

# Histogramas

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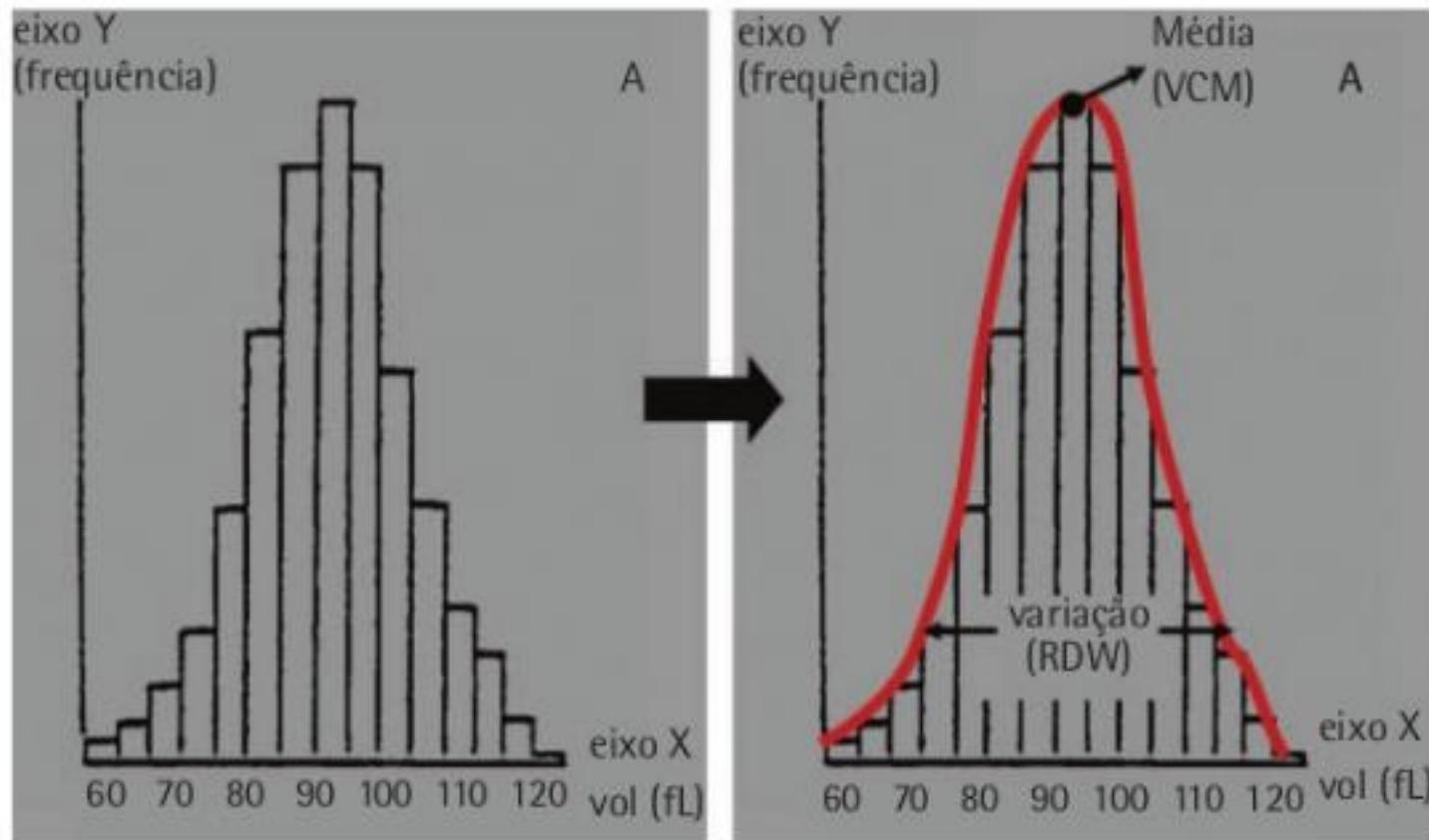
Prof. Archangelo P. Fernandes

