

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



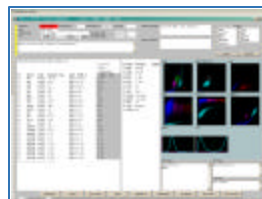
UTMB's Goals/Objectives

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



HST-N Hematology Automation

Sysmex



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



UTMB

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

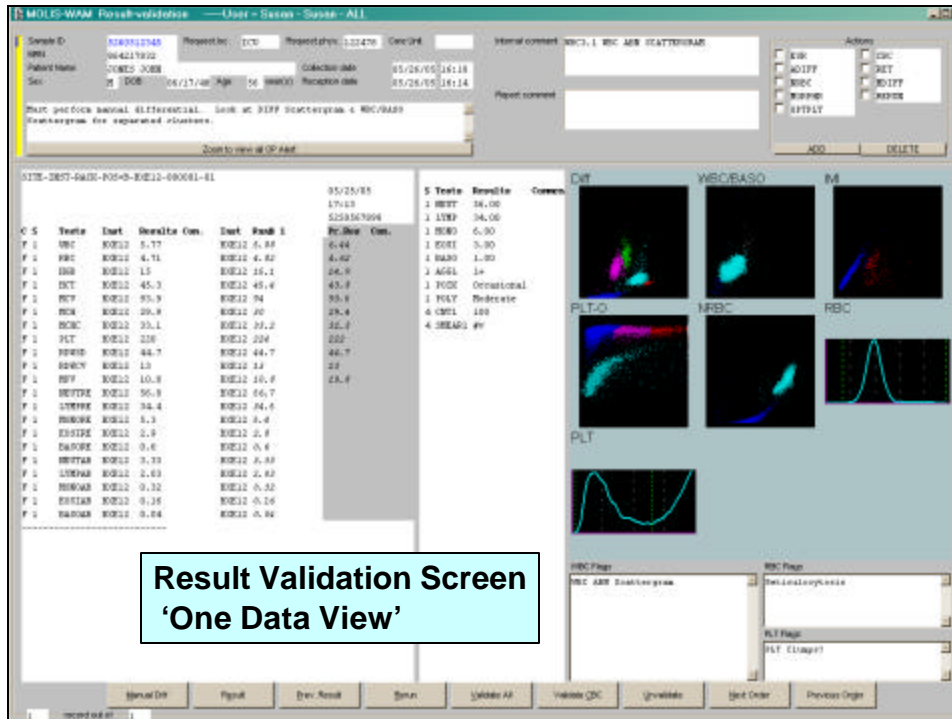
The screenshot shows the 'MOLIS 30' application window. On the left is a vertical menu with the following items: 'Validate Results' (highlighted with a red box), 'Query Orders', 'Sample ID Errors', 'Unregistered Results', 'Enter Orders', and 'Change Password'. To the right of this menu is the 'WAM Main Menu' area, which contains a text field with 'SMG wam_t' and a button labeled 'WAM Main Menu'. At the bottom left is a red 'X' button, and at the bottom right is the 'MOLIS WAM' logo.



