

Transforming Microbiology at *DynaLIFE_{DX}* Labs:

Using Automation, LEAN Workflow and Tools Optimization

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Presentation Overview

- 1) *DynaLIFE_{Dx}* : The Organization
- 2) BD Kiestra™ Total Lab Automation
- 3) LEAN *Optimization*
- 4) Unexpected Challenges
- 5) Quality & productivity benefits

*DynaLIFE*_{Dx}

- We are part of an integrated service providing all Microbiology testing for dozens of hospitals including large acute care, regional and community hospitals
- We provide AP, Micro and other lab testing, referral, consultation and support services to over 150 hospitals and health centers
- We operate a large referral lab in Edmonton
- We operate labs in regional and rural hospitals

DynaLIFE_{Dx}

- We employ over 1,150 dedicated, professional laboratory staff...
- ... and 40 pathologists, medical microbiologists, biochemists and other medical laboratory specialists







Inuvik

Canada

Edmonton

United States

New Orleans

Driving Innovation in Lab Medicine

DynaLIFE_{DX} has consistently offered a forward thinking approach throughout its history and continues to develop and implement innovative solutions.

We always strive to find new tools rather than increasing the number of hands we need to deliver our expanding volume and scope of service.

Transforming Microbiology

- Late 2012** Through an in-depth analysis of Microbiology automation options we chose to implement the BD Kiestra™ Total Lab Automation system.
- Early 2013** Our business case was approved and our change management process was initiated.
- Sept 2013** First TLA operational in North America
- Nov 2013** Full implementation of our TLA completed

The Kiestra System has changed or facilitated changes to almost every component of our Microbiology laboratory...



Why was the introduction of automation Microbiology so important to us?

- We test 900,000 Microbiology specimens annually (40% are acute care, and 60% are extended care and community)
- Opportunities to improve quality, patient care, patient safety, TAT and lab productivity – **huge!**



Microbiology Automation The BD Kiestra™ System



Key Advantage: Standardized Culture Plates

The Inoqua automated specimen handling system delivers:

- Standardized inoculum size
- Standardized streaking patterns by specimen type
- Isolated colonies which support immediate pathogen ID



Key Advantage: Plate Management

- Correct media is barcoded and transported via the track
- Each plate is then sent to the appropriate incubation environment (CO₂, O₂, etc.)
- Plates are then transported by track to benches for further work up
- Discard plates are also managed by the system



Key Advantage: Inoculation & Streaking Automation drives Standardization



Key Advantage: Smart Incubators

- Standard Incubation times set for each specimen type
- Eliminates over or under incubation which can interfere with colony isolation and pathogen ID
- No longer incubating “on the bench”

