/aact/am.asp>.

Hermeneutic Circle of Biology and Career Development



Quanshun Zhang DVM, MS

Senior Scientist and Program Director

3/13/2018



SCIENCE

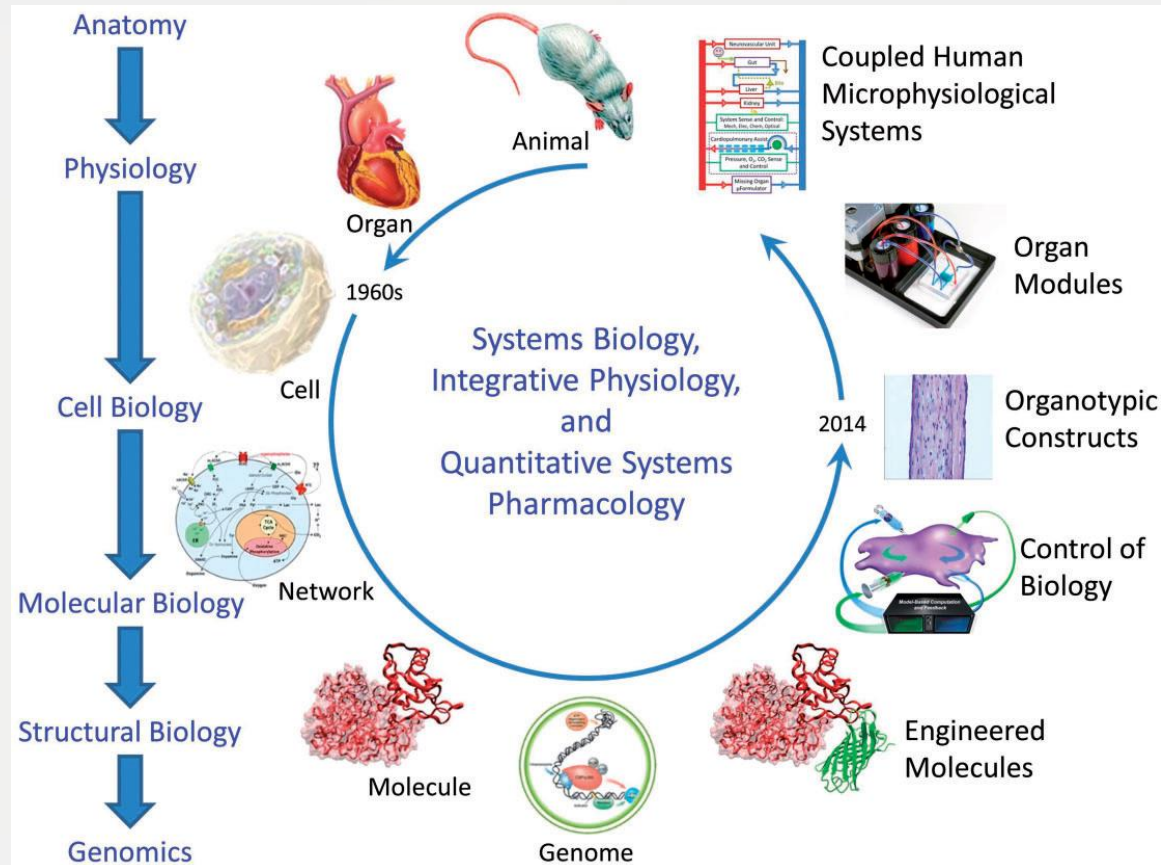
EDUCATION

OUTREACH

Overview

1. Hermeneutic Circle of Biology
2. From Hayflick Limit to Conditional Reprogrammed Cell Culture(CRC)
3. My Career based on Eb purification and Gnotobiotic Piglet models

“That we must understand the whole in terms of the detail and the detail in terms of the whole.” Gadamer



The hermeneutic circle(spiral) of biology and microphysiological systems



SCIENCE

The Circle and Its Relationship to your Work

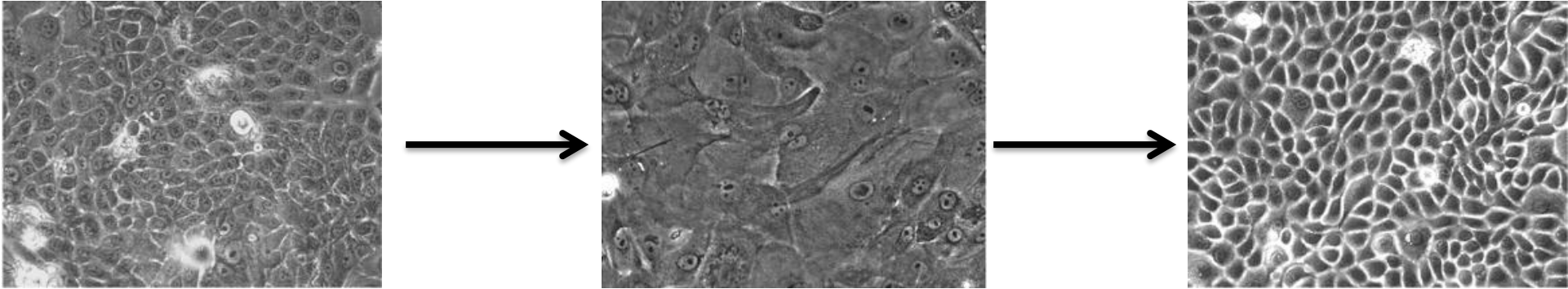
Four major groups of non-animal test methods used in research and regulatory safety testing of chemicals and products

1. ***in vitro monolayer cell*** culture systems
 - 3T3 NRU PT, Cytosensor, 3T3 Cytotoxicity
2. ***ex vivo tissues*** and organ systems
 - excised corneas, *ex vivo* human and rodent skin
3. ***in vitro reconstructed tissue*** models
 - skin corrosion, irritation, ocular irritation
4. ***non-cellular, in chemico*** test systems
 - skin corrosion (Corrositex), sensitization (DPRA)

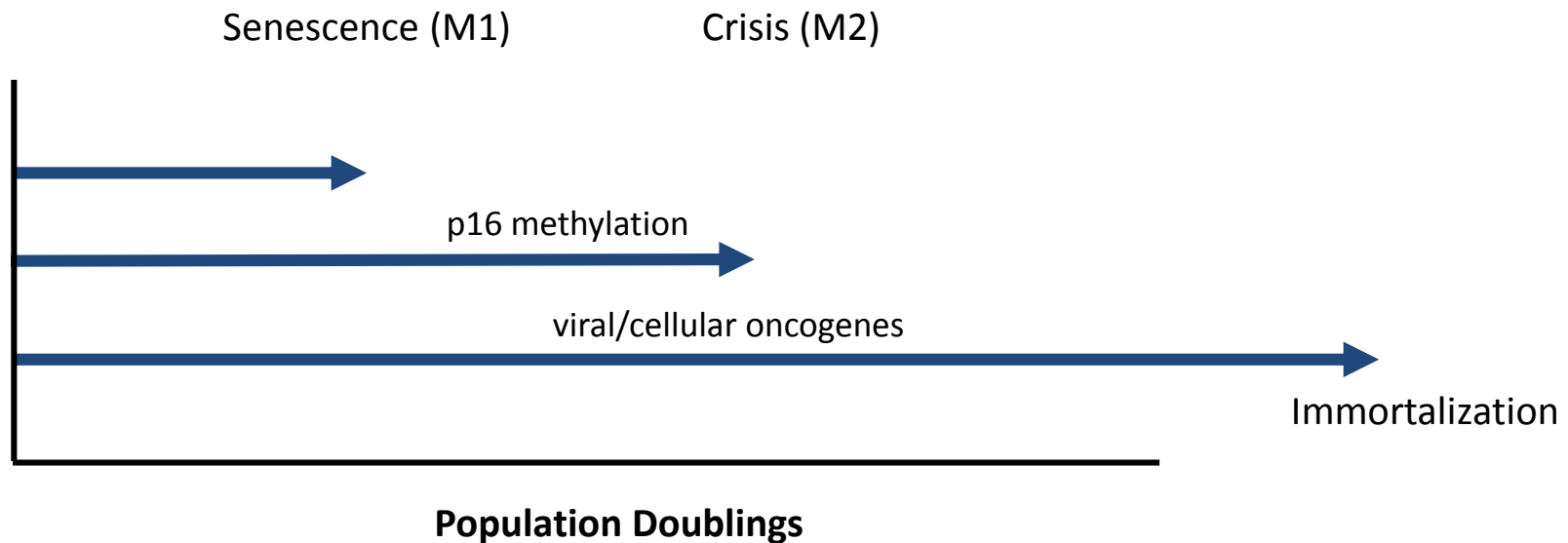
Hayflick limit and CRC

Hayflick limit and Conditional Reprogrammed Cell Culture, which is the truth?

