

Intelligent Automation

Using Automation, Middleware and Digital Imaging to Transform Hematology Workflow and Outcomes



UTMB

Major Academic Health Science Center



- 6 hospitals
- Level 1 trauma center
- 24-room multi-specialty operating suite
- 6-room offsite operating facility
- 100 campus based clinics
- 37 community based clinics
- Prime health care provider for TDCJ with laboratory services to over 100,000 inmates at over 55 TDCJ units in the state of Texas



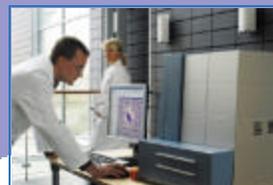
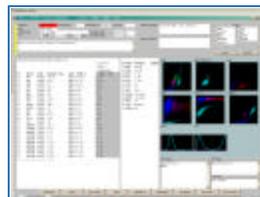
UTMB's Goals/Objectives

- ✳️ Compensate for decreased FTE's
- ✳️ LEAN, more efficient workflow
- ✳️ Standardize Result Reporting
- ✳️ Improve Turnaround times
- ✳️ Paperless!!



HST-N Hematology Automation

Systemex



Cellavision DM 96



MOUS

CBC Instrumentation



- **Two XE-2100's and one SP-1000**
 - **Tests:** CBC with 6 part differential, Retic and NRBC (also available now - IPF, Ret HE, body fluid analysis)
 - **Throughput:** 2 x 120 samples/hr= 240/hr
 - **Minimum specimen volume:** 1ml for closed mode, 130ul for open
 - **Review rate:** 20-28%
 - **UTMB's workload** - 1000 CBC's/day



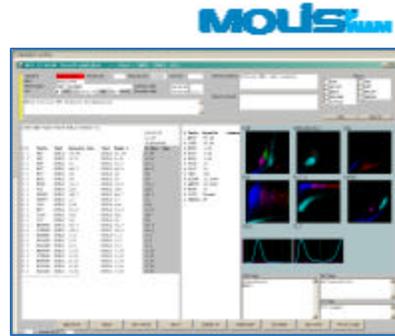
Intelligent Automation

An integrated software and automation platform that optimizes data and sample management with a higher level of **LIS collaboration**.

***HST-N + Molis/WAM =
Intelligent Automation***



What it Looks Like



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MOLIS WAM

- User-defined rules for auto-validation
- Automate repeat/reflex with user-defined criteria
- STAT samples sorted and viewed first
- Paperless review
- Centralized database for delta checking
- Concentrate instruments through single interface

 UTMB

Intelligent Rule Engine

- **Advanced Rule Engine**
 - More **complex** rule combinations in ONE rule
 - More variables to create rules
 - More rules for sub-sites
 - *Better* rules to integrate discrete data
- **Higher** level of result qualification than provided by LIS
- **Less** operator intervention; fewer errors
- **Improved** standardization and control across shifts and labs



Middleware Rules – Information to help Labs Work Smarter

- **Rules on the Order level**
 - Location, Unit, Requestor, Age, Sex, Priority
- **Rules on the Result level**
 - Present, outside/inside range, coded comment, flag
 - Check previous results/orders - % or absolute
 - Check result/absence/presence of another parameter
- **Rules for reruns**
 - First run, all run, group/single tests for runs
- **Action Rules**
 - Rules to create comments, operator alerts, add/delete tests



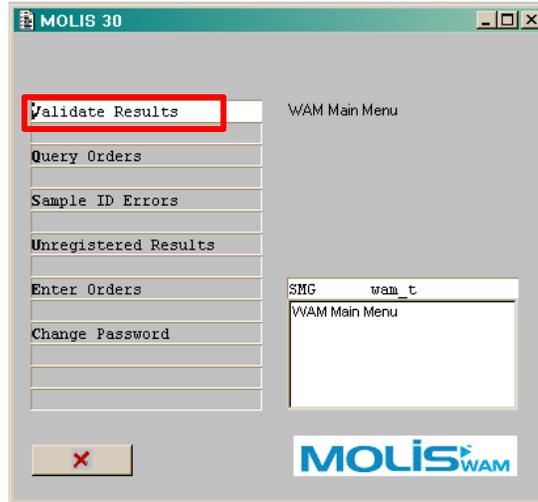
Examples of Rules

Test	Rule	Action
WBC	Immature GRAN?	Verify auto diff if it matches, perform Mdiff if no match
RBC	If RBC < 3.0 and LOC = PEDs and age < 2 years	Re-run
HGB	If HGB > 16.0 and Requestor = Smith and no previous result	Reflex Smear and HOLD all tests
PLT	If PLT ABN distribution and retic ordered and PLT < 80	Hold CBC and ADIF