Profa. Alessandra Barone Fernandes

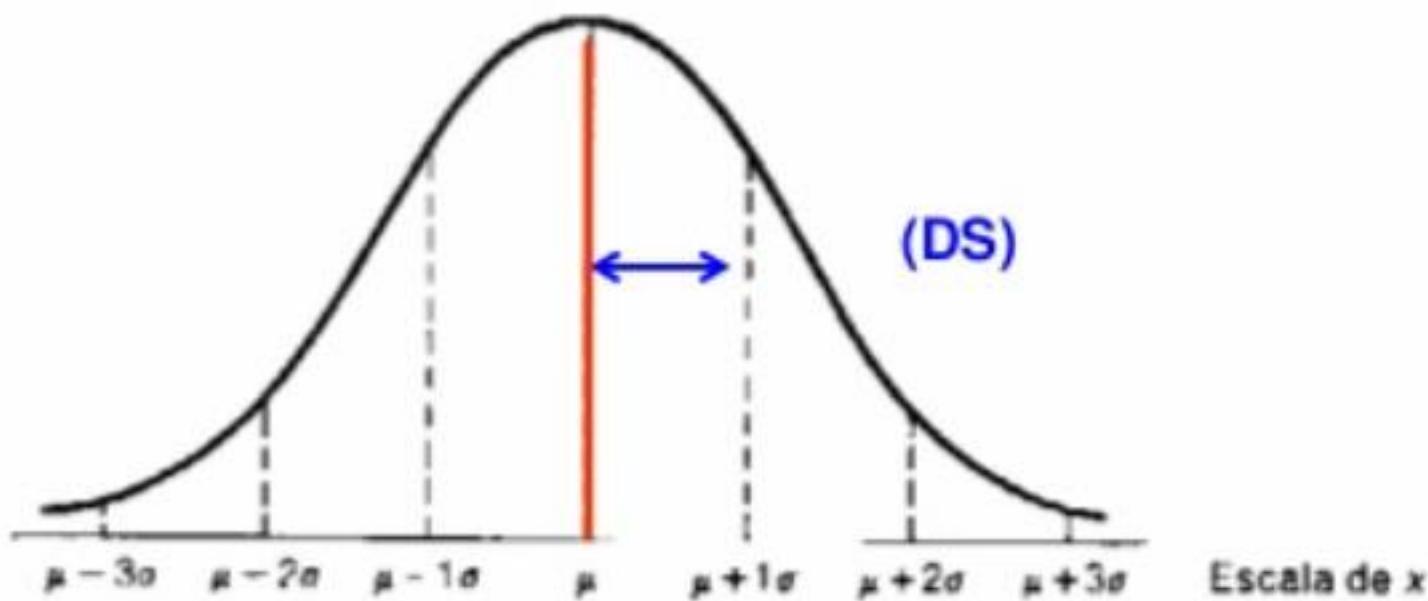
# Histograma

- Curva de frequência de distribuição e tamanho das células com volume na abscissa e frequência na ordenada
- A curva pode ser desviada para esquerda ou para direita evidenciando alterações no tamanho das células
- Em condições de dupla população celular, o histograma apresenta duas curvas que podem se sobrepor e formar uma curva com aspecto de “corcova de camelo”.

## Histograma para volume: curva de distribuição dos volumes dos eritrócitos

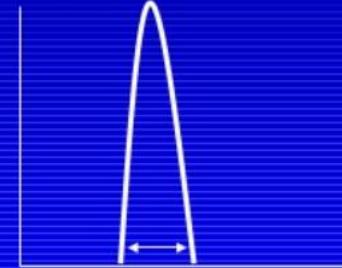
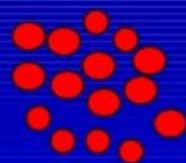


# Histograma

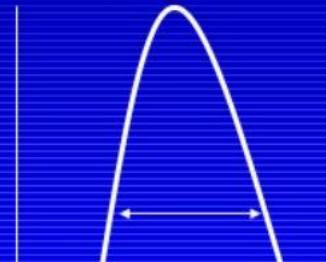
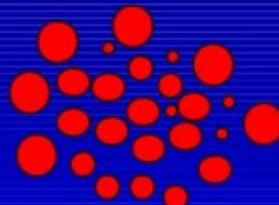