Lifespan of cultured human cells

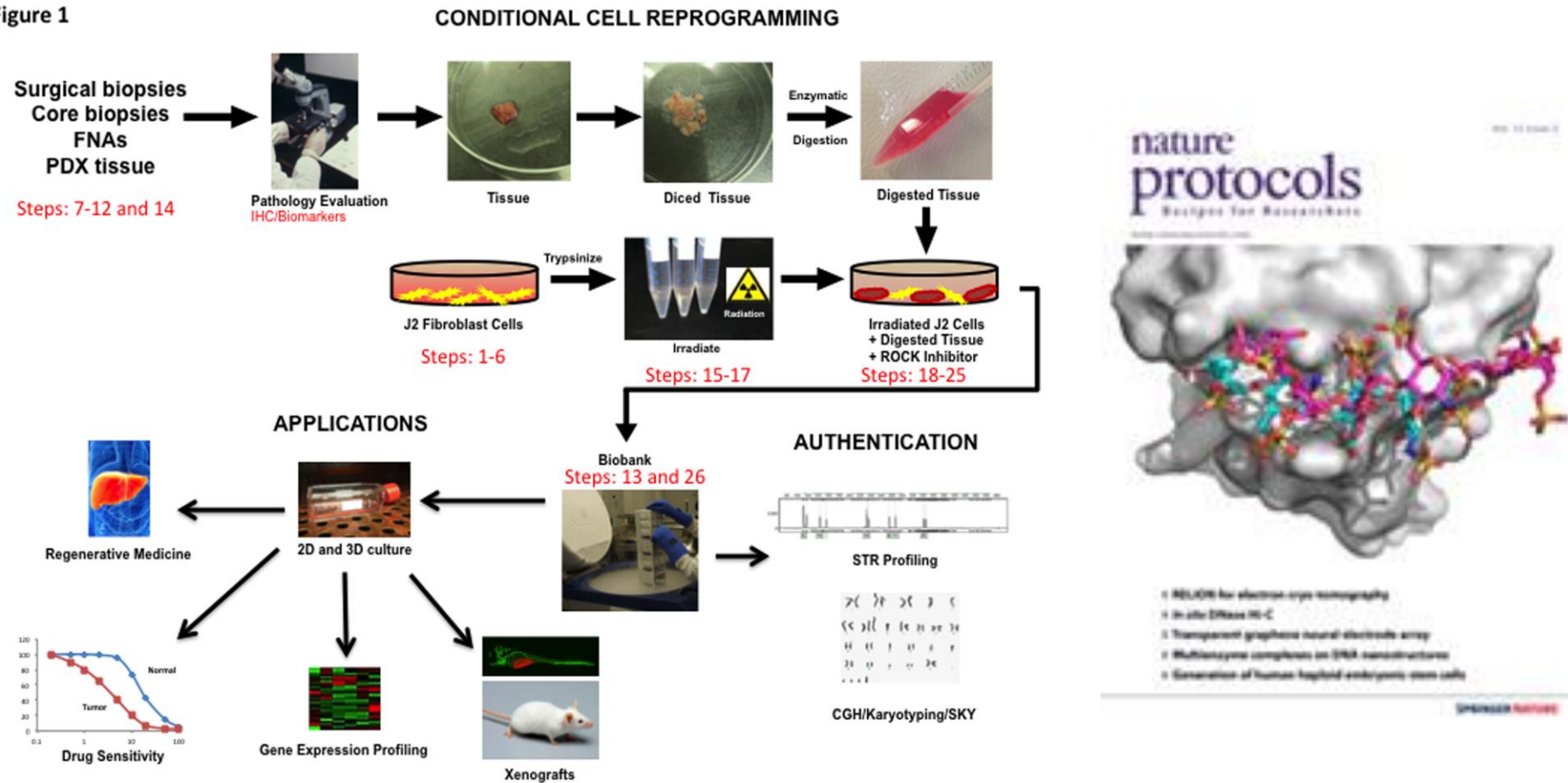


L. Hayflick and P. S. Moorhead. The serial cultivation of human diploid cell strains. *Experimental Cell Research* 25: 585-621, 1961. (Hayflick Limit)



Conditional Reprogramming (CR) Technology

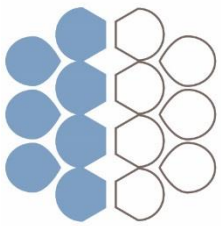
Figure 1



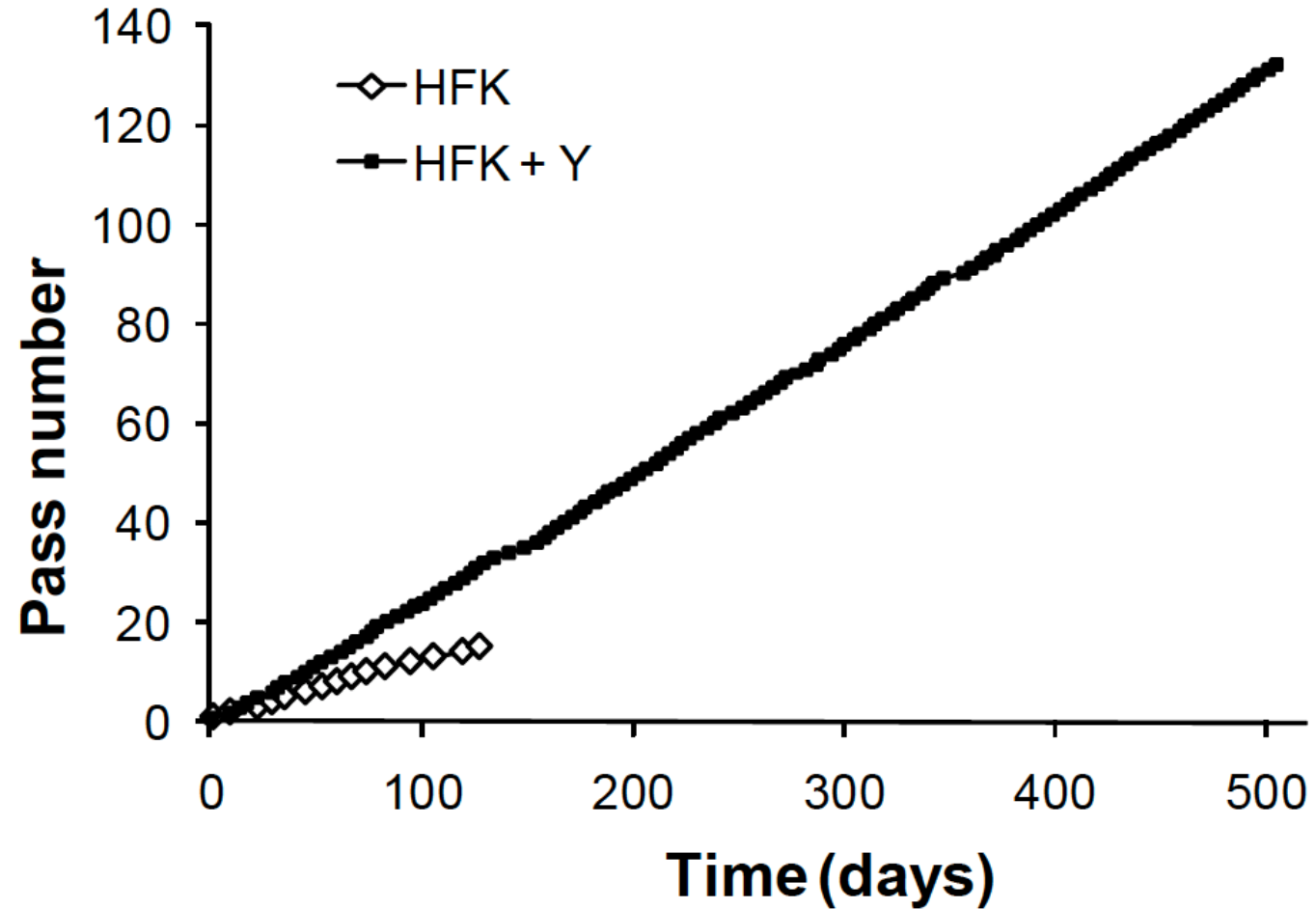
Conditional reprogramming and long-term expansion of normal and tumor cells from human biospecimens. *Nature Protocols* **12**, 439–451 (2017) doi:10.1038/nprot.2016.174

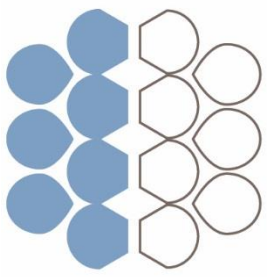
[ROCK Inhibitor and Feeder Cells Induce the Conditional Reprogramming of Epithelial Cells. The American Journal of Pathology, Vol. 180, No. 2, February 2012](#)

[February 2012 Volume 180, Issue 2, Pages 599–607](#)



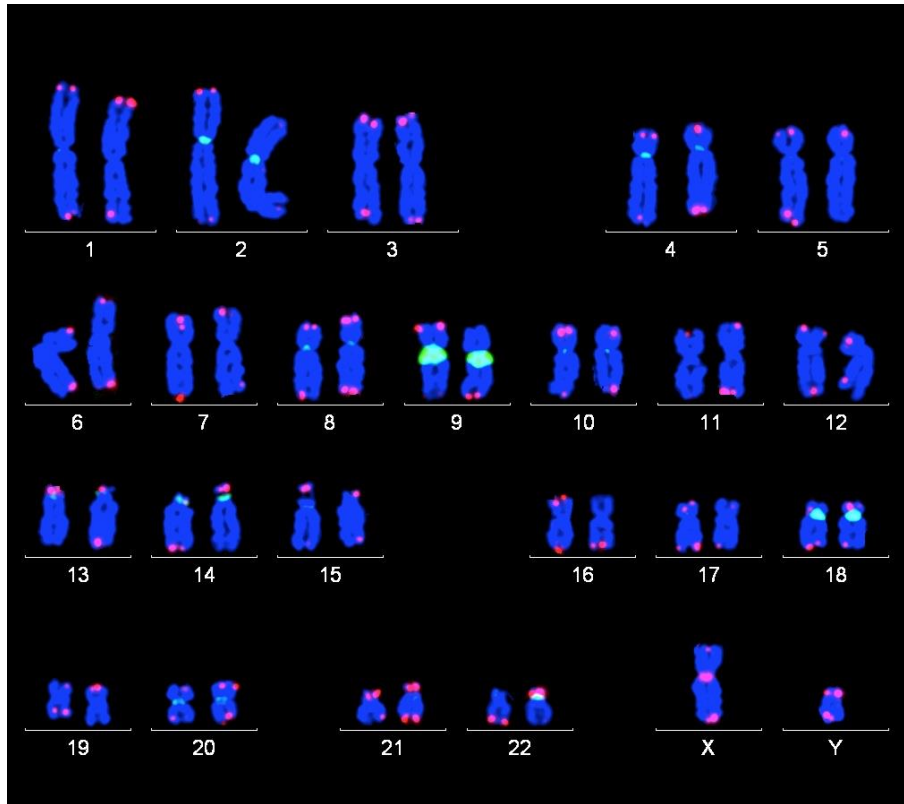
Permanent Life of Normal Cells



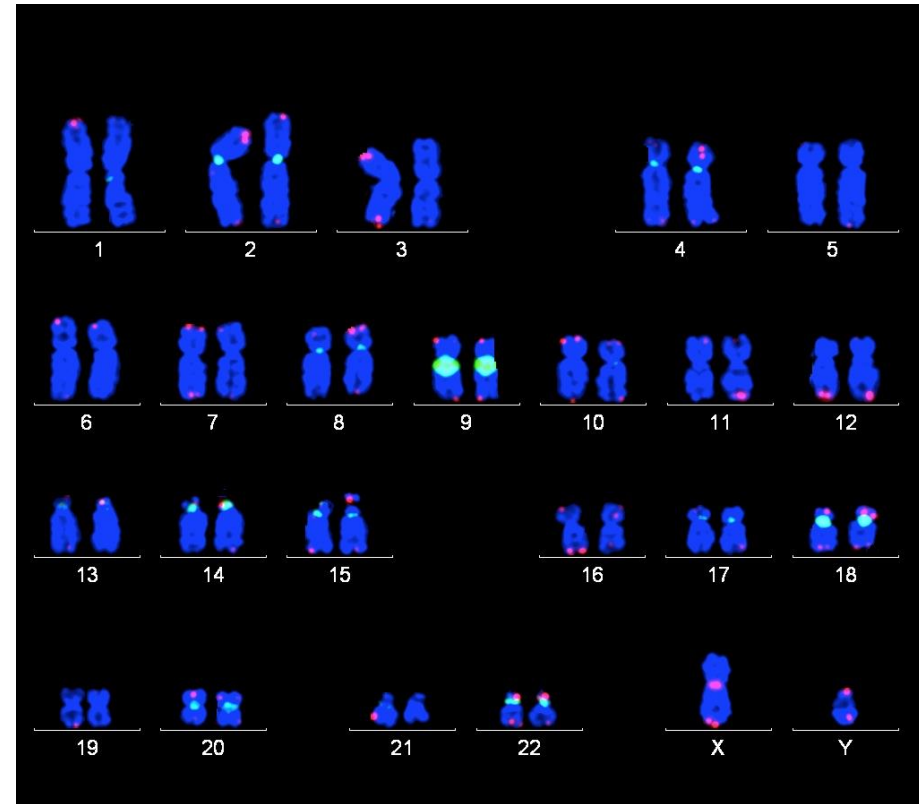


CENTER FOR
CELL
REPROGRAMMING

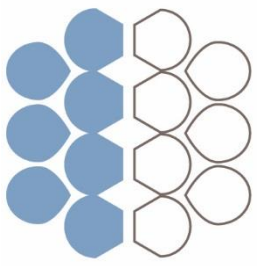
Telomeric quantitative fluorescence in situ hybridization (TQ-FISH)