UTMB Validation Process

- Validate CBC
- Unregistered Results
- Sample ID Errors
- Query

Navigating through MOLIS WAM



Validation Selection Screen - V2





Validation Screen

This annotated screenshot highlights key features of the Validation Screen:

- 1:** Points to the main data table and the scatter plots/histograms area.
- 2:** Points to the 'STAT' results at the top of the data table.
- 3:** Points to the patient information fields at the top.
- 4:** Points to the internal and external comment fields.
- 5:** Points to the 'ADD' and 'DELETE' buttons for tests.
- 6:** Points to the navigation toolbar at the bottom.

1. Patient results, scatter plots, histograms, and instrument flags are displayed. Previous results and the manual differential display on one screen in separate windows.

2. **STAT** results are sorted first on the list, to expedite client review & validation

3. Operator alerts display rule text and customer specific instructions

4. Internal and external free or canned text comments can be entered

5. Tests can be added/deleted

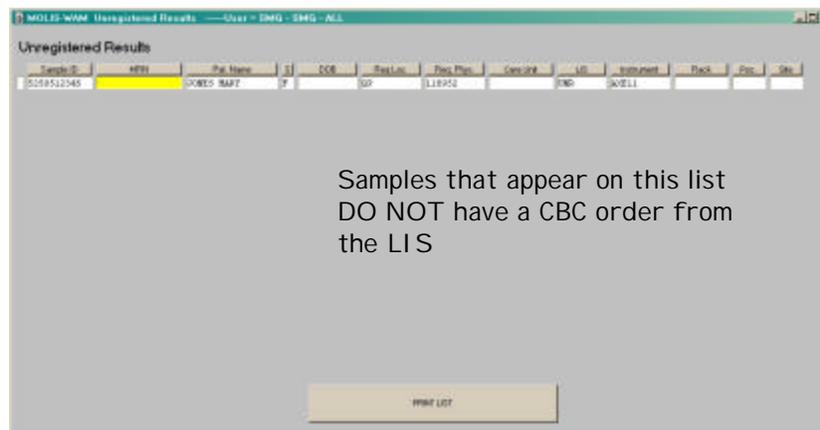
6. Navigation buttons on the bottom tool bar provide quick access to other functions

Paperless Processing: data on screen

Graphic data and flagging from the instrument



Unregistered results screen



Sample ID Error

MOLIS-WAM Sample ID Read Error — User = SMG - SMG - ALL

Sample ID read error

Sel.	Rec. Dt.	Rec. HH	Instr	Rack Nb	Pos.	Sample ID
<input type="checkbox"/>	03/14/2005	16:42	BXE12	000003	03	ERR000000000015
<input type="checkbox"/>	03/14/2005	16:42	BXE12	000003	04	ERR000000000016
<input type="checkbox"/>	03/14/2005	16:42	BXE12	000003	05	ERR000000000017
<input type="checkbox"/>	03/14/2005	16:43	BXE12	000004	01	ERR000000000018