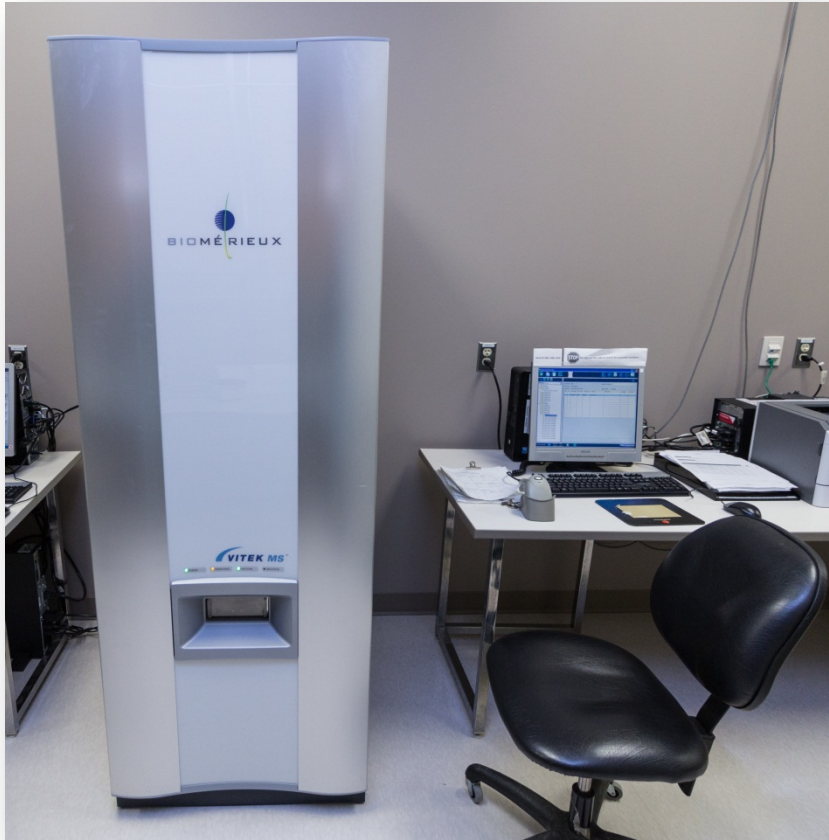


Key Advantage: Digital Imaging

- Techs interpret plates in the reading room
- Digital imaging enhances plate reading/track follow-up
- No growth plates reported immediately
- Colonies identified for further work-up or Susceptibility testing



Critical Supporting Systems MALDI-T of Pathogen Identification



Matrix Assisted Laser
Desorption / Ionization
Time-of-Flight:

- can identify over 2200 different bacterial pathogens
- complete the identification of a recognized pathogen under 1 minute

Impact of Automation on TAT