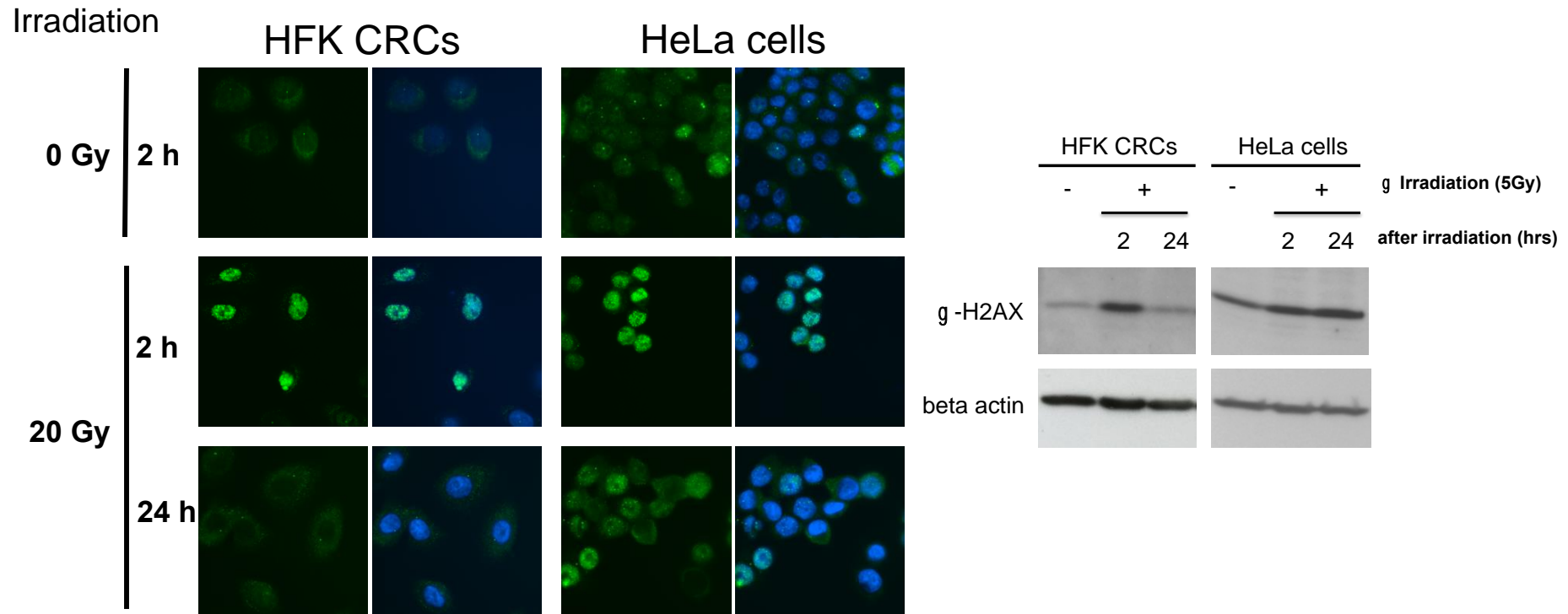
Early passage



Late passage

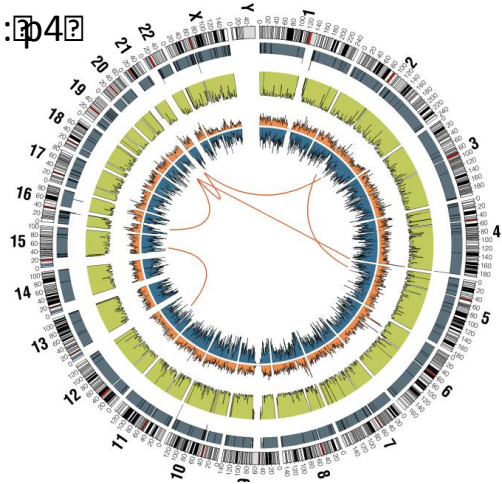


γ -H2AX foci reveal normal DNA repair in CRCs

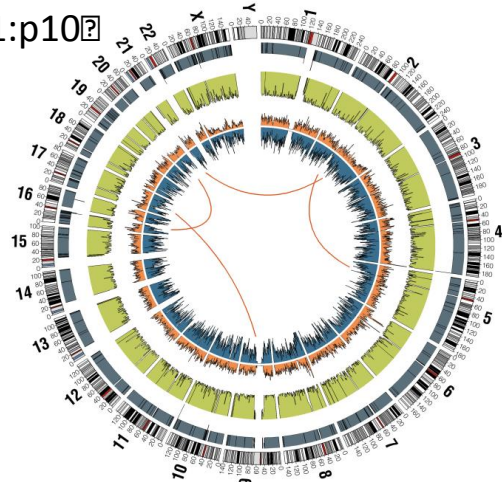


Genomic Stability

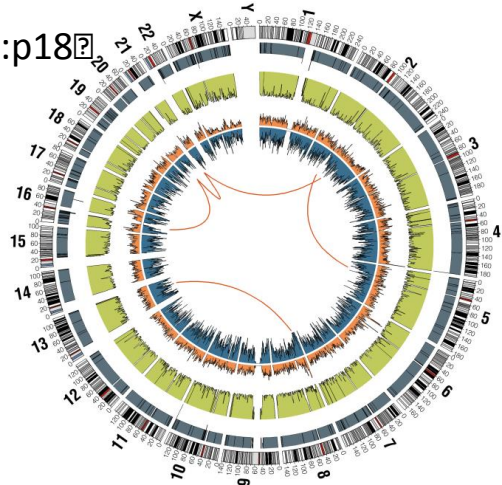
A1:p4



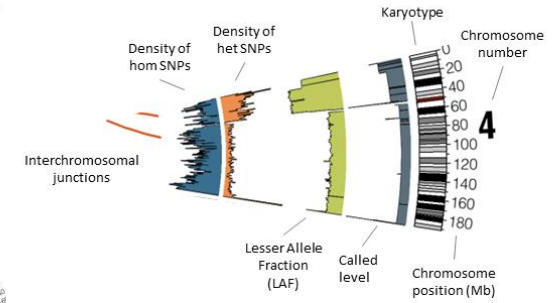
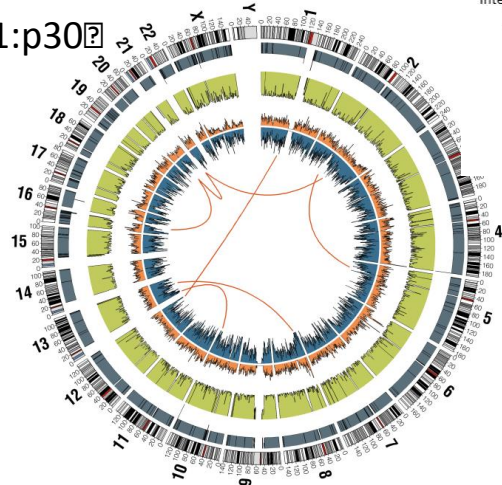
B1:p10



C1:p18



D1:p30



CRC technology

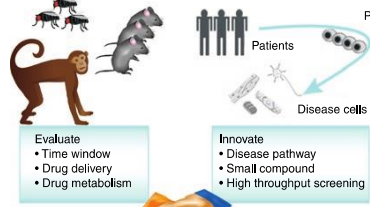
Characteristics of CRC

- propagation rapidly
- genomic Stability
- not iPSC or ESC
- retain lineage differentiation potential
(matrigel , ALI 3D cultures)
- maintain tissue-specific function in vitro
and in vivo

