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- “Analyser” “interferences….?!”

  - *Steven Schischka*
  - *Principal Scientist - Haematology*

The Sample – WBIT's

- Delta check RBC parameters
- Sample found under centrifuge
- Staff member went through all the samples bags
- To look for the missing EDTA
- Labelled sample after finding form missing an EDTA
- Staff member was one of 3 working in the collection centre
- Why? – Fear of getting in trouble

The Sample – WBIT's

- Previously A Neg patient is not O Pos – antenatal testing
- Previous collection dr's clinic
- Current collection pathology centre
- Cousin visiting from overseas and having antenatal testing done "for free" using Australian residents medicare card
- Intentional fraud

The Sample – WBIT's

- Patient has two blood tests in one day
- One – Normal FBE
- One – Thalassaemic parameters
- Medicare card #1 in Melbourne
- Medicare card #2 in Sydney
- National pathology service with cumulative interstate results
- Intentional fraud

The Sample – WBIT's

- INR result and dose phoned to patient
- Patient states this is impossible – didn't have a blood test today
- Home visit pathology collector – Definitely took blood of correct patient.
- Name, DOB, Address, phone number all have ticks on the form
- Pathology collector does drive by – realises went to wrong house
- Home visit collector took blood off the neighbour
- Patient male not female
- Home visit INR patient too – patient didn't query early visit by collector
- Failure to follow process due to familiarity

The Sample – WBIT's

- Hospital inpatient FBE yesterday "normal" but today thalassaemic
- Collector identified patient by asking them are you "Jane Doe"
- Hospital collector took blood off "patient" after confirming ID
- "Patient" was a visitor holding the baby while mum showered
- "Patient" didn't speak English and didn't protest at having bloods taken

The Sample – WBIT's

- Psych patient has sudden neutropenia and thrombocytopenia – on clozapine
- Patient was re-bled to confirm pancytopenia – FBE normal
- Entire ward bled to find the truly pancytopenic patient
- Patient not found
- In ward review the next morning the nurse admitted to removing a clot from the difficult syringe collect

The Sample – WBIT’s

- New collection system introduced
- WBIT theoretically impossible if used correctly
- WBIT identified by FBE parameters
- Two people sharing log-ins and a printer
- Post collection sign off being done in advance
- Collector(s) took wrong labels and labelled tubes away from bedside

The Sample – WBIT's

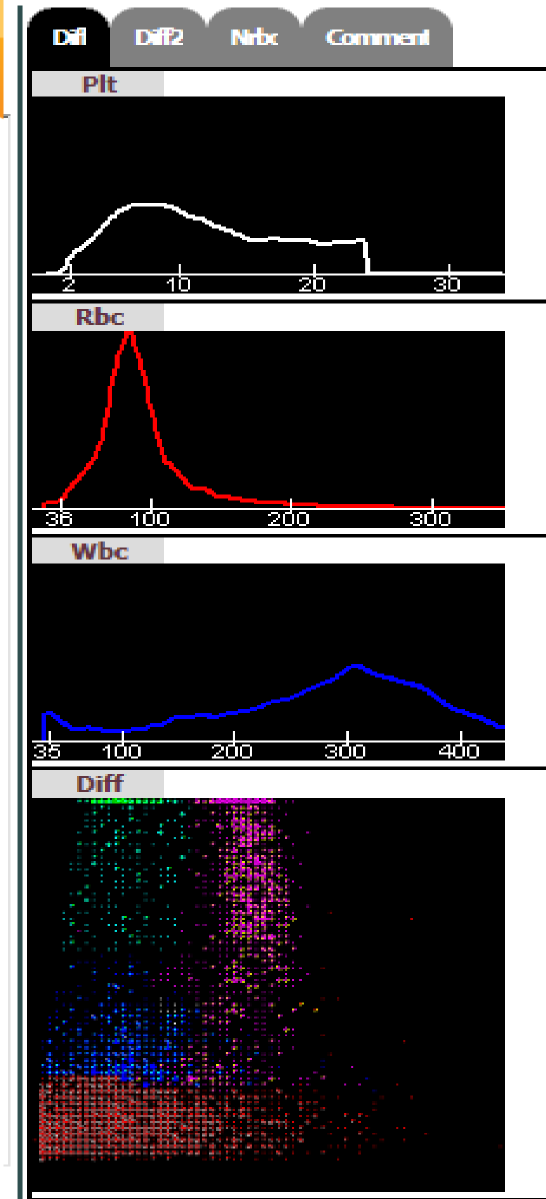
- New collection system introduced
- WBIT theoretically impossible if used correctly
- WBIT identified by FBE parameters
- Printing devices don't have battery display and have short battery life
- When printer is recharged and turned on the Memory on the POC collection device reprinted 1 label and then 2 labels from the correct patient
- 2 other samples collected at same time were labelled correctly