Traditional Microbiology	Primary Culture	Sub-Culture	Pathogen Identification	Antibiotic Susceptibility	Total time to Report
	1 – 2 days	1 day	1 day	1 day	4 - 5 days

Microbiology Automation	Primary Culture	Path ID and Susceptibility	Total time to Report
	18-25 hours	20-24 hours	1.5 to 2 days

LEAN Optimization

1. Design of layout and workflow
2. Single piece flow specimen handling
3. Staffing linked to workflow
4. Adoption of Chromagar
5. Automated inoculation and streaking
6. Real-time dashboards/KPI Reports
7. Visual System Controls

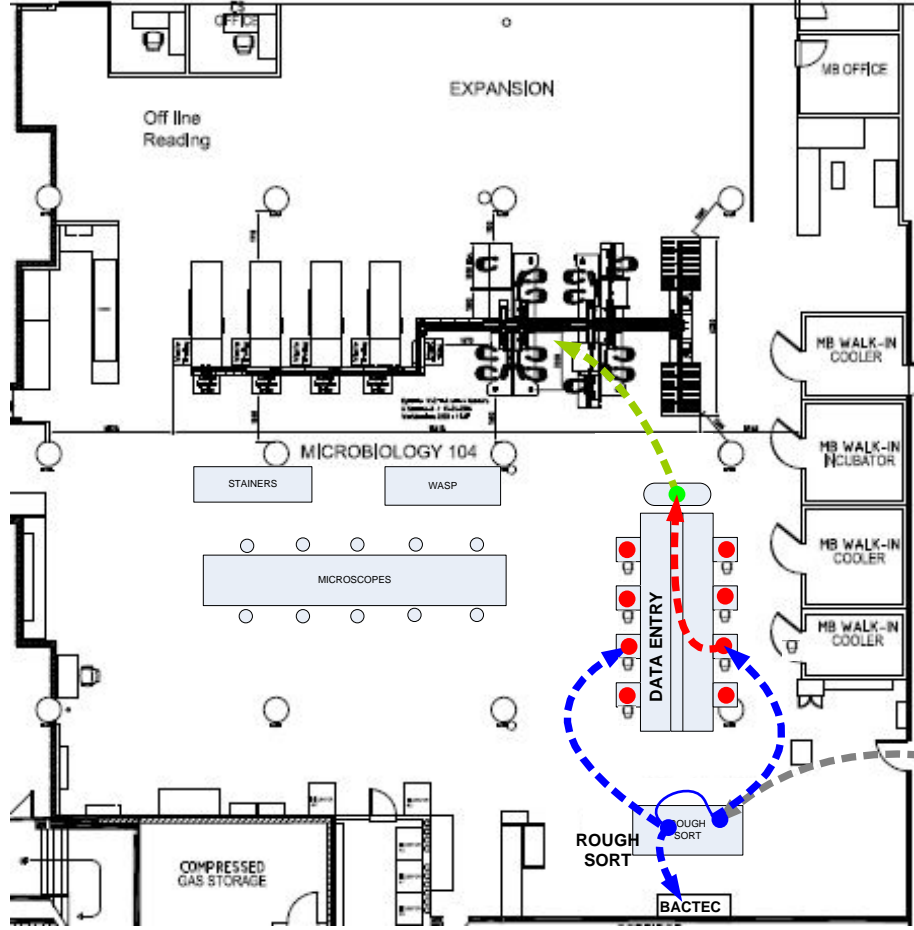
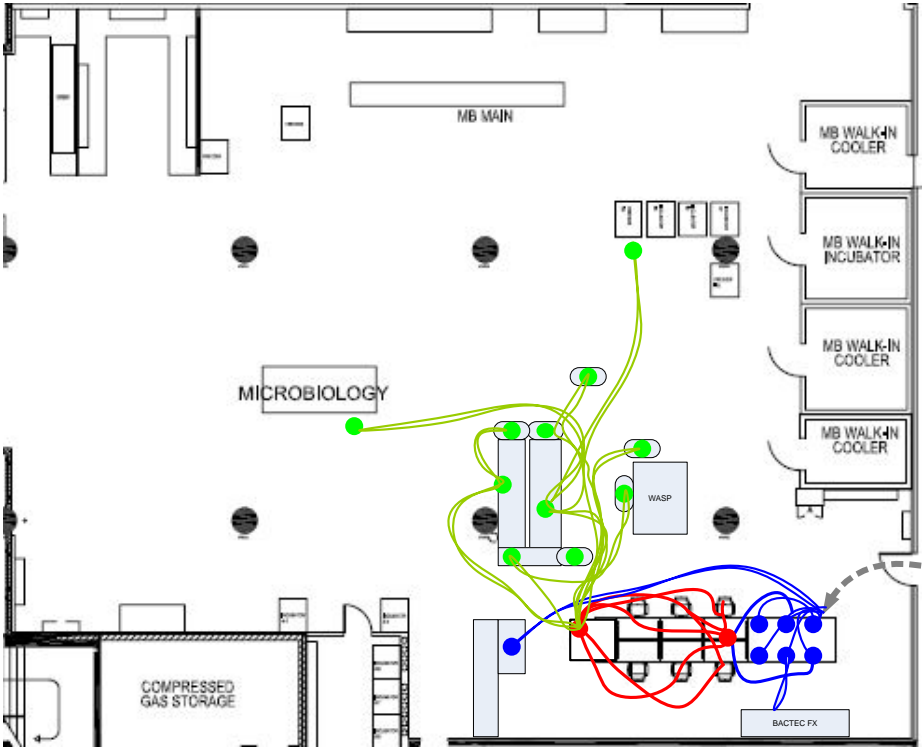
Planning: Mock Lab