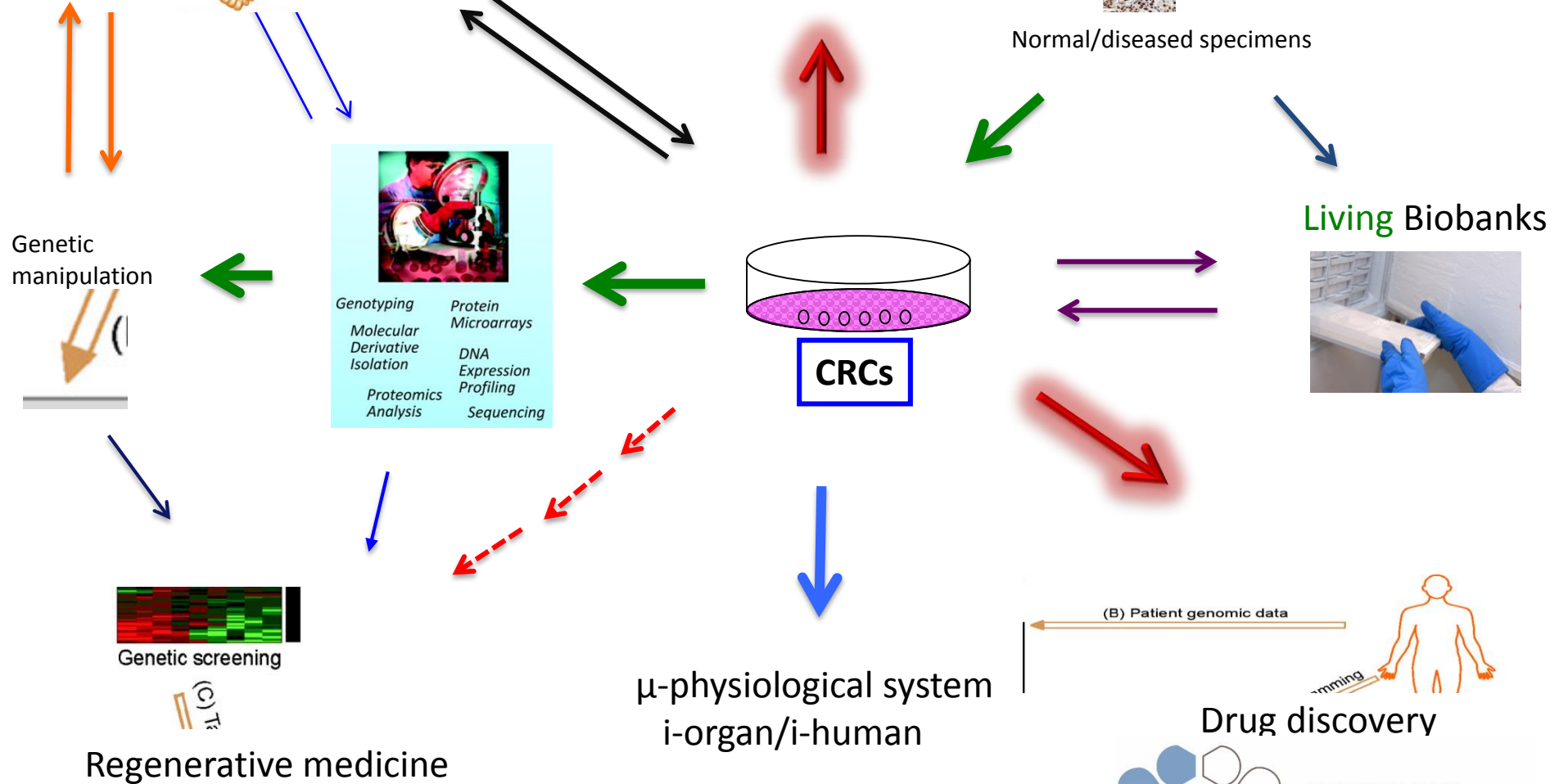
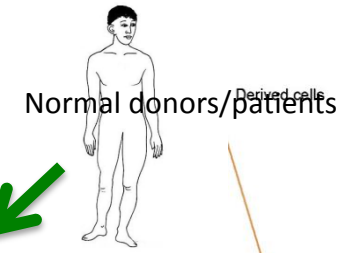
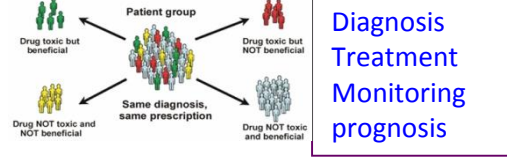
Liu, X. et al. The American Journal of Pathology. 2012

Liu, X. et al. Nature Protocols. 2017 Feb

Cell/animal disease model



Personalized medicine



CRCCellomics



My Career (2001-2013)

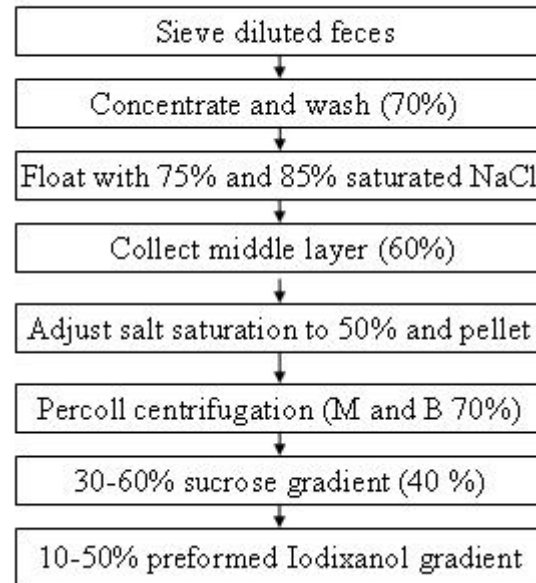
1. HPLC core and “Hard money” (Postdoc)
2. Solve the key problems for *Enterocytozoon bieneusi* and Got two R21 grant (Research Associate)
3. Animal Core works (From Gnotobiotic Piglets to Human Microbiome Models)(Research Assistant Professor)
4. NIH Contract work (Neutropenic Mouse Thigh Infection Models) (Total 5m)

Background

- The *E. bieneusi* infection was rediscovered two decades ago in individuals with AIDS with severe symptoms of chronic diarrhea and wasting (Desportes et al., 1985).
- In 2004, Zhang et al purified spores with a new gradient and produced 4 well characterized monoclonal antibodies (IgG) (Zhang et al., 2005), which are available to the whole Eb research community.

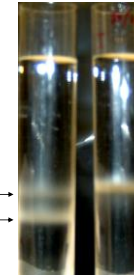
Purification of Spores by Salt-Percoll-Sucrose-OptiPrep Centrifugation

Flowchart of Purification



Eb from MM

{ B-1 1.146-1.156
B-2 1.165-1.175



M 1.146-1.156



Eb from human

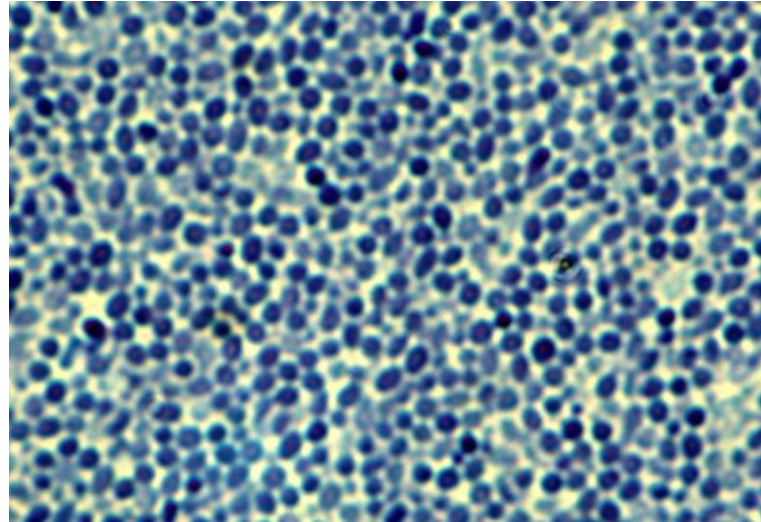
Specific density:

Eb from Rhesus macaque, 1.146-1.156 and 1.165-1.175

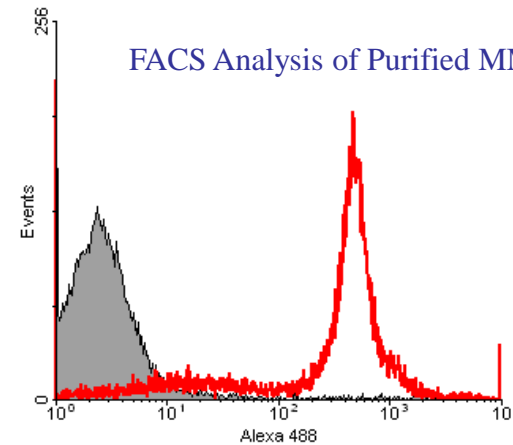
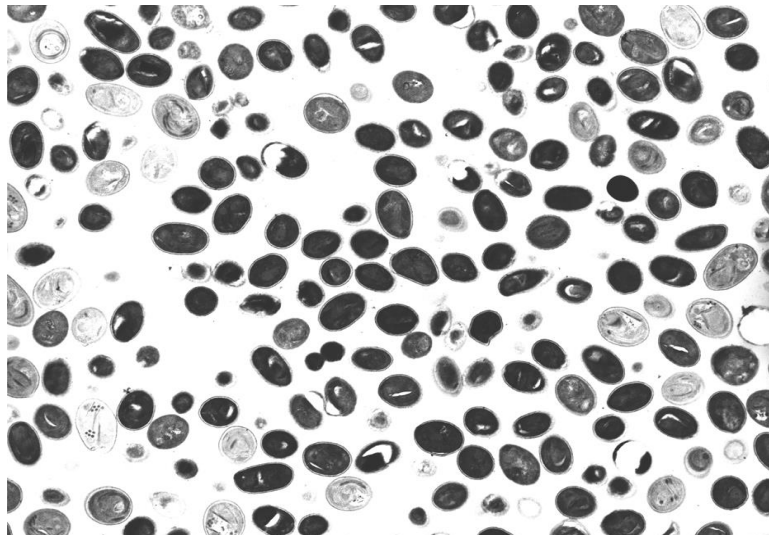
Eb from human, 1.146-1.156

Light Micrograph, TEM, SEM Micrograph and FACS Results Showing the Purity of Purified Spores