# Histograma

$$RDW = \frac{SD \times 100}{VCM}$$

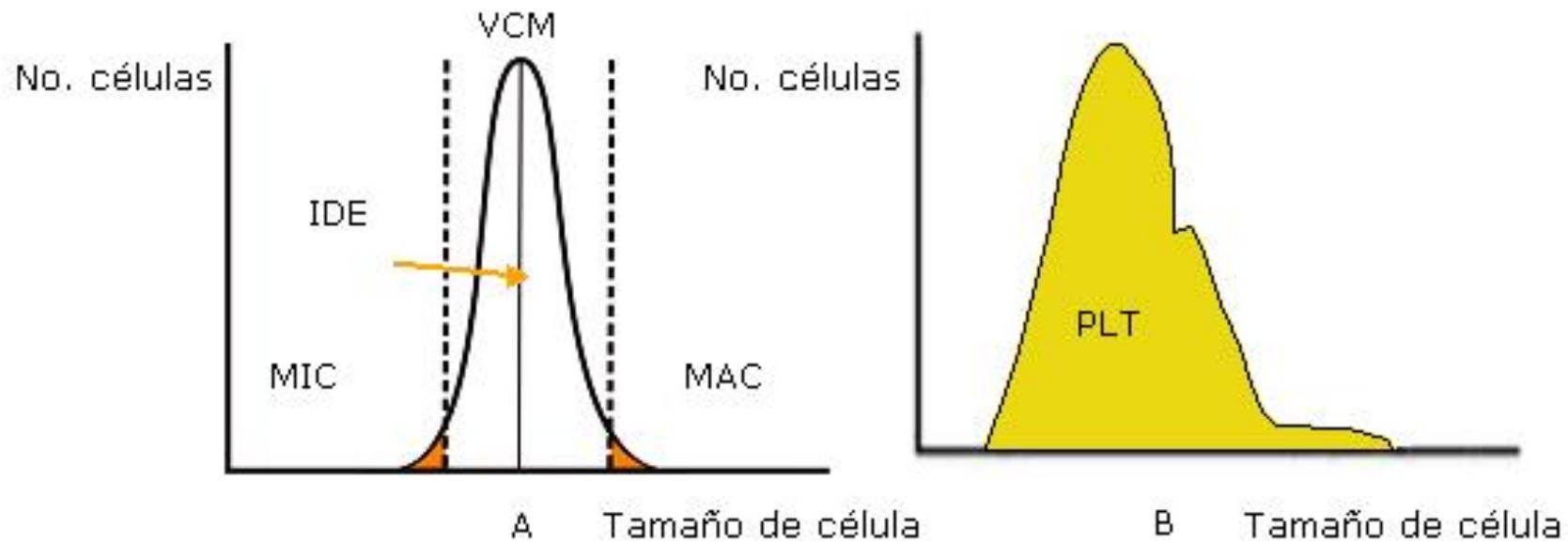


11.5 – 15.5



> 15.5

# Histograma



**Fig. 2.** Histogramas o curvas de distribución de volumen. A: eritrocitos; B: plaquetas (PLT); IDE: índice de distribución eritrocitaria; VCM: volumen corpuscular medio; MIC: microcitosis; MAC: macrocitosis.