- Bench layouts and workflows designed
- Design system set-up
- Bench top Inoqua and ImagA helped us set up our streaking patterns
- Training on reading digital plate images and system software



LEAN Lab Layout

After



Before

Single Piece Flow Specimen Handling

February 2013

vs

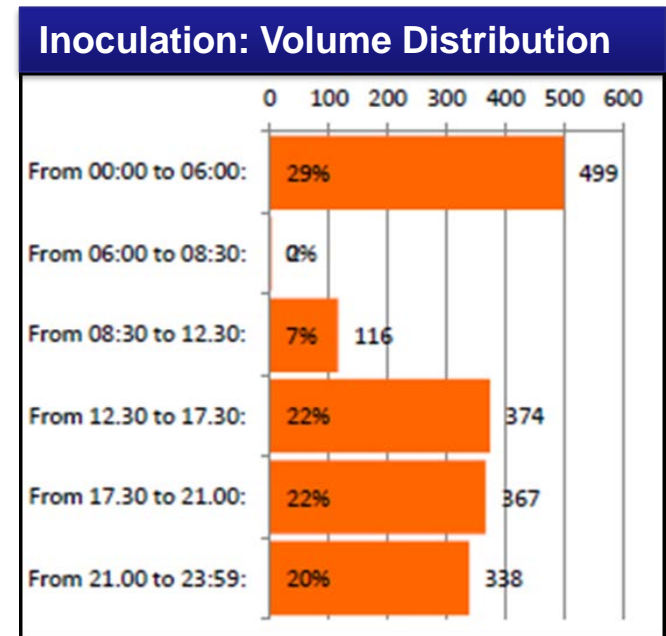
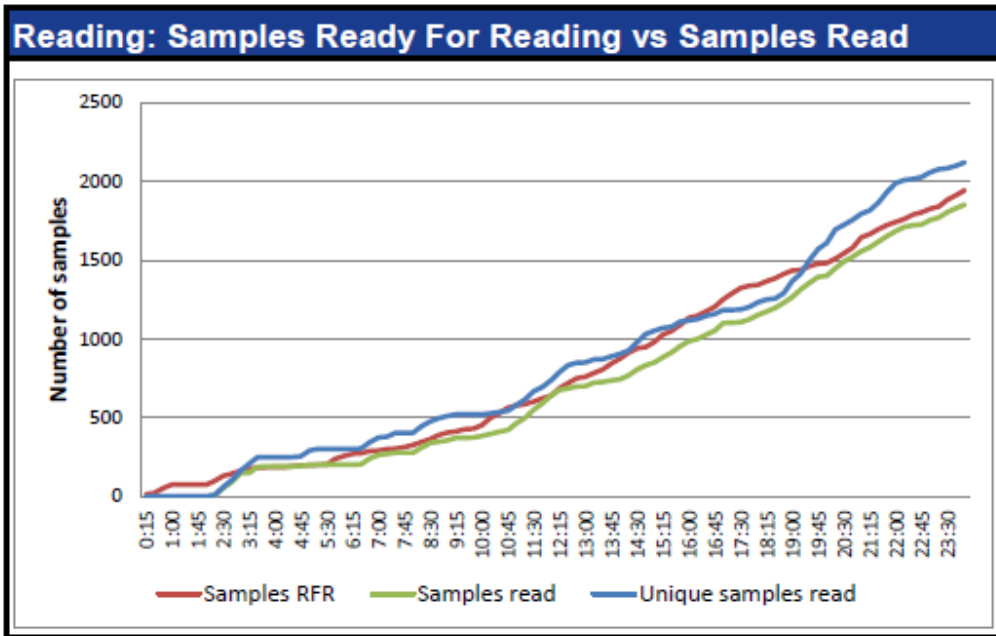
June 2014

- Batch processing
- Manual labelling of media and mostly manual planting
- Swings in workload
- Ave elapsed time to process a specimen was 180 min
- Significant rework and photocopying

- Single piece flow
- Automated plate labelling and positive specimen identification
- Even workload on InoqUA
- Ave elapsed time to process a specimen is 56 min!
- Reduction in duplication and rework

Net Result: 69% Reduction in Process Lead Time

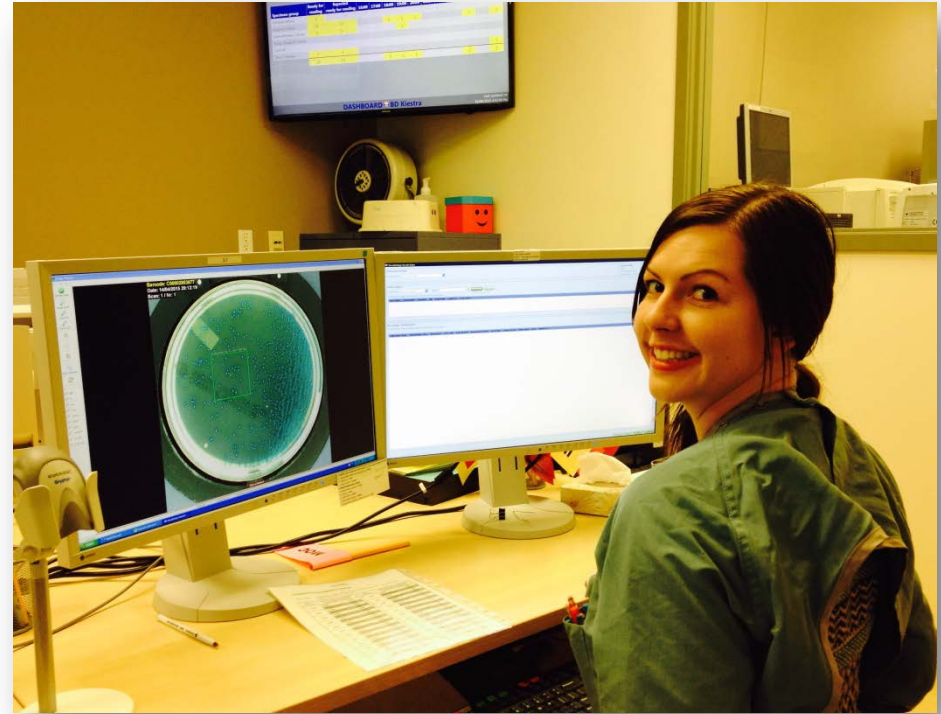
Staffing Matches Demand



- Staffing scheduled to align with specimen arrival and ready to read times allocated across 24 / 7.
- Allows for steady distribution of work and improved TATs.