Toluidine Blue Staining of MM Eb



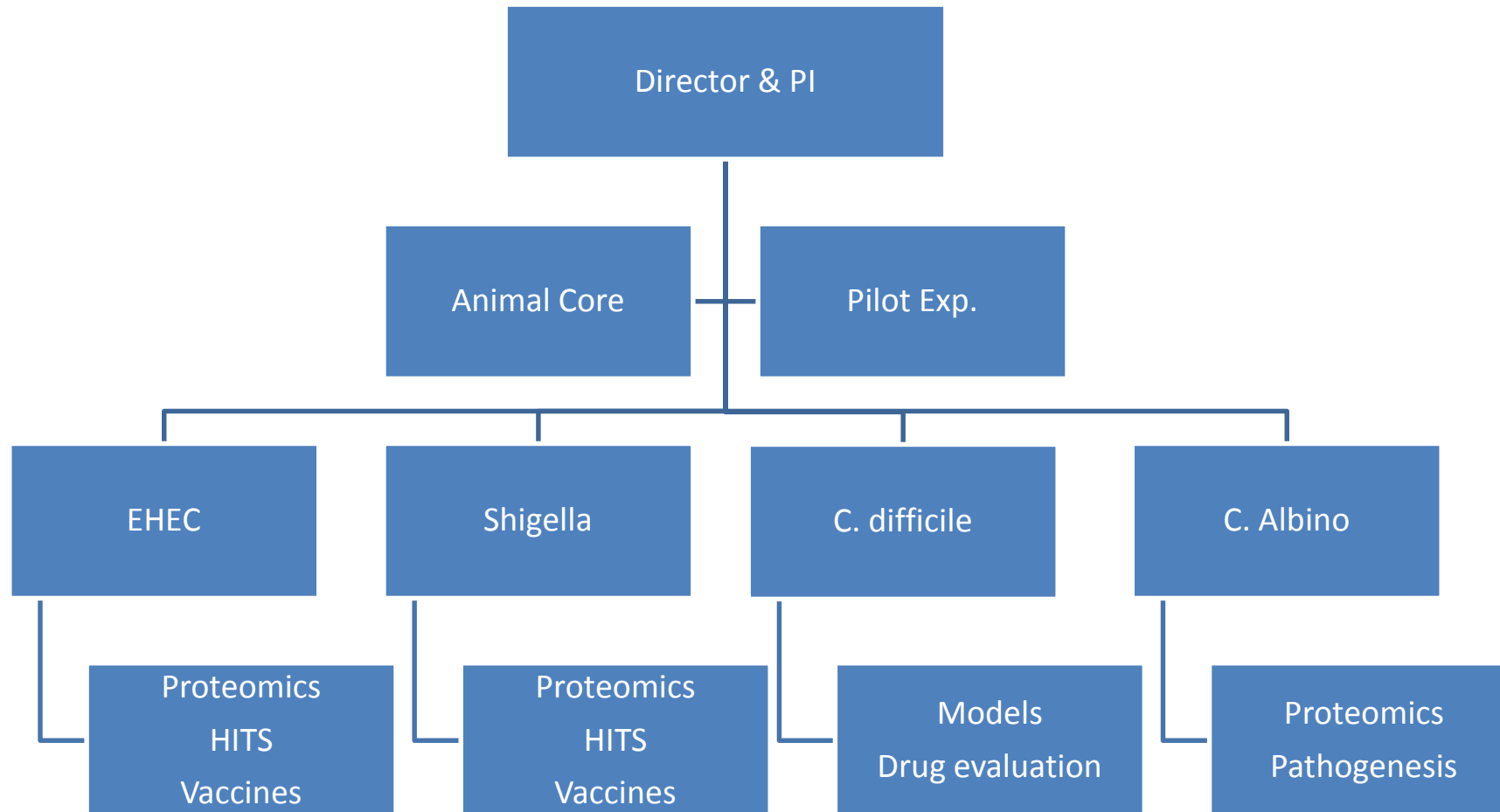
TEM Micrograph of MM Eb



Completed Projects

- Production of monoclonal antibodies against Eb and applications. (IAI, 2005)
- Cloning and analysis of the α -tubulin genes of Eb from Rhesus macaque MM231 and then from human H206 (Akiyoshi et al., 2007).
- Production and Applications of monoclonal and polyclonal antibodies against *C. difficile* Toxin A (Infect Immun. 2009)
- Genomic Survey of the Non-Cultivable Opportunistic Human Pathogen, *Enterocytozoon bieneusi*. PLoS Pathog. 2009 Jan; 5(1): e1000261. R21
- Production and Applications of monoclonal antibodies against Cryptosporidial sporozoites and secreted proteins.
- Similarities and differences of *Enterocytozoon bieneusi* from Human and *Rhesus macaque*
- Innate immunity to *Enterocytozoon bieneusi* (Parasite Immunol. 2011)R21

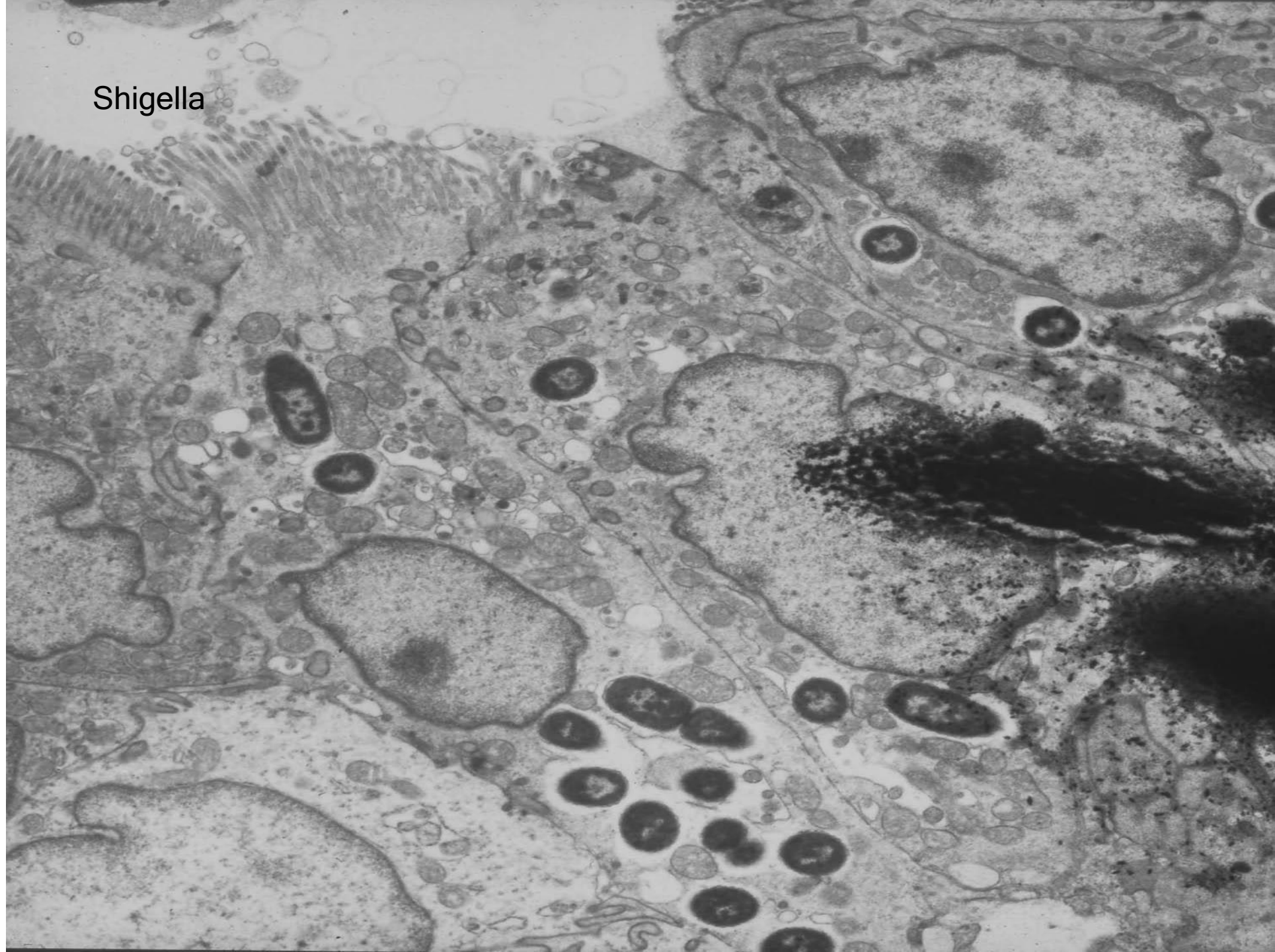
Infrastructure of Division of Infectious Diseases