The Sample – WBIT's

- Delta check FBE on one of two trauma patients
- Unknown male and unknown female
- Unknown male has history from 4 days ago in electronic record
- Call to trauma unit – patient has history, has he been re-admitted
- Trauma unit unknown male record had been able to be updated
- Patient re-identified and wrist band etc changed
- All bloods including X-match, x-rays etc re-ordered in the middle of a trauma

The analyser lies

- Patient with fluctuating lymphocytosis
- Marked increase in target cells
- Non-lysed RBC
- Being counted as lymphocytes
- Review of scatterplots required at release



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The analyser lies

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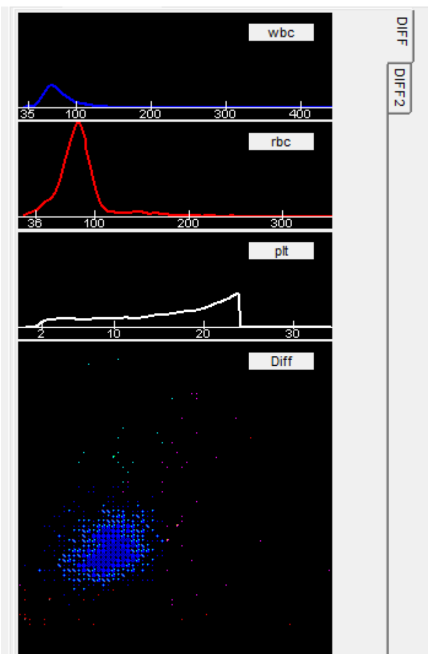
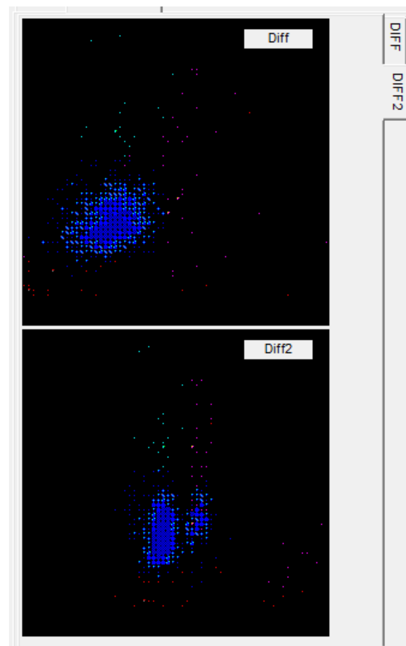
- Known CML on treatment – historic basophilia
- Unusual cells on blood film – degranular basophils
- Counted as lymphocytes and hiding behind 2 D scatter of lymphocytes





0.54				0.54
0.00		0.00		0.01
0.43		0.43		0.52
0.00		0.00		0.01
0.00		0.00		0.00
0.11		0.11		0.00
0.0	<<	0.0		2.4
80.0		80.0		96.4
0.0		0.0		1.1
0.0		0.0		0.1
20.0		20.0		0.0

The computer lies

- 5 patients YYX000001 to YYX000009 have MCV's of around 62 fl,
- mildly anaemic and inverse differential, WBC scatter plots look strange
- Some previously normal and some first time in patients
- Happened just after the annual change over in lab numbers
- From YYX000001 to (YY+1)X000001

- A batch of porcine samples had been manually processed a week earlier as sample number 01-20 with no prefix
- IT system automatically inserts X00000 into the lab numbers and holds them in queue for a week
- YY was not automatically added
- Results from previous year inserted into current year due to annual cycle of lab numbers and results being held for one week