# Histograma

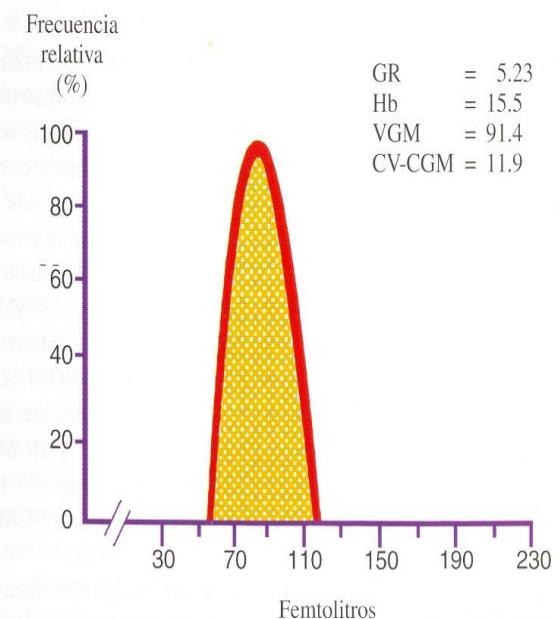
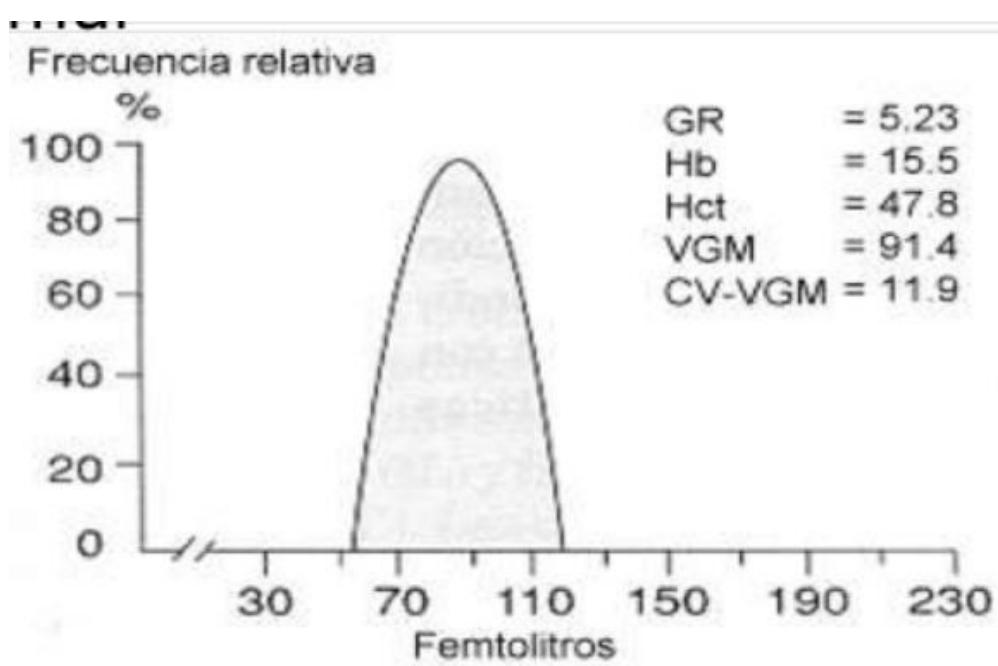