Remove Selection Print Selection



Query Orders from the Main Menu

MOLIS 30

WAM Main Menu

Validate Results

Query Orders

Sample ID Errors

Unregistered Results

Enter Orders

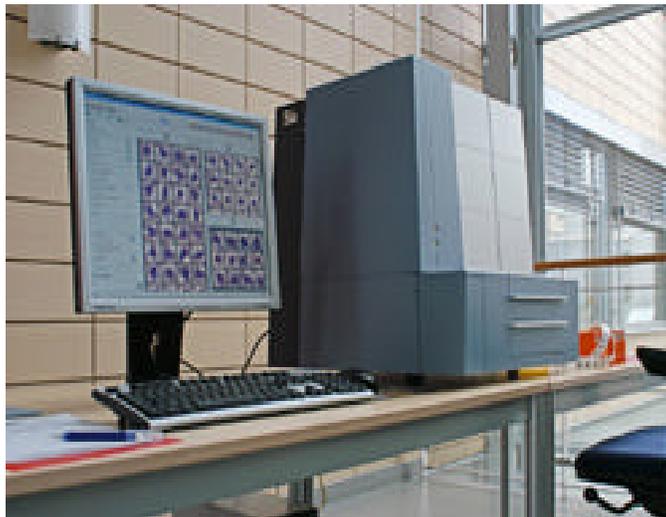
Change Password

SMG wam_t

WAM Main Menu

MOLIS WAM

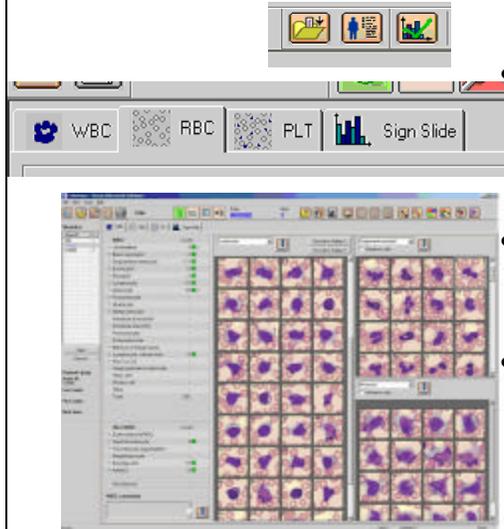




DM96 - Database View

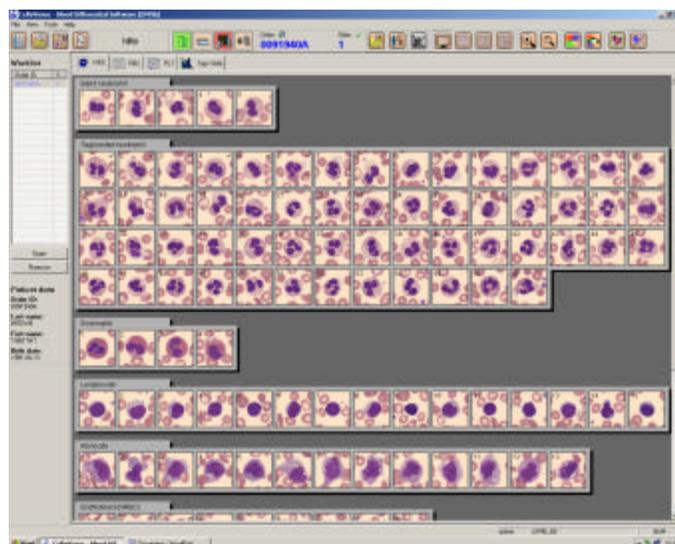
ID	Name	Location	Date
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102	102	102	102
103	103	103	103
104	104	104	104
105	105	105	105
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107	107	107	107
108	108	108	108
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200	200	200	200

CellaVision – WBC Tab

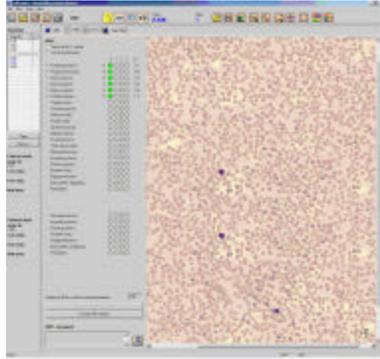


- Press WBC Tab to review results
- Can add or remove cells or reclassify the cells
- The system keeps track of all WBC's viewed by the operator.
- A tick mark appears when all WBC's of a cell class have been displayed..