The QC lies

- Daily maintenance performed
- New QC loaded

- APTT, INR, FIB, TCT all incorrect
- Ddimer – correct

  - Routine QC reconstituted
  - Ddimer QC is liquid stable
  - Staff member had performed saline replacement in the middle of the night
  - Saline bottle put with water bottles
  - Saline used to reconstitute QC material

The Computer lies

- Dr phones with complaint that abnormal blood film was not reviewed
- Lymphocytes are below normal range but film was not reviewed
- Lymphocytes are 1.5 on laboratory display with reference range 1.5 – 4.0
- Suspicion that results are from different laboratory
- Scientist asks Dr to fax the results in
- Results are in fact from the laboratory

  - Lymphocytes on report are 1.47 with abnormal low flag

  - Lab results uses script A to generate a cumulative display report for internal use

  - External results uses script B to generate a single display report for external use

  - Decimal places are different on the two reports from the same lab.

Normal

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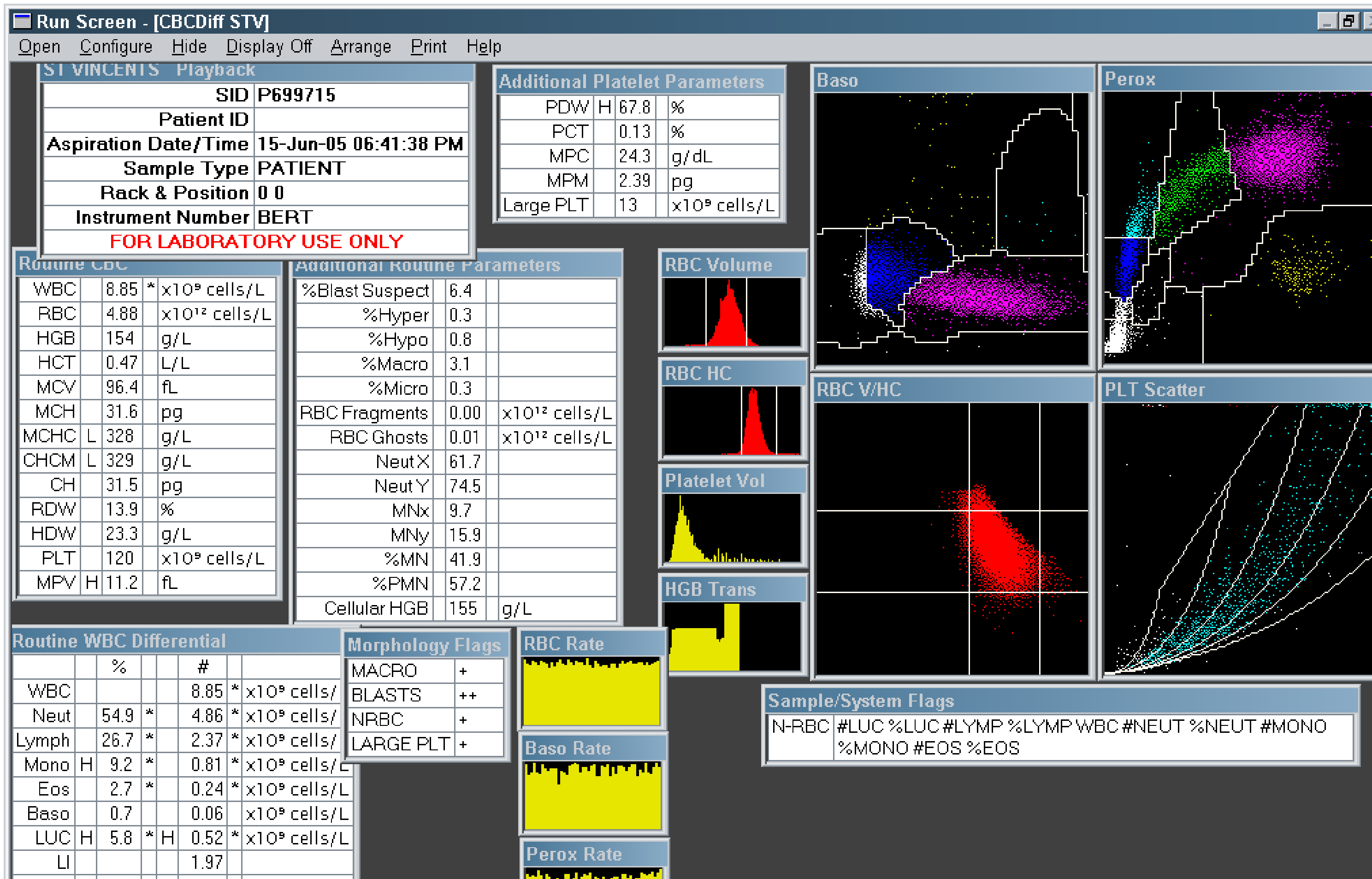