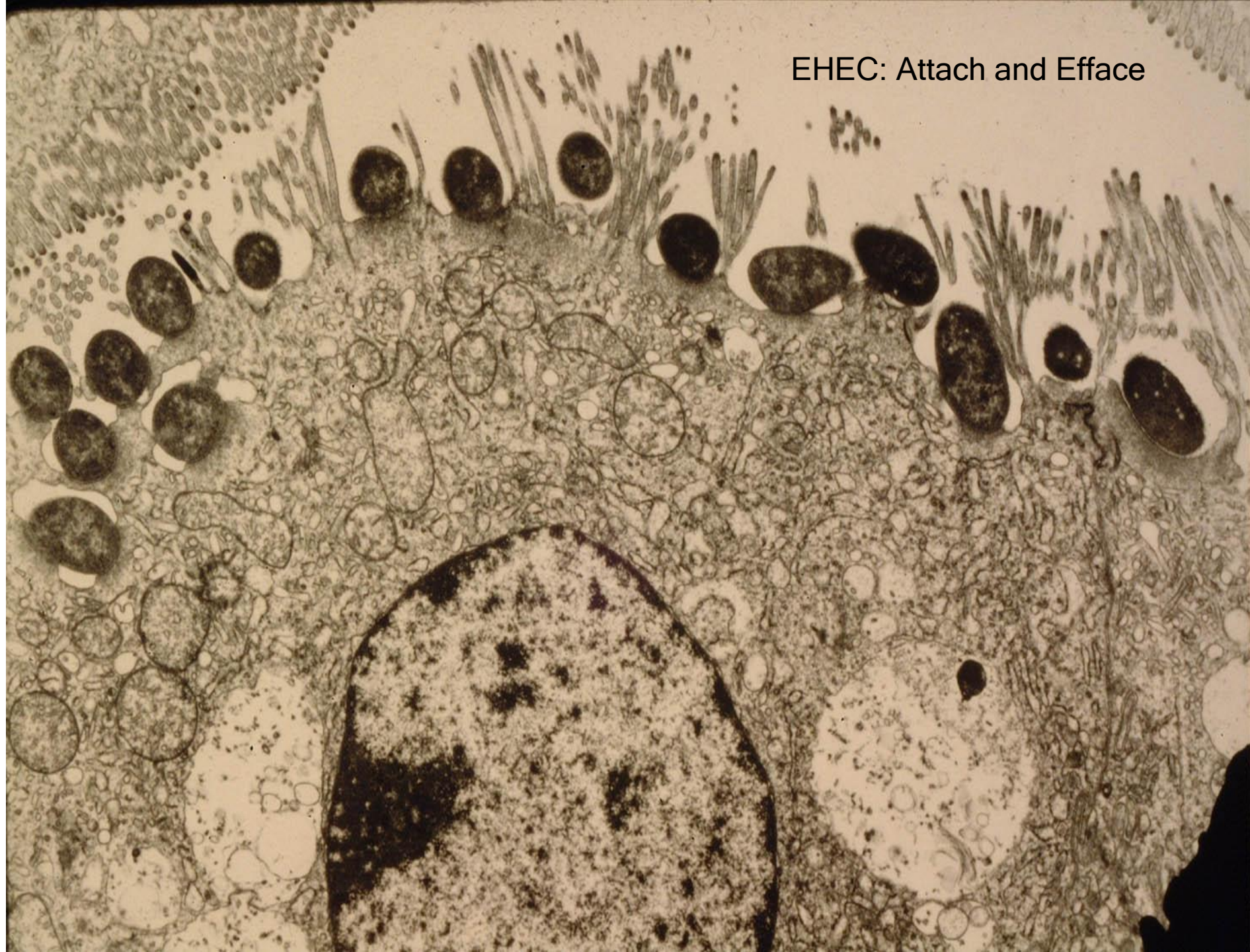
Gnotobiotic Piglet Models

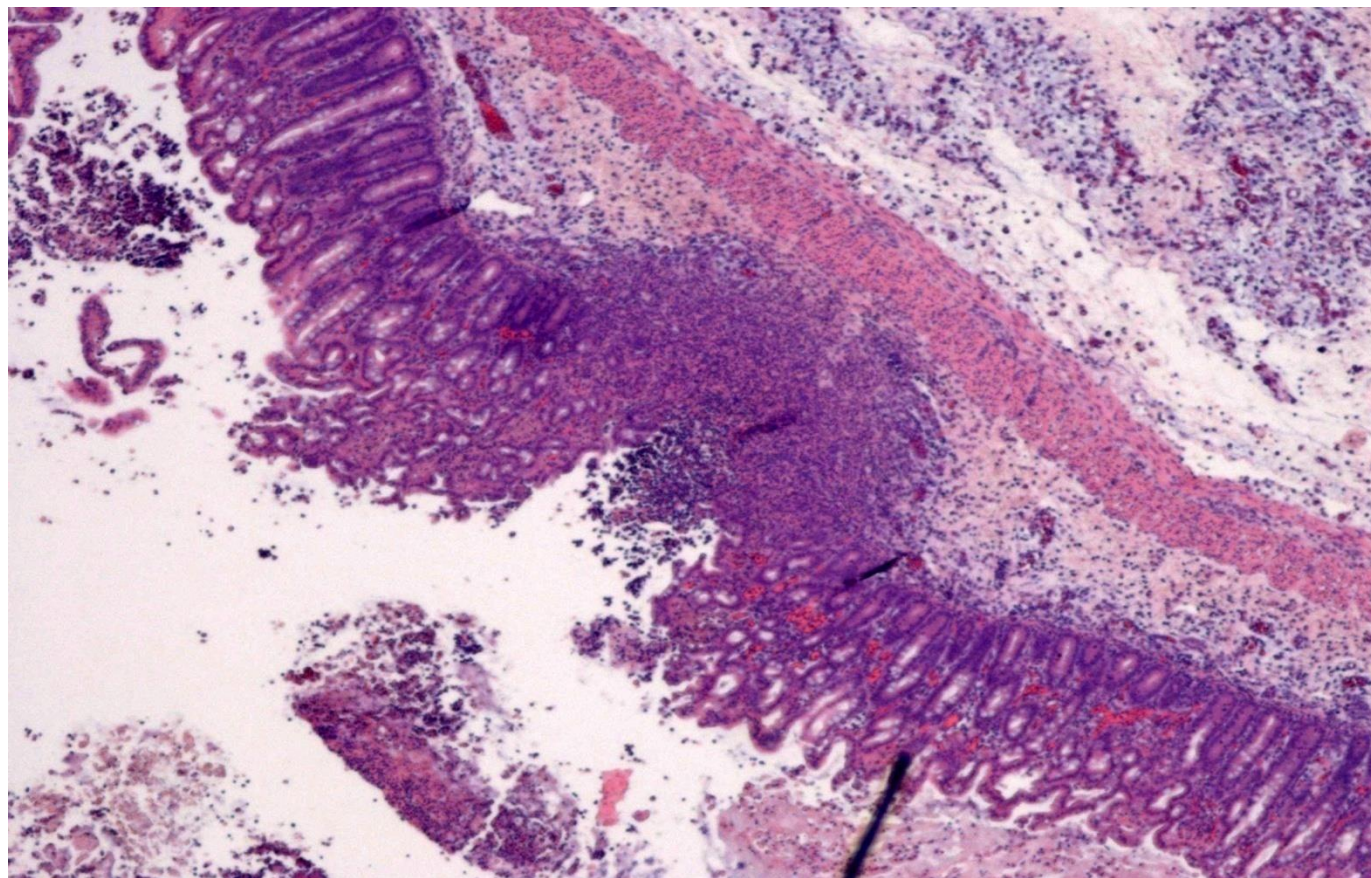
- Shigella
- EHEC
- C. difficile
- Candida albican
- Piglet Model with Normal Human Gut Microflora

Shigella



EHEC: Attach and Efface



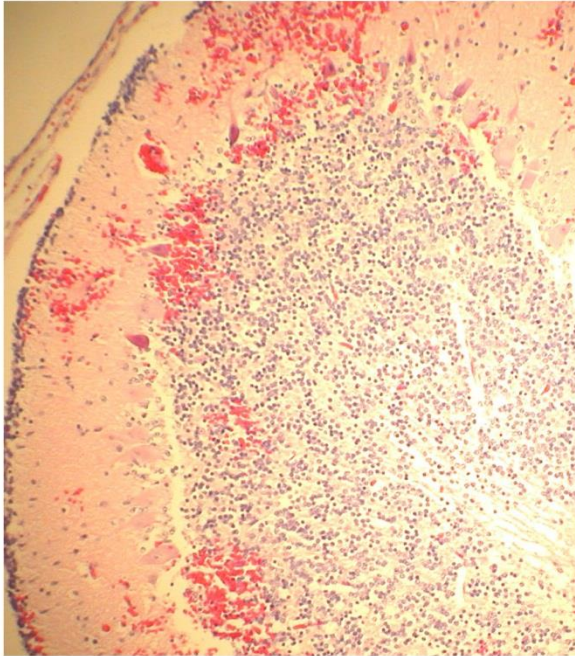


Hematoxylin-eosin-stained histopathology images of piglets inoculated with *C. diff*

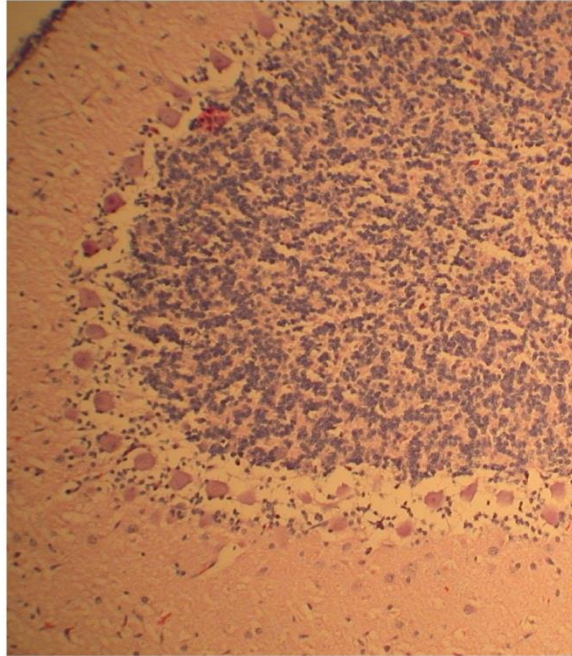
Completed Projects (continued)

- A Gnotobiotic Piglet Model for Evaluating Antibiotics against EHEC O157:H7(J Infect Dis. 2009)
- Gnotobiotic piglet model for shigellosis (J Infect Dis. 2010).
- Gnotobiotic piglet model of C. difficile (J Infect Dis. 2010).
- In vitro versus in vivo differential proteomic analysis of Shigella dysenteriae type 1 (Dr. Rembert Pieper, Pathogen Functional Genomics Resource Center, J. Craig Venter Institute) (Proteome Sci. 2009; Proteomics. 2009; BMC Microbiol. 2011)
- Proteomics of E. coli O157:H7 (Dr. Rembert Pieper, PFGRC of JCVI) (PLoS ONE 2011)
- Identification of the factors required for colonization and persistence of S. dysenteriae by high-throughput genetic approaches (HITS, Dr. Brian Akerley, UMASSMED)
- Identification of the virulence factors of E. coli O157:H7 (HITS, Dr. John Leong, UMASSMED)

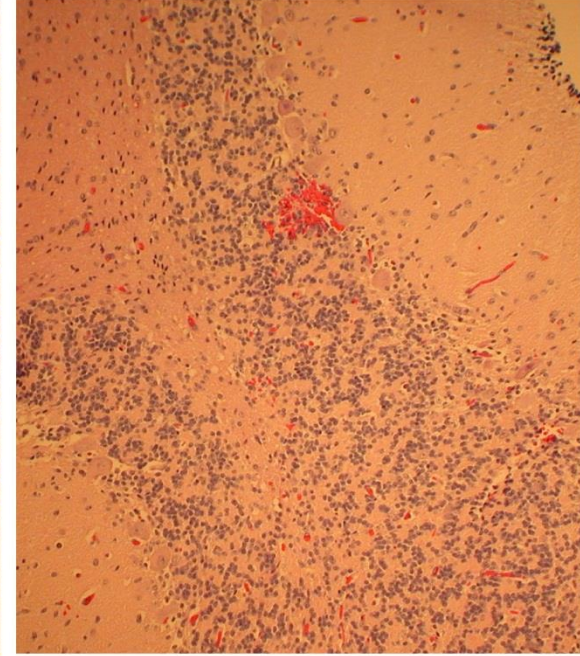
E.coli 8624+Ciprofloxacin (10 mg, BID),



E.coli 8624+Azithromax (5 mg per day)



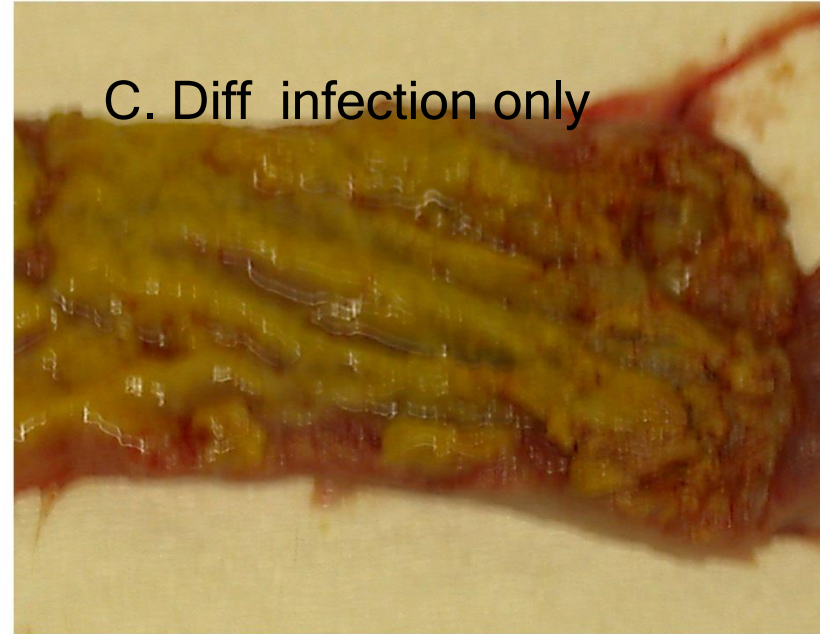
E. coli 8624 only (1.00E+9)



A.



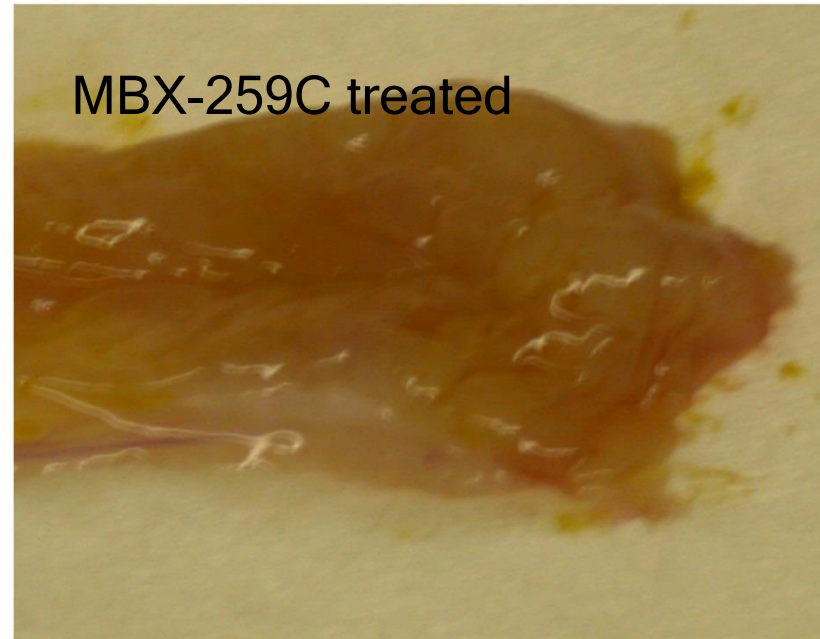
B.