WBC Tab – Full Screen View



CellaVision – RBC Tab



- Select the RBC Tab
- The tech has the following reporting result options:
 - 1- Use Characterization
 - 2- Report as 0-Normal
 - 3- Exclude RBC morphology
 - 4- Confirm Counter Results

PLT tab

PLT result

PLT estimate factor:

Average PLTs/HPF value:

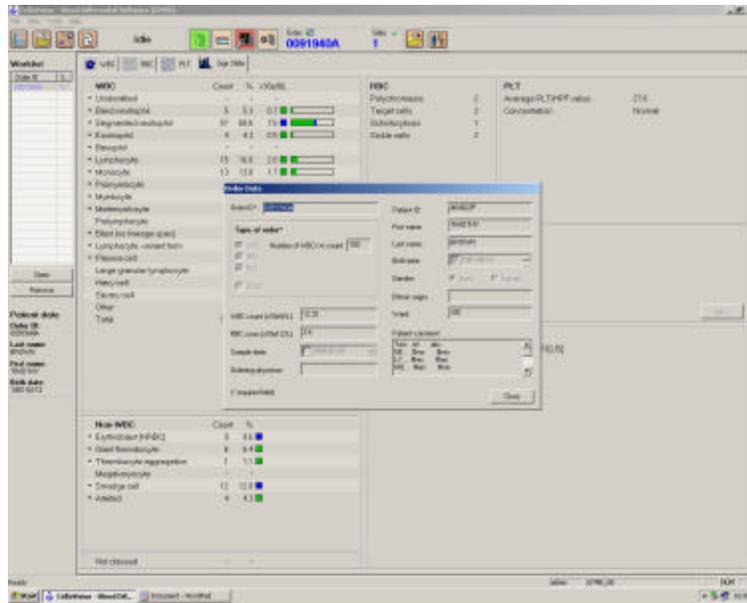
PLT concentration:

Calculated estimate: x10e9/L

Calculated level:

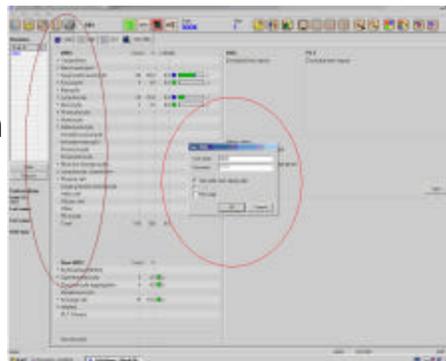
Manual level:

Sign Slide Tab w/Order Data



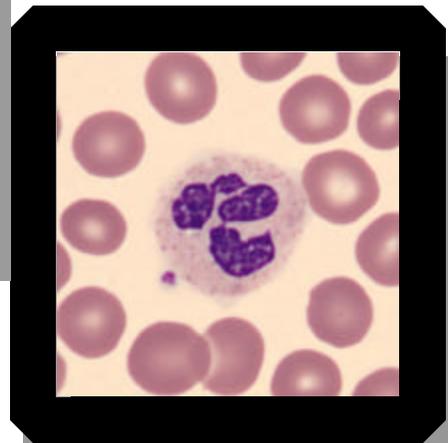
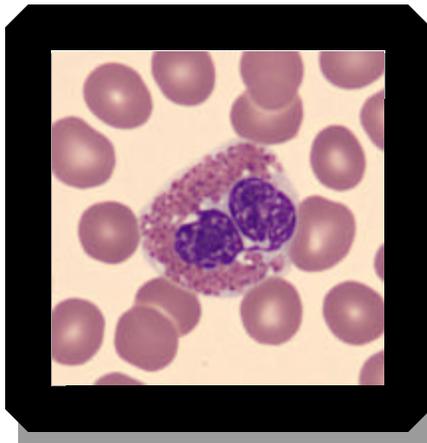
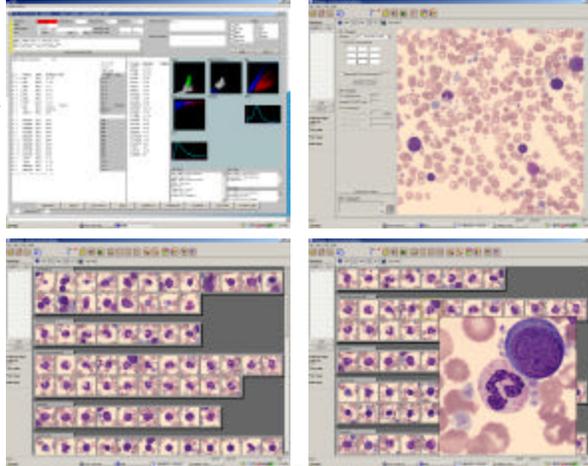
CellaVision – Sign Out Order Tab