Heat affected blood

Run Screen - [CBCDiff STV]

Open Configure Hide Display Off Arrange Print Help

ST VINCENTS Playback

SID	P814878
Patient ID	
Aspiration Date/Time	27-Sep-05 10:40:32 AM
Sample Type	PATIENT
Rack & Position	0 0
Instrument Number	BERT
FOR LABORATORY USE ONLY	

Additional Platelet Parameters

PDW		58.9	*	%
PCT	H	0.50	*	%
MPC		21.2		g/dL
MPM		1.47		pg
Large PLT		11		x10⁹ cells/L

Routine CBC

WBC		10.42	*	x10⁹ cells/L
RBC	L	3.04	*	x10¹² cells/L
HGB		114	*	g/L
HCT	L	0.25	*	L/L
MCV		81.8	*	fL
MCH	H	37.6	*	pg
MCHC	H	460	*	g/L
CHCM		331	*	g/L
CH		27.0	*	pg
RDW	H	39.9	*	%
HDW	H	55.4	*	g/L
PLT		651	*	x10⁹ cells/L
MPV		7.7	*	fL

Additional Routine Parameters

%Blast Suspect	40.4	
%Hyper	7.7	
%Hypo	16.4	
%Macro	12.9	
%Micro	23.8	
RBC Fragments	0.56	x10¹² cells/L
RBC Ghosts	0.11	x10¹² cells/L
Neut X	64.3	
Neut Y	70.8	
MNx	6.7	
MNy	3.0	
%MN	64.0	
%PMN	25.6	
Cellular HGB	82	g

RBC Volume

RBC HC

Platelet Vol

HGB Trans

RBC Rate

Baso Rate

Perox Rate

Baso

Perox

RBC V/HC

PLT Scatter

utine WBC Differential

		%			#		
VBC					10.42	*	x10⁹ cells/L
Neut		72.2	*		7.52	*	x10⁹ cells/L
mph	L	11.1	*		1.16	*	x10⁹ cells/L
lono	H	11.2	*	H	1.17	*	x10⁹ cells/L
Eos		4.7	*		0.49	*	x10⁹ cells/L

Morphology Flags

MICRO	+++
MACRO	+++
HYPO	+++
HYPER	+
ANISO	+++
HC VAR	+++

Sample/System Flags

B-NO	#BASO %Baso WBC WBCB
B-NV	LI
B-SUSP	#BASO %Baso #LUC %LUC #LYMP %LYMP
CHCMCE	CHCM HCT HDW HGB MCH MCHC MCV RBC RDW CH CHDW