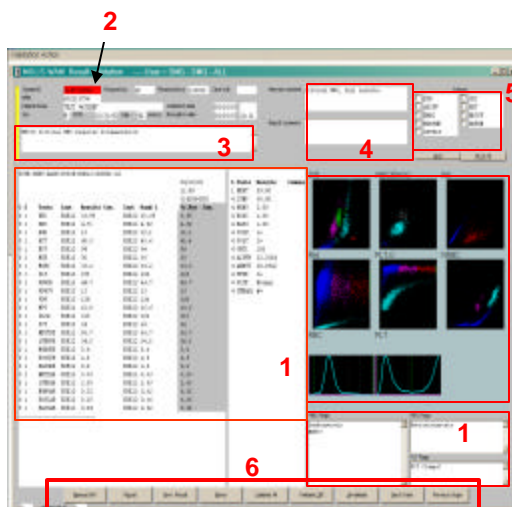
Validation Selection Screen – V2

The screenshot shows the 'MOLIS WAM Validation selection screen' for user 'ata - Anne Tate (System) - ALL'. The screen is titled 'Results validation'. It features several input fields: 'Sample ID' (with a yellow highlight), 'Receipt Date', 'MRN', 'Patient Name', 'Sex', 'DOB', 'Requesting Location', 'Requesting Physician', 'Care Unit', and 'Priority'. Below these fields are two main sections: 'Orders with Initial Demographics' and 'Unregistered Results00'. The 'Orders with Initial Demographics' section contains buttons for 'All Types', 'Orders with Scan', 'Orders with MonOff', 'gpc', and 'Orders for Review'. The 'Unregistered Results00' section contains buttons for 'Unregistered', 'Unregistered to be released', and 'Unregistered, additional action required'.





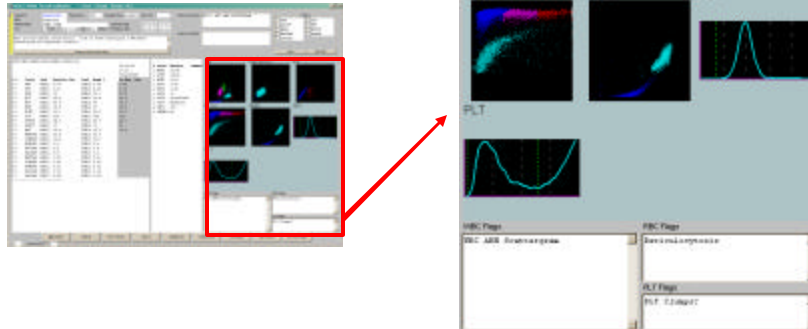
Validation Screen



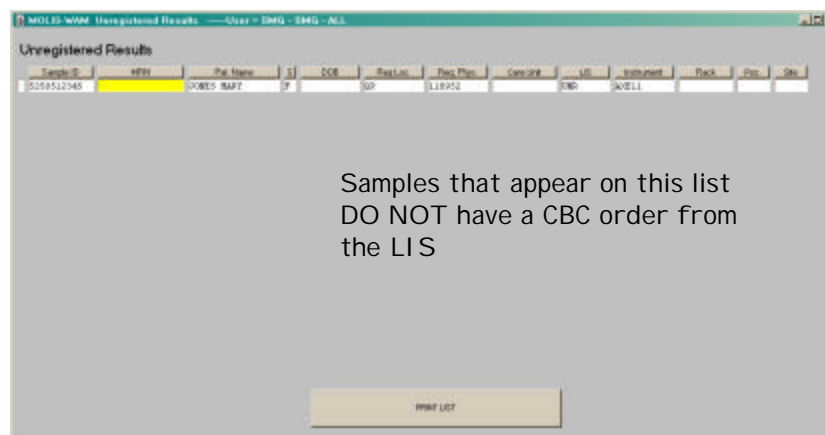
1. Patient results, scatter plots, histograms, and instrument flags are displayed. Previous results and the manual differential display on one screen in separate windows.
2. **STAT** results are sorted first on the list, to expedite client review & validation
3. Operator alerts display rule text and 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	ERR0000000000015
<input type="checkbox"/>	03/14/2005	16:42	BXE12	000003	04	ERR0000000000016
<input type="checkbox"/>	03/14/2005	16:42	BXE12	000003	05	ERR0000000000017
<input type="checkbox"/>	03/14/2005	16:43	BXE12	000004	01	ERR0000000000018