C.



D.



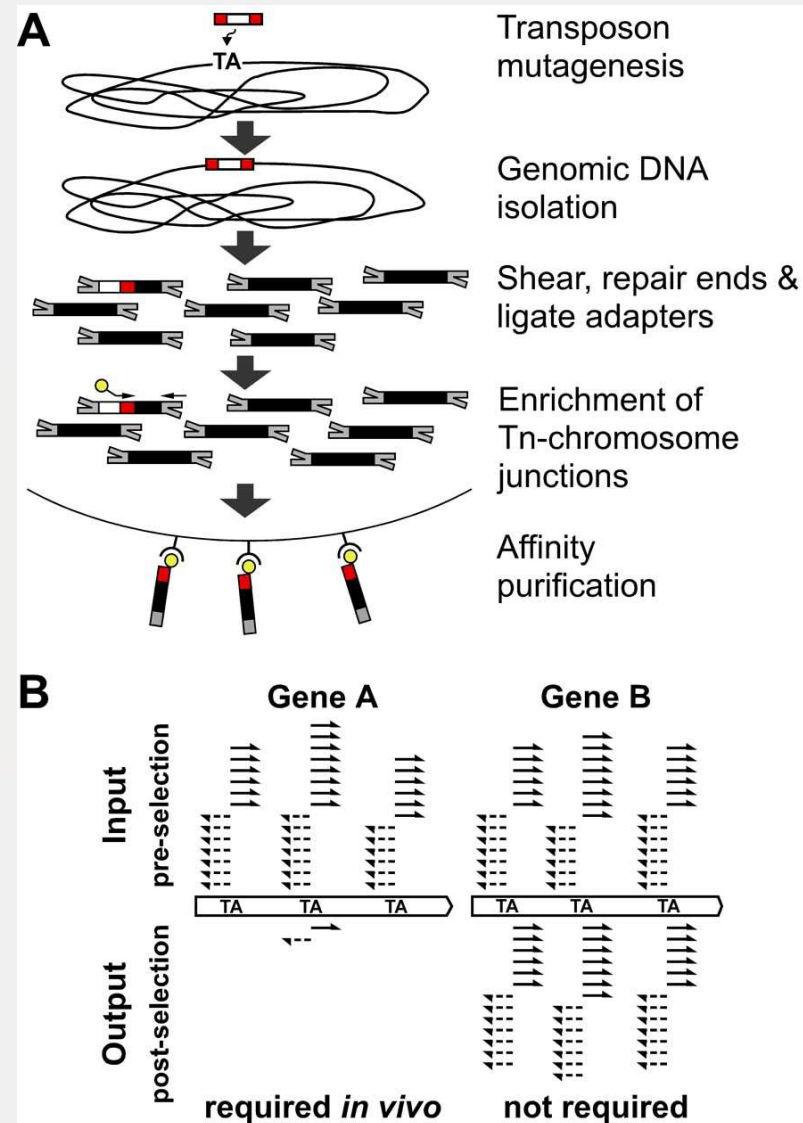
Completed Projects

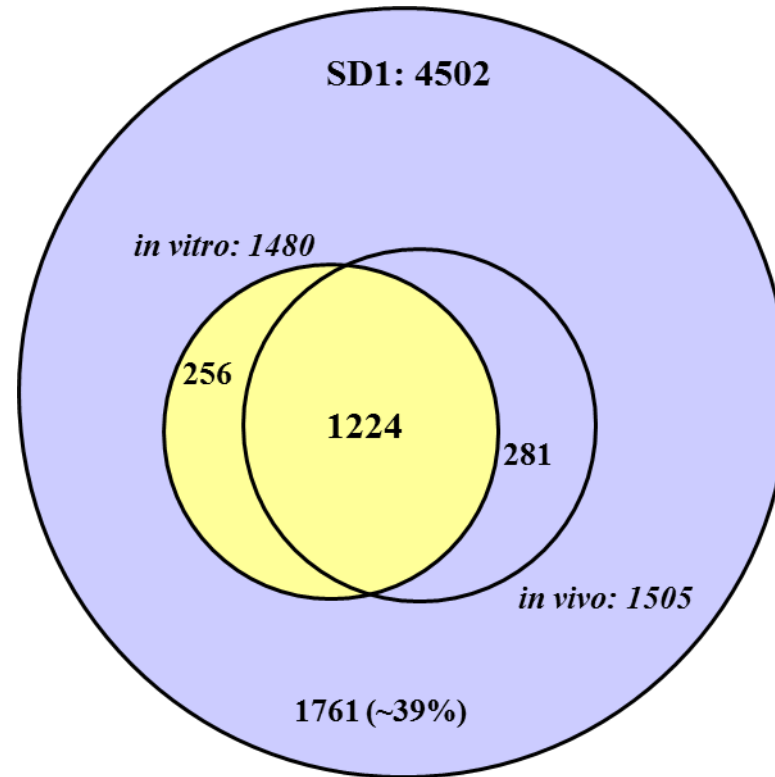
- Evaluation of fully human monoclonal antibodies against *C. difficile* toxin A(CDA1) and B (CDB1) (Contract from Merck).
- Evaluate monoclonal antibodies against *C. difficile* toxin A and B (NIH).
- Evaluate the impact of Tygecycline on *C. difficile* infection in a newly developed animal model with normal human gut microflora (2011 Pfizer ASPIRE Award).
- Evaluation of an Experimental Drug (MBX259C) in the Gnotobiotic Piglet Model of *C. difficile*.
- Neutropenic Mouse Thigh Infection Model Development and Proof-of-Concept Testing of Therapeutics and Vaccines for Bacterial diseases (Project leader, NIH Contract No. HHSN2722010000251)

High-throughput Insertion Tracking by Deep Sequencing (HITS)

Shigella: 239 (12 hours)
and 240 (48 hours)
essential genes for
surviving in the gut.

EHEC: 3 pilot
experiments and formal
experiments are done.





Proteomics

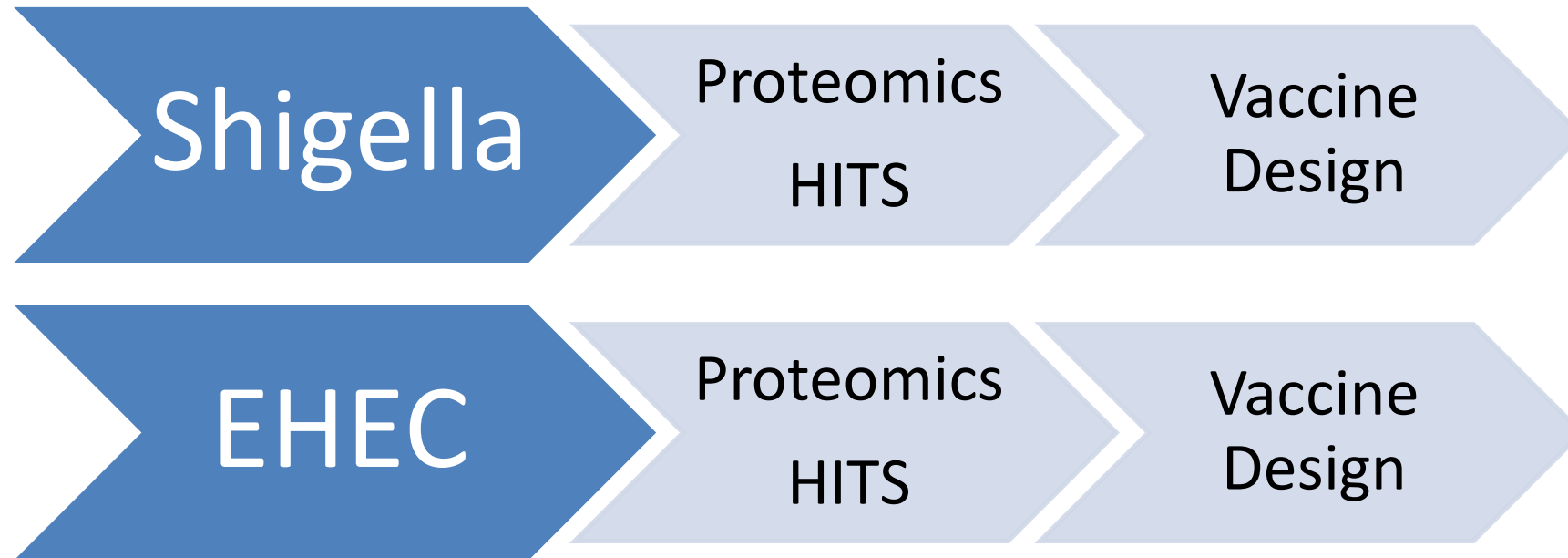
In vivo versus In vitro differential protein abundance analysis of SD1 and EHEC

Methods: 2D gel-MS/MS or 2D/3D-HPLC-MS/MS with APEX (Absolute Protein Expression Technology)

EHEC (2521) representing 47% of all predicted *E. coli* O157:H7 gene products

Shigella (1761/4502)

The whole Pictures



In Summary

- What's your position in this biological circle?
- How to deal with the published old truth?
- Pursue the truth from scratch and your career will evolve.