Contaminated sample – glucose drip

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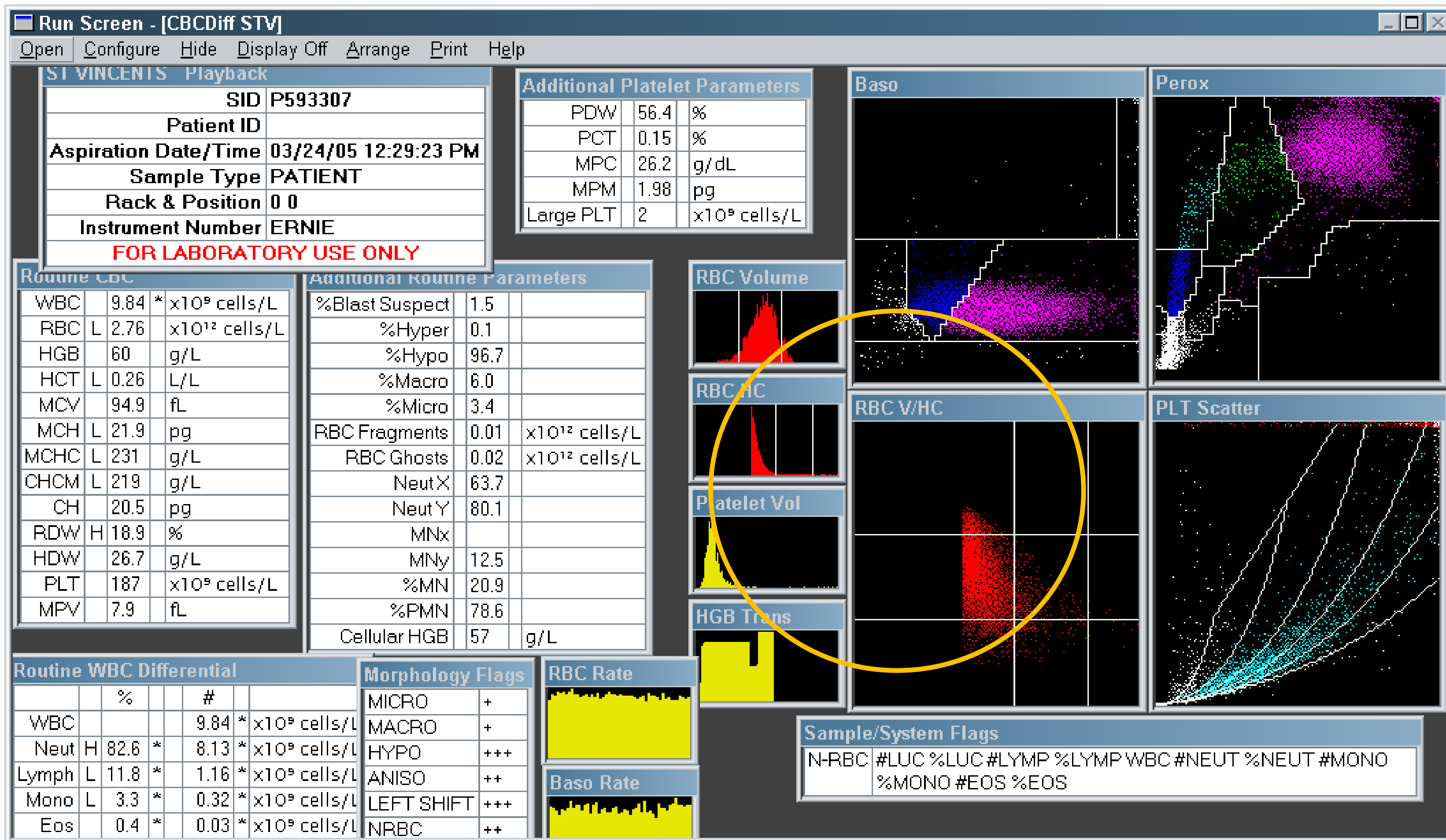

Patient Artefact- MPO “Deficiency”

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Run Screen - [CBCDiff STV]

Open Configure Hide Display Off Arrange Print Help

ST VINCENTS Playback

SID	P705046
Patient ID	
Aspiration Date/Time	14-Jun-05 05:38:11 PM
Sample Type	PATIENT
Rack & Position	0 0
Instrument Number	BERT

FOR LABORATORY USE ONLY

Additional Platelet Parameters

PDW	H	65.8	%
PCT		0.15	%
MPC		25.0	g/dL
MPM		2.15	pg
Large PLT		11	x10⁹ cells/L

Routine CBC

WBC		12.88	x10⁹ cells/L
RBC	H	6.13	x10¹² cells/L
HGB		176	g/L
HCT	H	0.53	L/L
MCV		86.2	fL
MCH		28.8	pg
MCHC		334	g/L
CHCM	L	326	g/L
CH		27.9	pg
RDW		13.7	%
HDW		23.9	g/L
PLT		162	x10⁹ cells/L
MPV		9.5	fL

Additional Routine Parameters

%Blast Suspect	0.4	
%Hyper	0.4	
%Hypo	1.3	
%Macro	0.2	
%Micro	1.0	
RBC Fragments	0.01	x10¹² cells/L
RBC Ghosts	0.01	x10¹² cells/L
Neut X		
Neut Y		
MNx	11.7	
MNy	14.6	
%MN	8.5	
%PMN	90.7	
Cellular HGB	172	g/L