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



Query Selection Screen

MOLIS-WAM Query Selection — User = SMG - SMG - ALL

Query

Sample ID ->

OR

Reception Date -> Default Date Range is Two Calendar Days

Reception time

MRN

Patient Name Sex DOB

Requesting Location

Requesting Physician

Care Unit

Priority

☒ Only pending Orders
☐ All Orders
☐ Only completed Orders

CBC	A-Diff	Rerun	NRBC	ALL
M-Diff	Retics	QLR	ESR	Scan

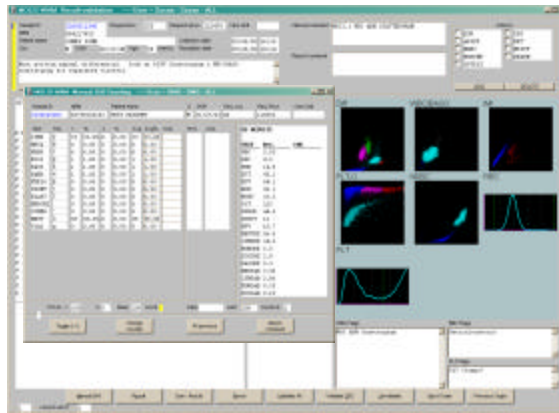
UTMB

Results of Query

- Sort by Header
- R-St Column
- 0- indicates not run

The screenshot displays a software interface for query results. The main window is titled 'Selected Orders' and contains a table with columns: Order ID, Order, Item, QTY, Unit, Price, Tax, and Total. The table lists various orders and items, with some cells containing '0' to indicate they were not run. To the right, a 'Current Order' summary is shown, including fields for Order ID, Order, Item, and Total. At the bottom, there are buttons for 'Print List of', 'Print Results of Selection', 'Personal selections', and 'Personal to Instrument'.

The Manual Differential Screen

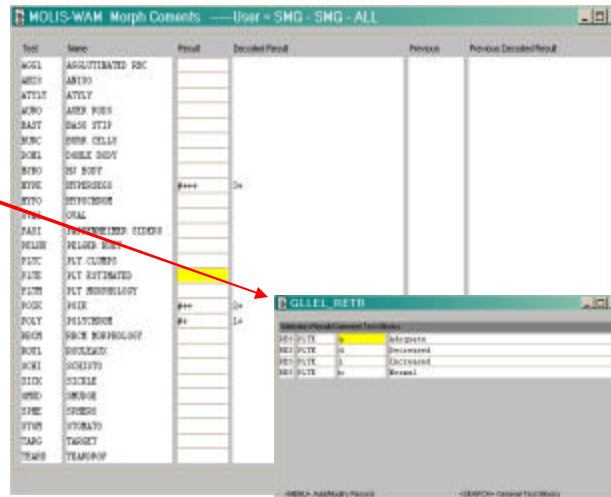


The man diff screen overlays the main validation screen to allow all graphic data and flagging to be viewed as Man diff is performed.



Morphology Comment Screen

- Entry of morphology codes
- Ability to open comment table to select comment codes
- Ability to view historical morphology comments