Chromogenic Agar Advantage

- The color of the colony identifies the pathogen
- Can report the pathogen identification right away
- More accurate ID
- From primary plate direct to susceptibility testing
- Improved TAT
- Improved productivity



Note: longer incubation times

Inoqua: Automated Inoculation and Streaking



Real-Time Dashboards

Specimen group	Ready for reading	Expected ready for reading	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00
Urine EURC	79	340		6	30	38	27	49	42	44	16	88	
Urine Cultures URC	53	341		8	16	42	41	79	7	10	78	56	4
Invasive Urines	2	5			1			1		1		2	
MRSA Screens	2	171		22	1	18	13	16	33	4	41	23	
VRE Screens	2	45		2	2	1	8	8		5	8	3	8
Skin/Superficial Cultures	1	94		7	21	12	2	22	8	9	8	1	4
Foreign Body Cultures	1												
LRT Cultures	6	22		3	3	3	1	3	3	4	2		
Ear Cultures	3	7		1	5			1					
Eye Cultures	3	3						1	1		1		
Nasal Cultures	1	2				1						1	
Oral Cultures		5						1	4				
	153	1035		49	79	115	92	181	98	77	154	174	16

DASHBOARD  BD Kiestra

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Real-Time Dashboards

Specimen group	Ready for reading	Expected ready for reading	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00
Genital culture													
Vaginal culture	5	13			2	1		1	5	2	1		1
Gonorrhoeae Culture	3	3			1				1	1			
Strep Group B Culture	15	1						1					
Consult													
Tech 2 review	8	5		3			1	1					
	31	22		3	3	1	1	3	6	3	1		1

DASHBOARD  BD Kiestra

Last updated on
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 **CANADA'S
BEST
MANAGED
COMPANIES**


DynaLIFE_{Dx}
Diagnostic Laboratory Services



DYNALIFE 27[™]
BD Kiestra

DYNALIFE 29[™]
BD Kiestra

Handwritten notes on a whiteboard, including a list of names and dates.

 CANADA'S
BEST
MANAGED
COMPANIES


DynaLIFE_{Dx}
Diagnostic Laboratory Services

Visual System Controls



Comprehensive Implementation Plan

- Project Plan
- Change Management Plan
- Core Team
- Expert User Group

Unexpected Challenges

1) System Issues - because we were first:

- Problems with the plate stacks
- Software configuration to support a 24/7 high volume lab
- Electrical and power requirements
- LIS and network connectivity
- Access to the Kiestra service desk in North American time zone

2) Change Management Hurdles

A Fundamental Shift in the Way We Work



Traditional Microbiology:



Your “bench”

New Work Structure



Read Images of multiple specimen types, direct further work-ups

Perform Work-ups based on images



Read Direct Smears

Quality Benefits Achieved

Improvements Include:

- Improved TAT
- Error reduction
- Standardization built in to each step
- Streamlined SOPs support standardization
- Patient and staff safety
- Antibiotic stewardship enhanced