- Click on Sign Order tab
- Final results display in one view
- All results sent to MOLIS WAM

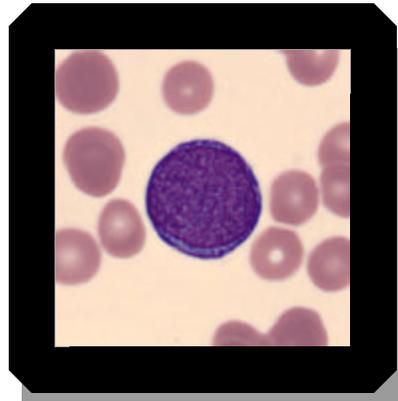
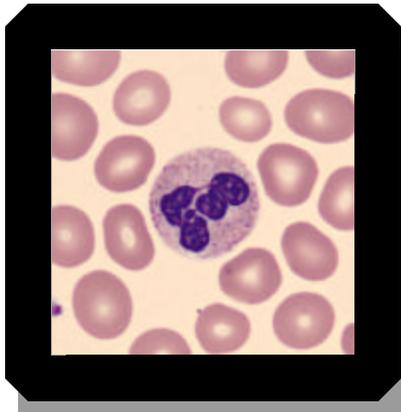


DM96 Opportunities

- **Patient Image Archive**
 - to follow patients/
track changes
- **Pathologist Review**
 - remotely
- **Education**
- **Digital Library**

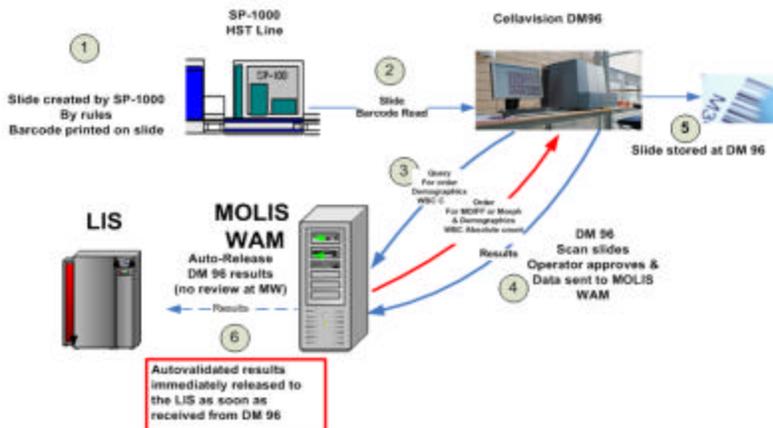


Images from the DM96



Autovalidation

Cellavision Information Flow

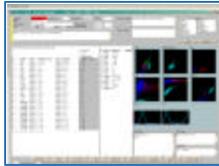


UTMB's Winning Combination / Achievements



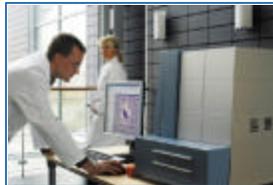
Lavender tube management
Automated Line
Streamlined our operation

HST-N Hematology Automation



Better Workflow
Freedom to go Paperless!
Standardized rules/processes across shifts
New Employee Training

MOUS



Workhorse to handle "routine" scans

Cellavision DM96



Keys to Success!

- Optimize LIS resources
 - LIS connectivity, database changes
- IT policies:
 - Backup, UPS, security
- Staff acceptance/trust of system
- Dedicated lab testing resources
- Ability to train all users at install & new hires
- Period of adjustment
- Allow the software to work for you instead of you working for the software!





 UTMB

Thank You