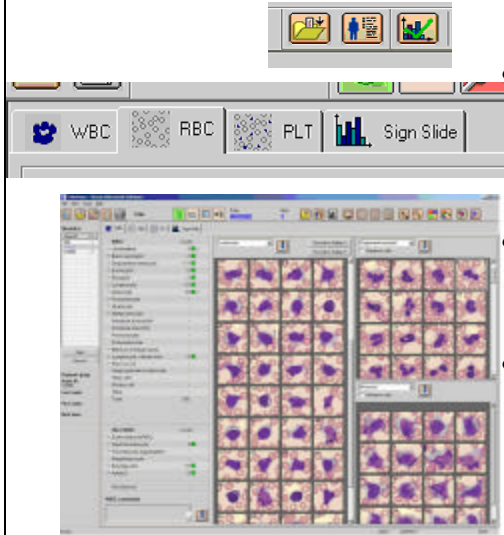


DM96 - Database View

DM96 - Database View

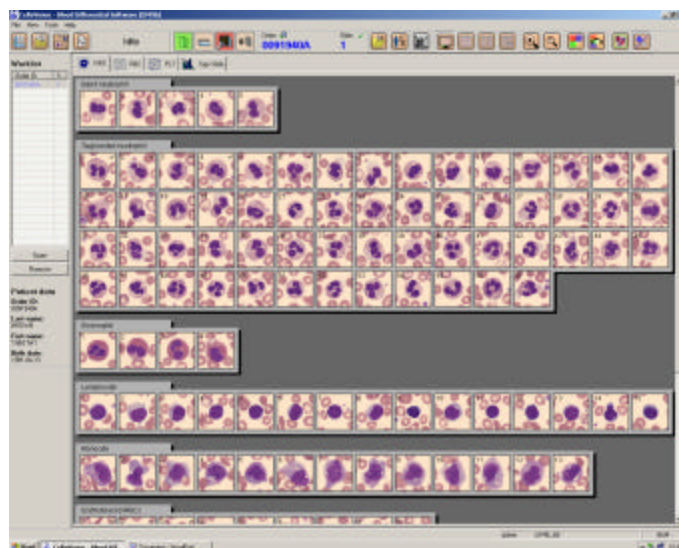
Order No.	Product	Quantity	Unit Price	Amount	Order Date	Order Status
101	101-001	1	100.00	100.00	2000-01-01	Open
102	102-002	2	50.00	100.00	2000-01-02	Open
103	103-003	3	33.33	100.00	2000-01-03	Open
104	104-004	4	25.00	100.00	2000-01-04	Open
105	105-005	5	20.00	100.00	2000-01-05	Open
106	106-006	6	16.67	100.00	2000-01-06	Open
107	107-007	7	14.29	100.00	2000-01-07	Open
108	108-008	8	12.50	100.00	2000-01-08	Open
109	109-009	9	11.11	100.00	2000-01-09	Open
110	110-010	10	10.00	100.00	2000-01-10	Open
111	111-011	11	9.09	100.00	2000-01-11	Open
112	112-012	12	8.33	100.00	2000-01-12	Open
113	113-013	13	7.69	100.00	2000-01-13	Open
114	114-014	14	7.14	100.00	2000-01-14	Open
115	115-015	15	6.67	100.00	2000-01-15	Open
116	116-016	16	6.25	100.00	2000-01-16	Open
117	117-017	17	5.88	100.00	2000-01-17	Open
118	118-018	18	5.56	100.00	2000-01-18	Open
119	119-019	19	5.26	100.00	2000-01-19	Open
120	120-020	20	5.00	100.00	2000-01-20	Open
121	121-021	21	4.76	100.00	2000-01-21	Open
122	122-022	22	4.55	100.00	2000-01-22	Open
123	123-023	23	4.35	100.00	2000-01-23	Open
124	124-024	24	4.17	100.00	2000-01-24	Open
125	125-025	25	4.00	100.00	2000-01-25	Open
126	126-026	26	3.85	100.00	2000-01-26	Open
127	127-027	27	3.70	100.00	2000-01-27	Open
128	128-028	28	3.57	100.00	2000-01-28	Open
129	129-029	29	3.45	100.00	2000-01-29	Open
130	130-030	30	3.33	100.00	2000-01-30	Open
131	131-031	31	3.23	100.00	2000-01-31	Open
132	132-032	32	3.13	100.00	2000-02-01	Open
133	133-033	33	3.03	100.00	2000-02-02	Open
134	134-034	34	2.94	100.00	2000-02-03	Open
135	135-035	35	2.86	100.00	2000-02-04	Open
136	136-036	36	2.78	100.00	2000-02-05	Open
137	137-037	37	2.70	100.00	2000-02-06	Open
138	138-038	38	2.63	100.00	2000-02-07	Open
139	139-039	39	2.56	100.00	2000-02-08	Open
140	140-040	40	2.50	100.00	2000-02-09	Open
141	141-041	41	2.44	100.00	2000-02-10	Open
142	142-042	42	2.38	100.00	2000-02-11	Open
143	143-043	43	2.33	100.00	2000-02-12	Open
144	144-044	44	2.27	100.00	2000-02-13	Open
145	145-045	45	2.22	100.00	2000-02-14	Open
146	146-046	46	2.17	100.00	2000-02-15	Open
147	147-047	47	2.13	100.00	2000-02-16	Open
148	148-048	48	2.08	100.00	2000-02-17	Open