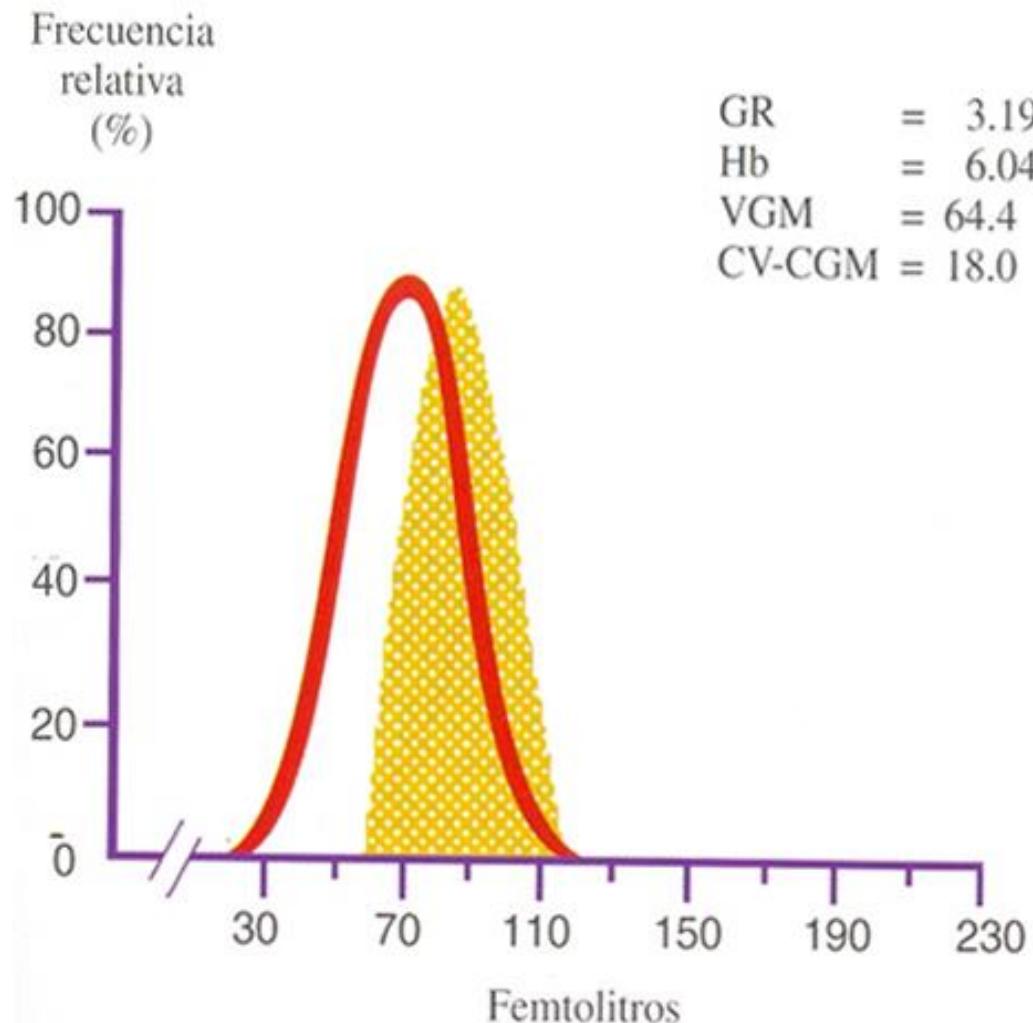
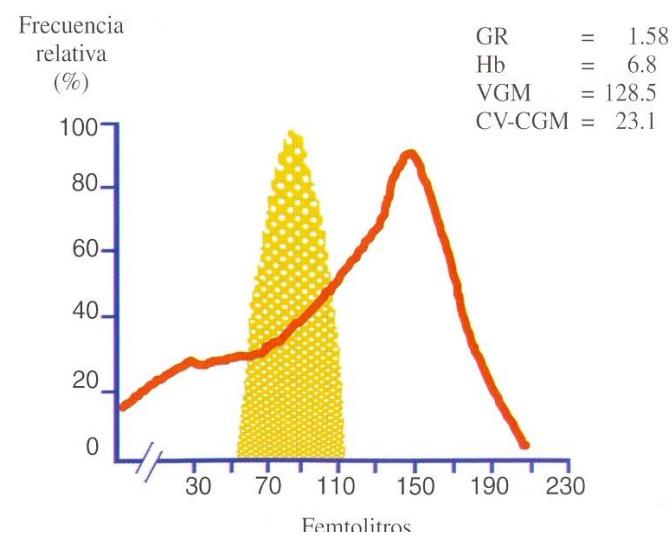
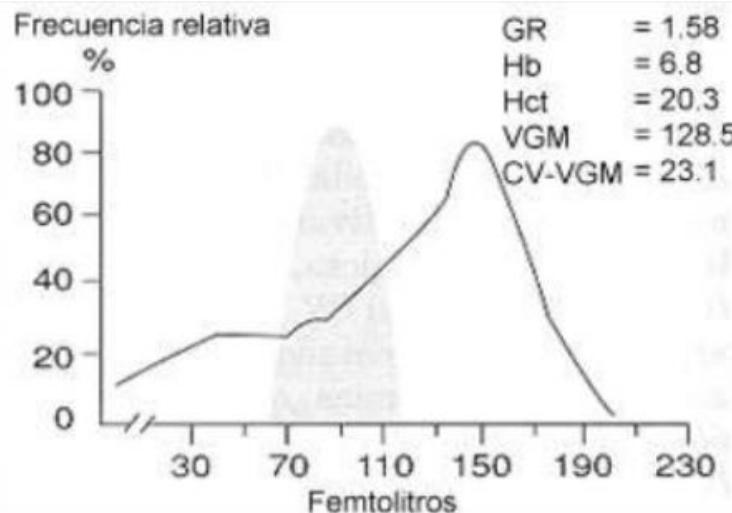