RBC Volume

RBC HC

Platelet Vol

HGB Trans

Baso

Perox

RBC V/HC

PLT Scatter

Routine WBC Differential

		%		#	
WBC				12.88	x10⁹ cells/L
Neut	L	1.0	L	0.13	x10⁹ cells/L
Lymph	L	3.1	L	0.39	x10⁹ cells/L
Mono	H	49.3	H	6.35	x10⁹ cells/L
Eos		0.1		0.02	x10⁹ cells/L
Baso		0.2		0.02	x10⁹ cells/L
LUC	H	46.3	H	5.96	x10⁹ cells/L
LI			L	1.84	*

Morphology Flags

ATYPS	+++

RBC Rate

Baso Rate

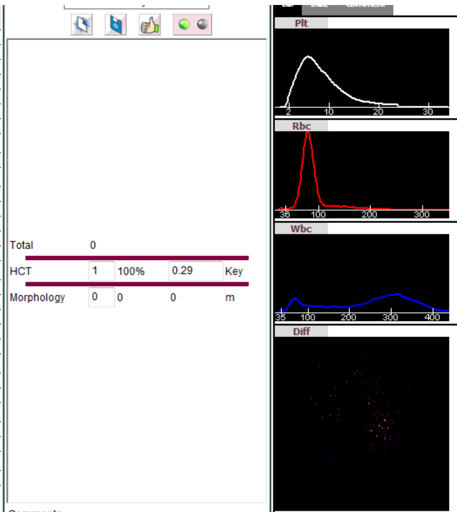
Perox Rate

Sample/System Flags

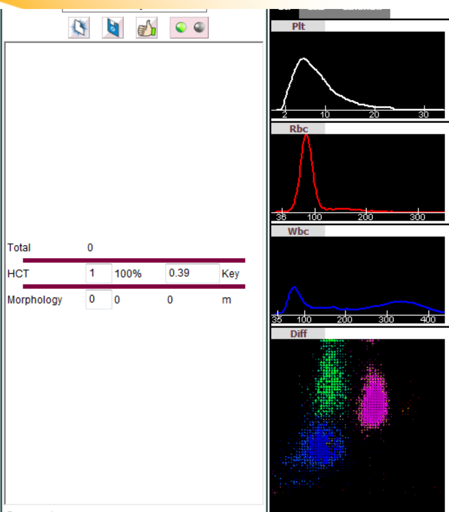
B-NV	LI

Numerous morphology flags and abnormal scatter

Parameter	Result	Flags	Prev. Result/Date
HGB	97	V__H	
RBC	3.40	V__H	
HCT	0.29	V__H	
MCV	84	V__H	
MCH	28	V__H	
MCHC	339	V__H	
RDW	14.3	V__H	
WBC	5.87	V__H	
NE#	4.11 (R)	____	
LY#	0.93 (R)	____	
MO#	0.71 (R)	____	
EO#	0.11 (R)	____	
BA#	0.00 (R)	____	
NE%	70.1 (R)	____	
LY%	15.9 (R)	____	
MO%	12.2 (R)	____	
EO%	1.9 (R)	____	
BA%	0.0 (R)	____	
PLT	326	V__H	
MPV	9.1	V__H	
M		____	
FILMREQ	YES	VC_H	
SS1	MADE	VC_H	



Parameter	Result	Flags	Prev. Result/Date
HGB	142	V_DH	126 04/04/2019
RBC	4.53	V_DH	4.02 04/04/2019
HCT	0.39	V_DH	0.35 04/04/2019
MCV	86	V_DH	87 04/04/2019
MCH	31	V__H	31 04/04/2019
MCHC	366	V__H	361 04/04/2019
RDW	14.6	V__H	14.3 04/04/2019
WBC	3.85	V_DH	4.86 04/04/2019
NE#	2.08	____	3.70 04/04/2019
LY#	1.16	____	0.57 04/04/2019
MO#	0.58	____	0.58 04/04/2019
EO#	0.01	____	0.01 04/04/2019
BA#	0.02	____	0.01 04/04/2019
NE%	54.1	__X_	76.0 04/04/2019
LY%	30.2	____	11.7 04/04/2019
MO%	15.0	____	12.0 04/04/2019
EO%	0.3	____	0.1 04/04/2019
BA%	0.5	____	0.2 04/04/2019
PLT	161	V_XH	119 04/04/2019
MPV	8.6	V__H	8.8 04/04/2019
M		____	100 04/04/2019
FILMREQ	YES	VC_H	YES 04/04/2019
BlastFlag	YES	VC_H	YES 04/04/2019
SS1	MADE	VC_H	MADE 04/04/2019