149	149-049	49	2.04	100.00	2000-02-18	Open
150	150-050	50	2.00	100.00	2000-02-19	Open
151	151-051	51	1.96	100.00	2000-02-20	Open
152	152-052	52	1.92	100.00	2000-02-21	Open
153	153-053	53	1.89	100.00	2000-02-22	Open
154	154-054	54	1.85	100.00	2000-02-23	Open
155	155-055	55	1.82	100.00	2000-02-24	Open
156	156-056	56	1.79	100.00	2000-02-25	Open
157	157-057	57	1.76	100.00	2000-02-26	Open
158	158-058	58	1.73	100.00	2000-02-27	Open
159	159-059	59	1.70	100.00	2000-02-28	Open
160	160-060	60	1.67	100.00	2000-02-29	Open
161	161-061	61	1.65	100.00	2000-03-01	Open
162	162-062	62	1.63	100.00	2000-03-02	Open
163	163-063	63	1.61	100.00	2000-03-03	Open
164	164-064	64	1.59	100.00	2000-03-04	Open
165	165-065	65	1.57	100.00	2000-03-05	Open
166	166-066	66	1.55	100.00	2000-03-06	Open
167	167-067	67	1.53	100.00	2000-03-07	Open
168	168-068	68	1.51	100.00	2000-03-08	Open
169	169-069	69	1.49	100.00	2000-03-09	Open
170	170-070	70	1.47	100.00	2000-03-10	Open
171	171-071	71	1.45	100.00	2000-03-11	Open
172	172-072	72	1.43	100.00	2000-03-12	Open
173	173-073	73	1.41	100.00	2000-03-13	Open
174	174-074	74	1.39	100.00	2000-03-14	Open
175	175-075	75	1.38	100.00	2000-03-15	Open
176	176-076	76	1.36	100.00	2000-03-16	Open
177	177-077	77	1.35	100.00	2000-03-17	Open
178	178-078	78	1.34	100.00	2000-03-18	Open
179	179-079	79	1.32	100.00	2000-03-19	Open
180	180-080	80	1.30	100.00	2000-03-20	Open
181	181-081	81	1.29	100.00	2000-03-21	Open
182	182-082	82	1.27	100.00	2000-03-22	Open
183	183-083	83	1.26	100.00	2000-03-23	Open
184	184-084	84	1.25	100.00	2000-03-24	Open
185	185-085	85	1.24	100.00	2000-03-25	Open
186	186-086	86	1.23	100.00	2000-03-26	Open
187	187-087	87	1.22	100.00	2000-03-27	Open
188	188-088	88	1.21	100.00	2000-03-28	Open
189	189-089	89	1.20	100.00	2000-03-29	Open
190	190-090	90	1.19	100.00	2000-03-30	Open
191	191-091	91	1.18	100.00	2000-03-31	Open
192	192-092	92	1.17	100.00	2000-04-01	Open
193	193-093	93	1.16	100.00	2000-04-02	Open
194	194-094	94	1.15	100.00	2000-04-03	Open
195	195-095	95	1.14	100.00	2000-04-04	Open
196	196-096	96	1.13	100.00	2000-04-05	Open
197	197-097	97	1.12	100.00	2000-04-06	Open
198	198-098	98	1.11	100.00	2000-04-07	Open
199	199-099	99	1.10	100.00	2000-04-08	Open
200	200-100	100	1.00	100.00	2000-04-09	Open