Figura 2.9 Histograma de los eritrocitos de un individuo sexo

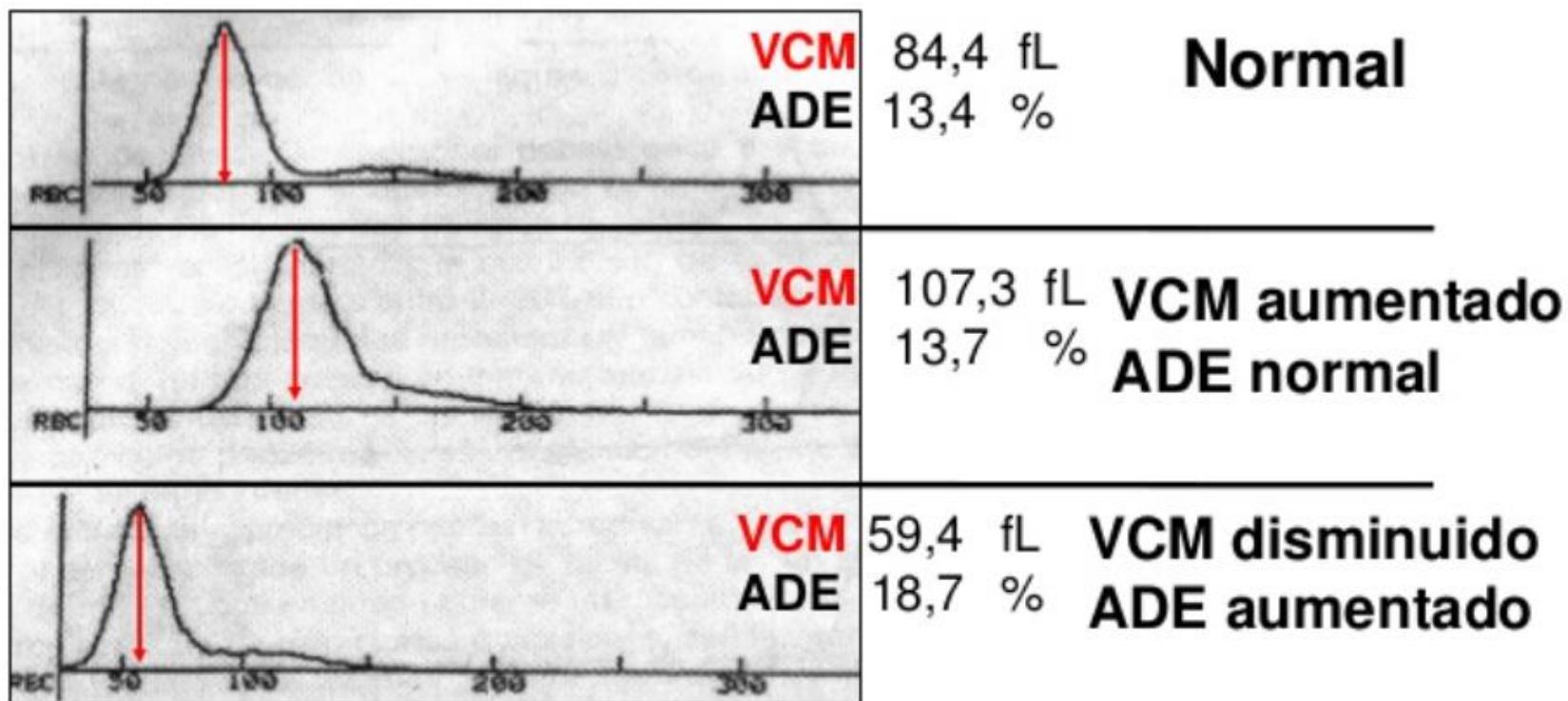
# Histogramma



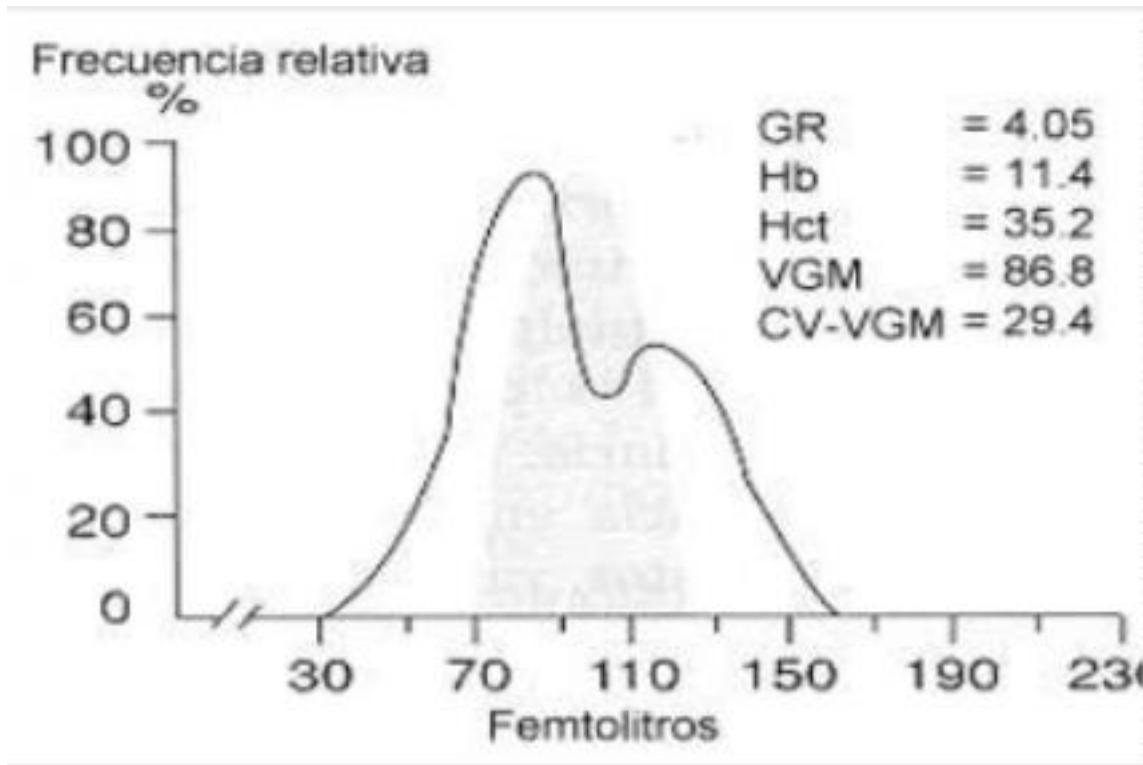
# Histograma



# Histograma



# Histograma



# Histograma

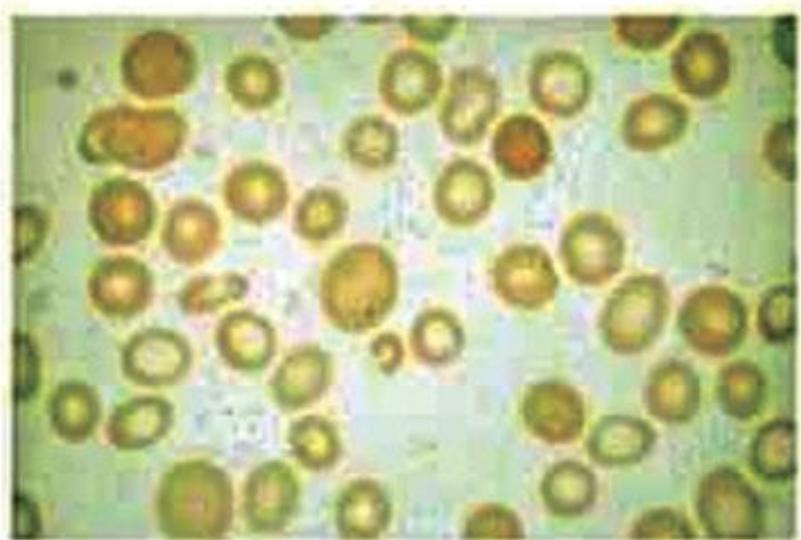
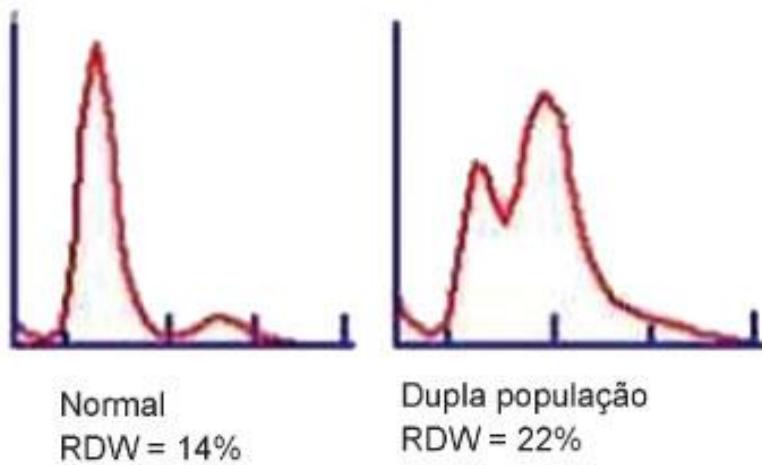


Figura 1. Curva de distribuição das hemácias de acordo com o volume, em condições normal (à esquerda) e patológica (à direita). Microscopia de sangue periférico mostrando dupla população eritrocitária