- Repeating samples appear to correct the error
- Faulty valve with reagent flow back
- First sample was essentially working as a reagent prime

Patient Artefact – Dimorphic Neutrophils, Some are actually eosinophils

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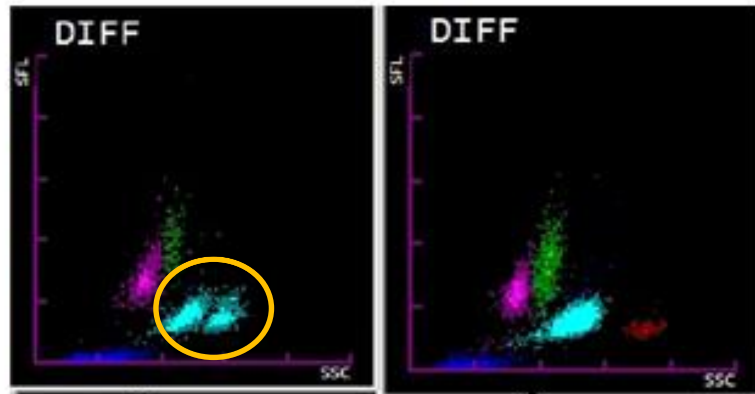
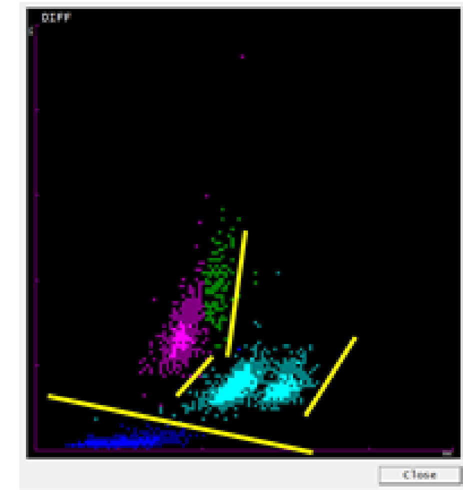


Patient sample results showing low SSC

Sample showing good Eosinophil differentiation

“Your analyser is performing as expected”



Pseudo Cold Agglutinin - Antibiotic Antibodies

Pseudo Anaemia

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Syringe collect with settled sample.

Usually Emergency department – why?

Inserting access port so don't want to stab patient again.

Syringe settles whilst completing access port requirements.

Not mixed before aliquoting into collection tubes

Delta Check MCV

Haematology	03-04-2019 15:21	11-03-2019 09:27	07-03-2019 09:06	05-03-2019 23:09	04-03-2019 09:16	03-03-2019 06:38	02-03-2019 03:33	01-03-2019 20:51	01-03-2019 12:12	03-05-2016 05:40
FBE										
Hb	118	99	96	85	87	82	94	90	85	127
WBC	6.08	3.13	4.17	4.87	6.81	5.93	8.50	9.20	7.43	4.34
Platelets	475	563	585	473	532	473	514	511	505	253
Hct	0.37	0.32	0.30	0.27	0.27	0.26	0.28	0.28	0.28	0.36
MCV	81	66	64	63	62	62	62	61	63	120
MCH	26.0	21.0	20.0	20.0	20.0	19.0	20.0	20.0	19.0	42.0
MCHC	316	313	314	314	319	315	332	320	307	351
RBC	4.61	4.79	4.73	4.29	4.36	4.19	4.60	4.58	4.45	3.04
RDW	40.2	23.9	22.0	21.9	21.1	21.4	21.3	21.3	21.1	11.9
Neutrophils	4.51	1.24	2.45	3.03	4.89	4.40	6.69	8.11	6.26	3.69
Lymphocytes	0.65	0.62	0.46	0.49	0.55	0.39	0.51	0.19	0.24	0.32
Monocytes	0.70	1.06	0.77	0.86	1.01	1.00	1.28	0.85	0.87	0.32
Eosinophils	0.19	0.18	0.47	0.45	0.29	0.12	0.01	0.01	0.03	0.01
Basophils	0.04	0.04	0.03	0.04	0.07	0.03	0.02	0.04	0.03	0.02