CellaVision – WBC Tab

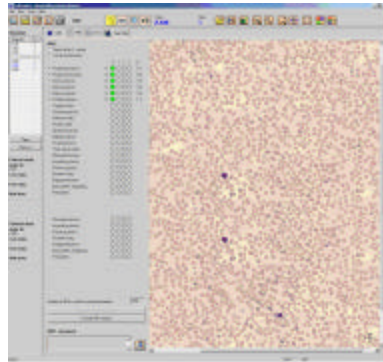


- Press WBC Tab to review results
Can add or remove cells or reclassify the cells
- The system keeps track of all WBC's viewed by the operator.
- A tick mark appears when all WBC's of a cell class have been displayed..

WBC Tab – Full Screen View

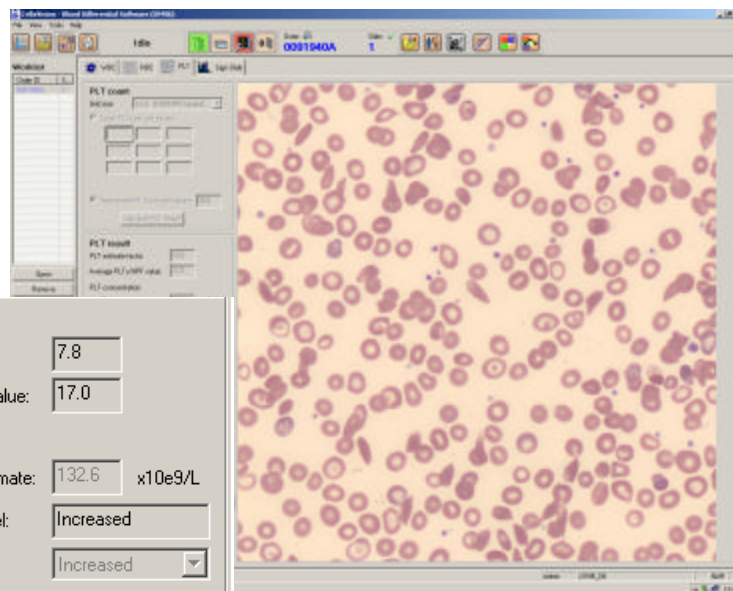


CellaVision – RBC Tab



- 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


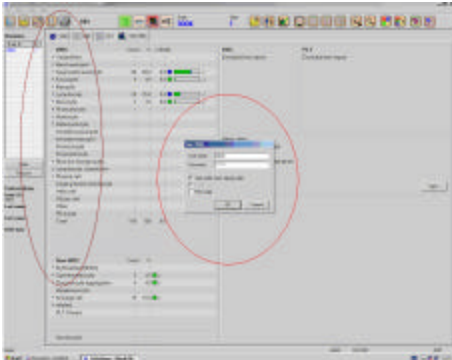
PLT tab



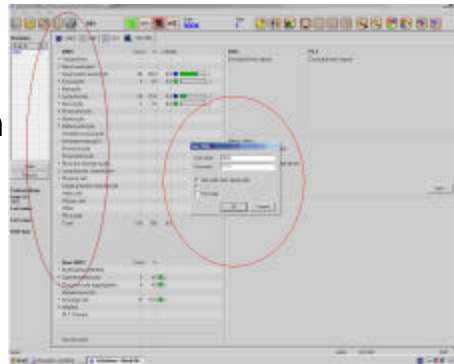
Sign Slide Tab w/Order Data

CellaVision – Sign Out Order Tab

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

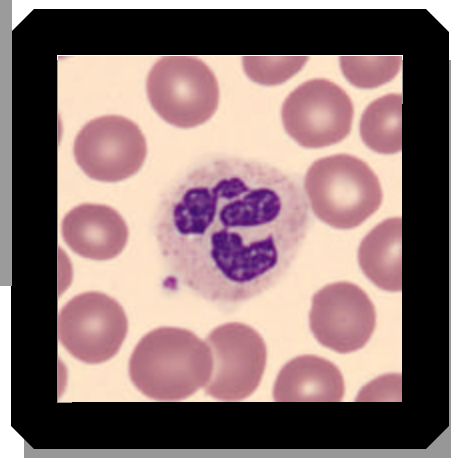
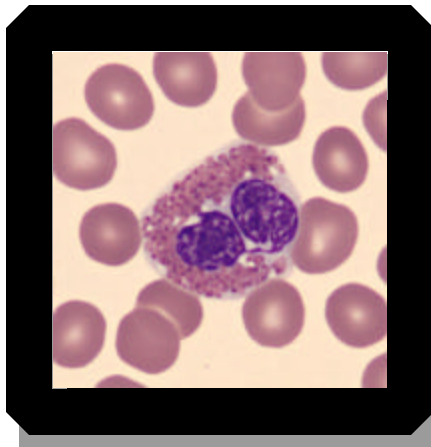
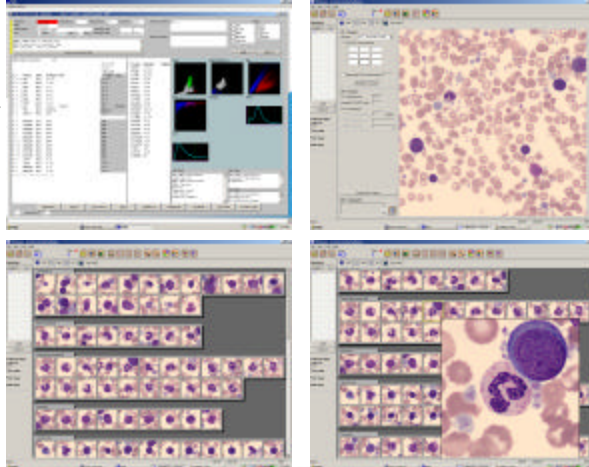