Collaborators

*Tufts University Cummings School of
Veterinary Medicine*

North Grafton, MA

Dr. Saul Tzipori

Dr. Arthur Donohue-Rolfe

PFGRC, J. Craig Venter Institute

Dr. Rembert Piper

Walter Reed Army Institute of Research

Dr. Malabi M. Venkatesan

Georgetown University

Prof. Xuefeng Liu

*Tufts University Medical School
Boston, MA*

Dr. Carol Kumamoto

*University of Massachusetts
Medical Center, Worcester, MA*

Dr. Brian Akerley

Dr. John Leong

From Academia to Industry: My Career Path

Agenda

- Self introduction
- Industry vs. Academia
- My transition from academia to industry

- 1997 Ph.D. Shanghai Medical University (Fudan)
- 1997 - 1999. China CDC, postdoc
- 1999 - 2000. NIH, postdoc
- 2001 - 2005. Georgetown University, Research Instructor
- 2005 - 2008 NIH, Research Fellow
- 2008 - 2011 Director of Research, Study Director, SITEK Research Laboratories
- 2011 - 2016 Director, Asia Pacific Product Safety Evaluation, L'Oreal
- 2016 - Current Director, Global Product Safety Science / L Brands

**Industry vs. Academia:
Which Is The Better Place For A
Toxicologist ?**

The Differences Between Academia And Industry

- Money
- Flexibility
- Teamwork
- Opportunity
- External credit

Money

- In industry salary is normally 1.2x to 2x higher than in academia
- 2014 on average, academics including postdocs made \$88 K annually, while in industry scientists made \$129 K (Biospace 2016)

Flexibility

- Academic researchers have more flexibility over their schedule, and flexibility over the type of research
- In industry, individuals have their own job descriptions, responsibilities, and fixed schedule

Teamwork

- Academic researchers typically work alone
- In industry, each team or individual has clear responsibilities and work together to support product development and launch

Opportunity

- Generally speaking, an academic research scientist career moves in a single direction—toward tenure and a full professorship
- Industry gives you the opportunity to see what your cross functional partners are doing in the organization, and that allows you to move around

External Credit

- Academic researchers could get external credit through publication and discovery
- Get less external credit working in industry

My Transition from Academia to Industry

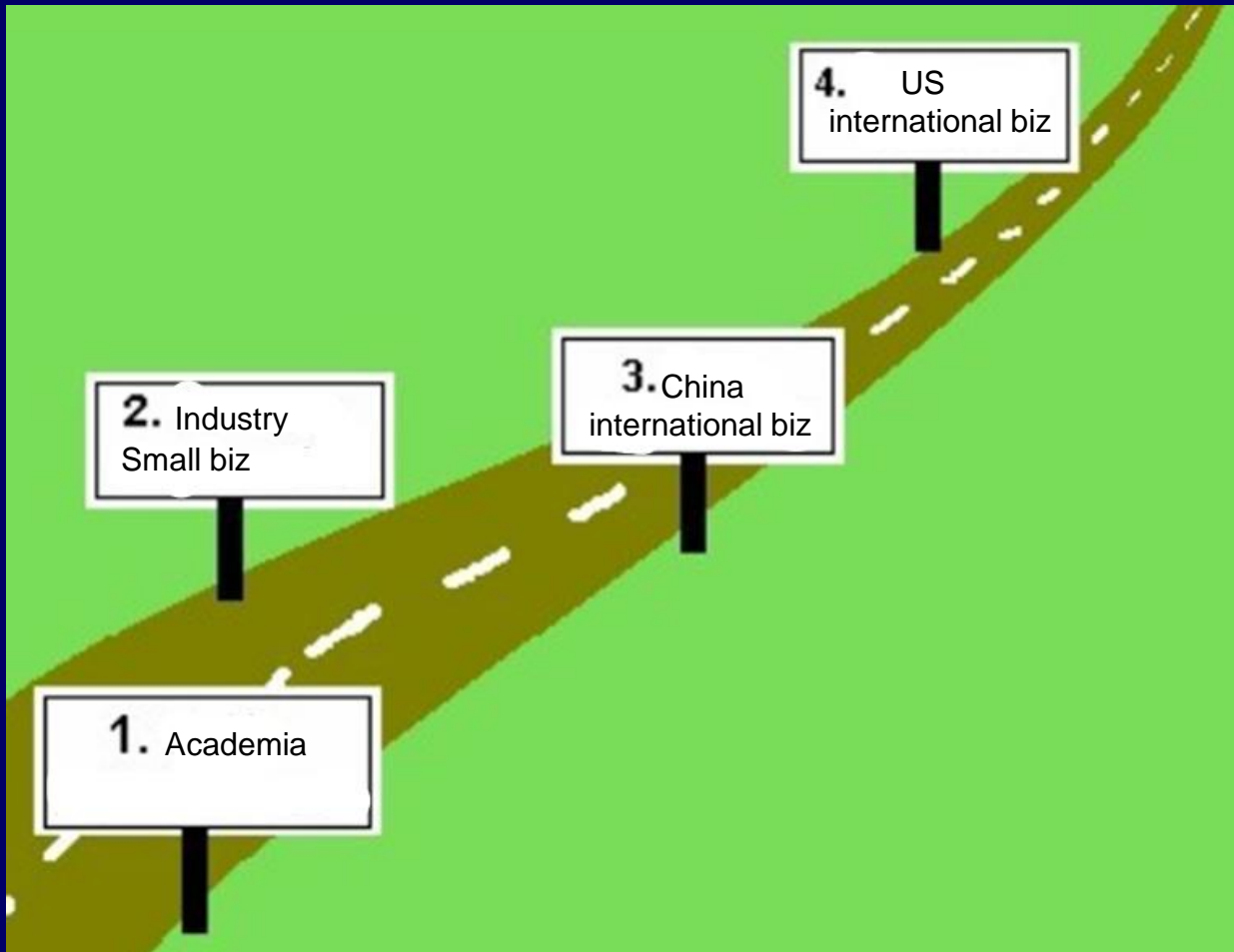
- 2008 from NIH, to a CRO as a director of research/study director
- Risk vs opportunity

Five Years as an Oversea returnee in Shanghai

- 2011 returned to China as Director, Asia Pacific Product Safety Evaluation, L'Oreal
- Risk vs opportunity

Came Back to the US

- 2016 – came back to the US, Director, Global Product Safety Science / L Brands
- Risk vs opportunity



Thank you

Career Development for Life

By

C.J. “George” Chang, DVM, MS, PhD, DABT

Sr. Pharmacologist, FDA/CDER/OND/OHOP

chingjey.chang@fda.hhs.gov; 301-796-5158

Chair, ASQ509 Biomed/Biotech SIG (Gaithersburg, MD)

<http://www.asq509.org/ht/d/sp/i/31557/pid/31557>

gchang2008@yahoo.com; 240-793-8425

WeChat: [gchang2016wc](#); LINE: [gchangline2015](#)

(Below are my personal opinions)

3/13/18

2018 SOT AACT-SIG

Effective Communication

- Practice **elevator speeches**; **Speak English in public**
- “**Toastmaster Clubs**” **help** - Try one out
- How do you **shake hands**? **Build the initial Trust**
- **Be honest** with yourself – **Use best your strength; working on your weakness**
- **Speak at every meeting** – **Speak with passion**
 - We might not have a 2nd chance
- Try best to know **3+ individuals** at every event
- **This is my business card; can I have one from you?**
- Do you **smile**? Call people by **first names**

Listen to Your Instincts (SWOT)

- Have **more tools on your belt – Learning for life**
 - Be prepared when opportunities come
- **Take calculated risks & volunteer**; you will never regret it
 - All challenges are best opportunities
- Everyone can be a **True Leader**; **lead by examples**
- **Manager** – Do things right; **Leader** – Do the right things
- Lose some battles is OK; **WIN THE WAR** is critical
- Choose **A workplace/program needs you the most**
- Continue to increase capability/capacity (**record to CV**)
- **CV** is the single document to carry with you for life

On Our Jobs

Know and Use well the 3 P's at work:

- **People**
- **Process**
- **Politics (how to influence)**
- Always keep an open mind; **think outside the box**

Have 3 Mentors at all the Time (to guide/watch back)

- **Within** your organization – 1 at least
- **Outside** your organization – 1 at least
- **Knock the doors** – Introduce yourself; ask for help
- **You might be surprised for what you will get**
- **If you don't ask, you will never get it**

Network, Network, Network

– “Volunteering” is the key

- Start **networking NOW** – Others have already done that
- Professional associations, alumni associations, FAPAC, AAGEN, OCA, special interest groups (SIGs)
- **ASQ509 Biomed/Biotech SIG: Every other Thursday evening at Gaithersburg, MD**
- **Practice** through every elevator/event/interview
- **When you want to hire yourself, you SUCCEED**
- **Ups** and **downs** are norms in our career/life paths
- **Enjoy your colorful paths & help others**
- **People refer you to others, because they “thought” they know you**

Ten Traits for a True Leader

- 1. Know yourself** - strength/weakness/opportunity/threats (SWOT)
- **Build your brand (character)** all the time.
- 2. Take calculated risks & volunteer** - transform risks into opportunities
- 3. Learn/leverage the politics – 3Ps + Business Acumen**
- 4. Lead changes/People** - Understand needs / build a better tomorrow
- 5. Think/ behave as a main-stream player**, instead an “Asian professional”
- 6. Volunteer the "impossible" tasks/assignments** – We might not have a second change.
- 7. Diversity/inclusion/equality** - implement in everything we do.
- 8. Use multiple mentors** - Ask for guidance.
- 9. Always think outside the box** - Be a best problem-solver.
- 10. Be flexible but determinant** - Results oriented
- 11. Facilitate collaboration, result-oriented**

Washington DC Biomed/Biotech Sectors

- **Government Agencies** – Federal, state, county, city
(NIH, FDA, CDC, PTO, USDA, EPA, NIOSH, on Advisory Panels - **Citizenship/PR**)
- **Government Contractors** – SAIC-Frederick, ORISE, Kelly, BAH, becoming free-agent contractor
- **Research & Development** – Basic, **applied, clinical, preclinical**, (bio-)analytical, environmental – **CROs (GLP, GCP)**
- **Manufacturing**– Pharmaceutical, **Biotech, Medical Device, Vaccine, Diagnostics**, Food, Chemical – **CMOs (cGMP)**
- **Consulting** – **Regulatory**, Organizational Strategy, **quality (auditing/ inspection)**, legal , trading, reference standards, **3rd party verification**
- **Educational** – Teaching, Hospital, think tank, focus groups
- **Business** – **Entrepreneurship**, investor, Corp. agents, trade Group, IP
- **Non-profit Organizations** – **Mission-focused Services**
- **Entrepreneurship** – **C-level leadership**

Winning Career Planning/Execution

- Are you willing to hire yourself NOW? –

- A Differentiating Skill Set and Character -

- Knowledge/Experience - **Wisdom** – Yours & others'
- Language Skills – Writing, **Speaking** - Toastmaster clubs
- Soft Skills – Take risks/volunteer (Ask/Introduce/Volunteer)
- Market/Intelligence – Training, qualification, certificates
- **Passion** - Value / Purpose / Honest
- **Winning Resume** – DO **NOT** Just List things, tell a story
- **Networking** – Your status, interest, goals, discussion groups
- **3Ps** (people, process, politics) + **Elevator Speeches**
- **Better than the competing NATIVE SPEAKERS**

Be a True Leader

Build Integrity, Trust/Verify, Empower, Delegate

Explain the “Why”; Give people a “Purpose”

Effectively Solve Issues + Build Sustainability

3P's to Learn – People, Process, Politics

4C's to Excel - Character, Competence, Commitment, Communication

SAFV to Survive: Scalable, Affordable, Feasible, Velocity*

ABC for Life: Adaptive, Be Prepared, Committed*

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