- Patient on hydroxyurea for polycythaemia rubra vera
- Patient now on venesection for polycythemia rubra vera
- Patient investigated for anaemia and given iron therapy………..

Historic Warfarin patient presents with bleeding

APTT	80.0	(25 – 35)	sec
INR	18.3	(0.8 – 1.2)	INR
Fib	4.5	(1.5 – 4.0)	sec
TCT	>300	(<20)	sec
Anti-Xa	4.0	(None or <1.0)	IU/ml

- If Anti-Xa is heparin then APTT should be >300 and INR “normal”
- If TCT is dabigatran then Anti-Xa should be 0.0
- If warfarin – TCT and Anti-Xa should be normal

1. Patient under cardiologist AND general practitioner. Cardiologist has changed patient to rivaroxiban and GP has changed patient to dabigatran. Patient taking both drugs fulfilled at different pharmacies.

2. Patient has renal failure and has been on dabigatran. Medical advice to swap from direct dabi to riva is to stop one one day and start the other the next day. Patient has not cleared dabi due to renal failure and now has riva on board too.

Unexpected pancytopenia in hematoma patient

HB	35	(115-165g/L)
WBC	1.0	(4.0-11.0)
Neutrophils	0.5	
Lymphocytes	0.3	
Monocytes	0.2	
PLTS	18	

Patient has presented with a hematoma in their knee.

? Bleed due to thrombocytopenia.

Call to clinician with results and clinical query…………..

Clinician purposely labelled sample as FBE so lab would process it over night otherwise “*they would have had to wait for microbiology in the morning*”

Grossly abnormal urine sample over night

Blood stained urine sample is swarming with

- bacteria
- WBC
- foreign bodies

- Female patient has presented with abdominal pain
- Speaks little English
- Has been asked to provide a urine sample which staff believe she has done
- Sample is in fact fecal sample and patient has severe diarrhoea but can only explain her tummy hurts

Natural Therapies

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- Patient being treated for lead poisoning
- Chelation therapy not working
- Turns out lucky charm/crucifix that he kisses is made of lead

- Patient unable to get pregnant
- Severe lead poisoning
- Chelation therapy not working
- Turns out herbal support from “overseas” made from seaweed in estuary down stream from heavy metals factory

- Patient with psychiatric issues develops pancytopenia
- ?Therapy related cytopenia
- Munchausen syndrome – self medication with Busulfan
- Patient proceeds to bone marrow transplant which fails

The florist, the Alphabet and the trauma

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- Patient being taken to theatre for operation
- Has had pre-meds and starts laughing
- “Ha-ha” you gave me the wrong flowers this morning
- I’m Jane Smith not Joan Smith………..

- Group A blood is hung for transfusion
- Patient states “I thought I was blood group O”?
- Transfusion continues……..with Incompatible blood
- Patient survives……..Just

- 3 year old child in and out of hospital with sepsis
- Multiple exploratory surgeries as commonly gut bacteria isolate
- Cyclic Pattern and suspicion develops
- Mother is found to be injecting fecal matter into the drip line.
- Ward staff split down the middle believing or not believing mother

Antenatal patient ? HELLP syndrome

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Test	Result	Range	Units
APTT	>300.0	(25 – 35)	sec
INR	>10	(0.8 – 1.2)	INR
Fib	4.5	(1.5 – 4.0)	sec
TCT	19	(<20)	sec
DDimer	0.3	(<0.25)	
APTT MIX	>300		
INR mix	>10.0		
Anti-Xa	0.0		IU/ml
PLTS	375	(150-400)	x10^9/L

- I forgot to take the blue top tube
- so I took some of the green
- and some of the purple
- and poured them into the blue top tube.