- Click on Sign Order tab
- Final results display in one view
- All results sent to MOLIS WAM

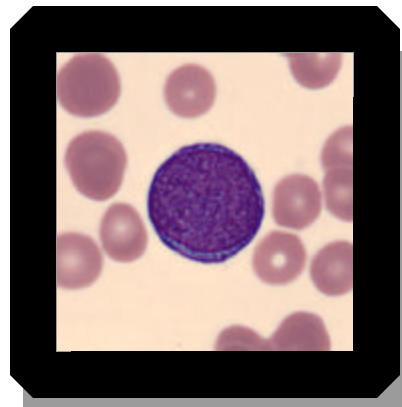
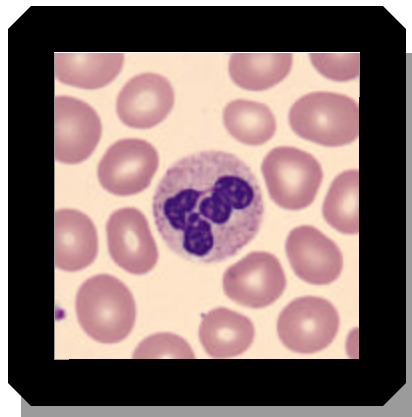


DM96 Opportunities

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

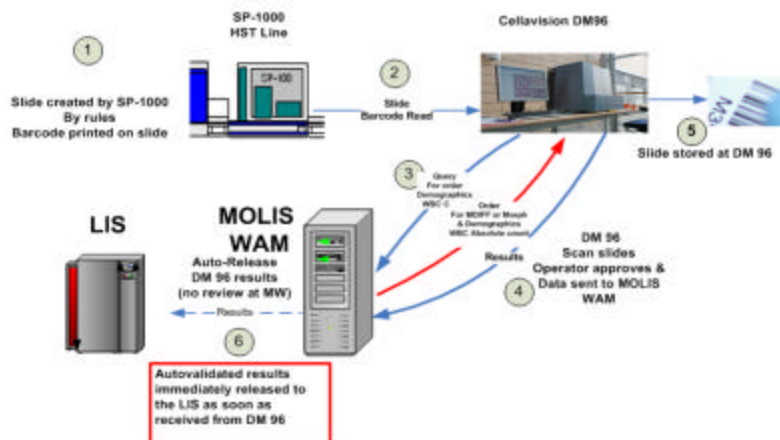


Images from the DM96



Autovalidation

Cellavision Information Flow

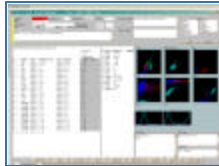


UTMB's Winning Combination / Achievements



Lavender tube management
Automated Line
Streamlined our operation

HST-N Hematology Automation



MOUS

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



Workhorse to handle "routine" scans

Cellavision DM96



Keys to Success!

- Integrate 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