Turnaround Time Comparison

Receive to Result TAT

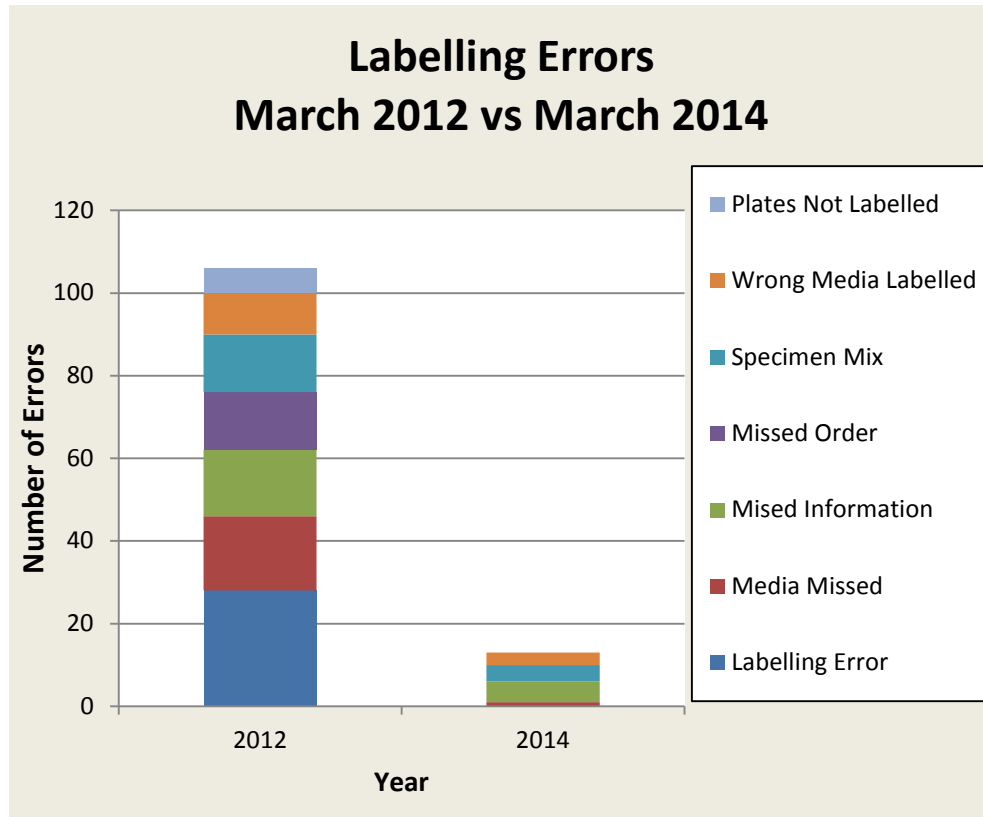
TEST	Pre-Kiestra Average TAT (Hrs) 2013	Post- Kiestra Chromagar Impact (Hrs)	Post-Kiestra Average TAT (Hrs) 2014	Net Improvement (Hrs)
MRSA	41	+ 6 hrs	33	7
Superficial Wounds**	70	No Change	60	10
Urine	43	+3 hrs	38	5
VRE	72	+10	41	31

Improved TAT supported by:

- staffing model,
- testing protocols,
- methodologies
- technology

Fewer Processing Errors

With single piece flow and using the InoquaA:



Labelling Errors in March	2012	2014
Labelling Error	28	0
Media Missed	18	1
Missed Information	16	5
Missed Order	14	0
Specimen Mix	14	4
Wrong Media Labelled	10	3
Plates Not Labelled	6	0
Total # Errors	106	13
Total # Specimens Processed	70,523	77,951
Total Error Rate	0.150%	0.017%

**87% Reduction in
Labelling Errors**

Supporting Antibiotic Stewardship

Our medical microbiologists are closely involved in provincial and local antimicrobial stewardship committees which seek to continually improve patient safety and outcomes by guiding appropriate use of antibiotics.

- Rapid accurate pathogen identification and reporting will more effectively guide the decisions made by physicians supporting enhanced antibiotic utilization. Now available to physicians via our Antibioqram App.
- In turn this will hopefully support the reduction of antimicrobial resistance through the establishment of strategies that limit the use of broad spectrum antimicrobial agents.

Operational Benefits Achieved

- Productivity gains
- Staff mix optimization
- Increased market share
- Reduced media costs
- Built experience and expertise
- Streamlined workflows
- We continue to aim to be the best and lead the game

Productivity Gains

- 9 FTE reduction delivered to date
- Absorbed a 15% increase in workload from a new consolidation initiative
- Function Shifts – from technologists to assistants
- Real-time redeployment to manage workload
- Use of workflow monitors to direct LA work

Media Usage

Anticipated a reduction in media usage based on improved colony isolation and reading cultures at the time they are ready

- 10% reduction in average BAP/specimen
- 30% reduction in average MAC/specimen

Still Optimizing

- Implement the BSC / semi-automated Inoqua – planned for summer 2015
- Further refinements to workflows in progress
- Expect to realize more staff efficiencies
- Continue to work with Kiestra to build enhancements to software
- Continue to build staff expertise

Our Great Micro Team on Go-Live Day!





Questions?