# Histograma

**RBC : 4.62**

**HGB: 13,5**

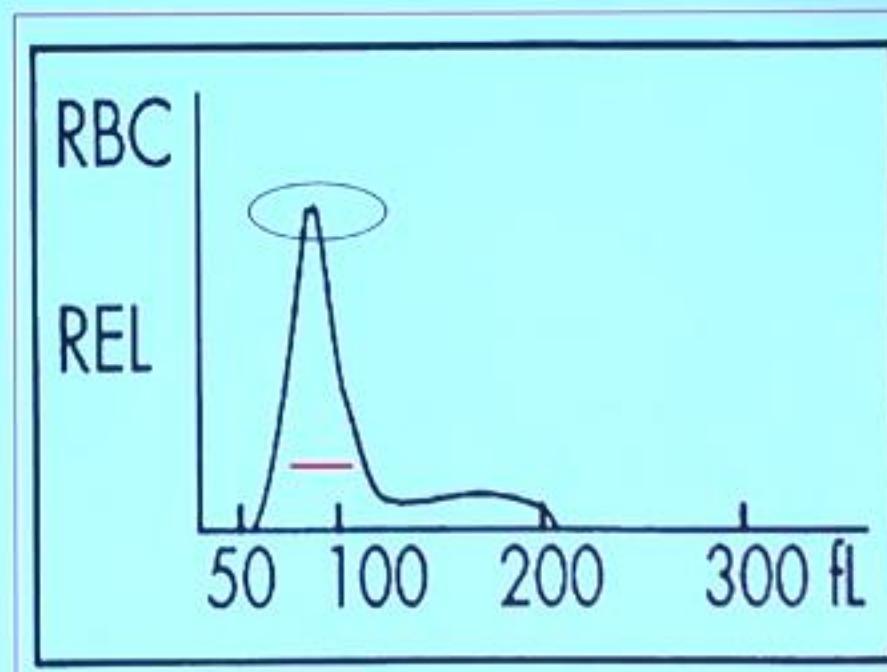
**HCT: 40,6**

**VCM: 87,7**

**HCM: 29,1**

**CHCM: 33,5**

**RDW: 13,0**



	<b>Mulher</b>	<b>Homem</b>	<b>RDW</b>	<b>11,5 a 14,5%</b>
ERI	4,7 (4,0-5,4)	5,3 (4,6-6,0)	VCM	90,5 (82,7-98,3)
HGB	13,3 (12,0-15,6)	15,3 (13,5-18,2)	HCM	29,2 (26,1-32,2)
HCT	43 (37-48)	48 (42-55)	CHCM	32,3 (30,7-34,3)

# Histograma

**RBC : 3.26**

**HGB: 12,7**

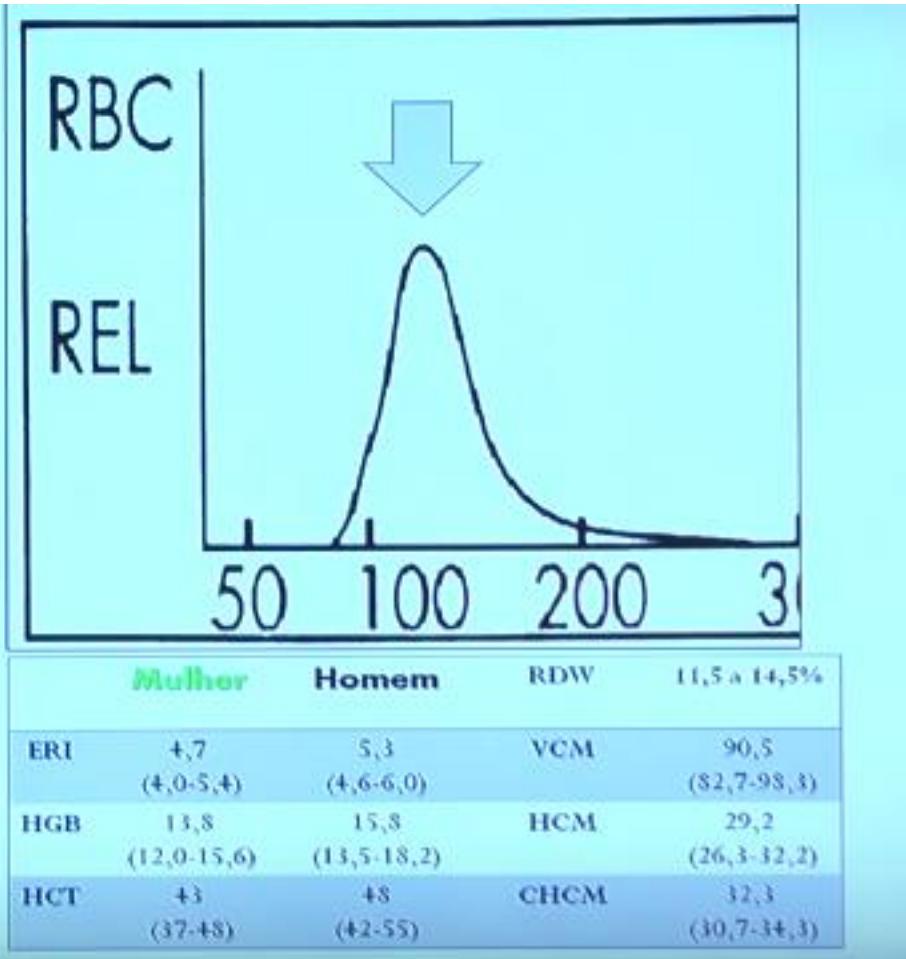
**HCT: 40,7**

**VCM: 124,9**

**HCM: 39,1**

**CHCM: 31,5**

**RDW: 15,0**



# Histograma

**RBC : 4,89**

**HGB: 8,7**

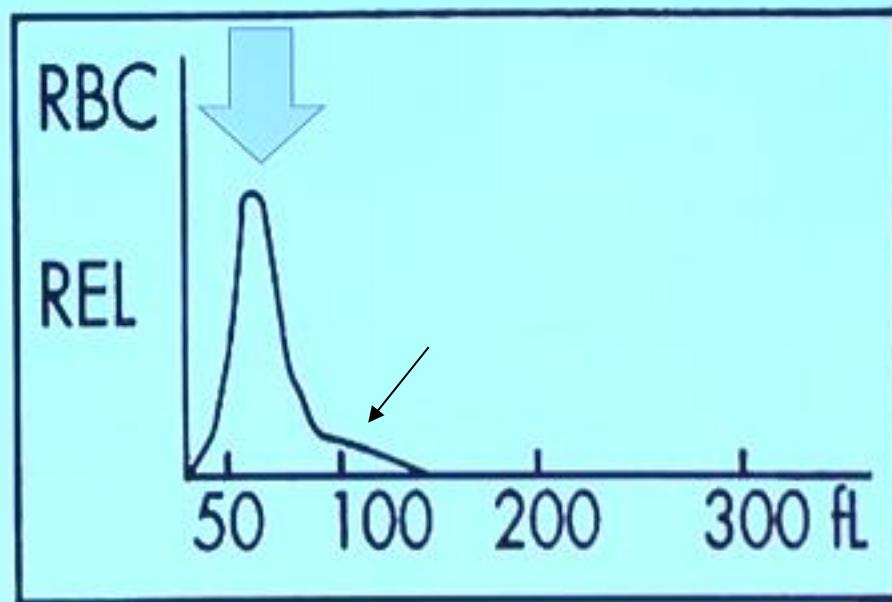
**HCT: 28,5**

**VCM: 58,9**

**HCM: 17,9**

**CHCM: 30,5**

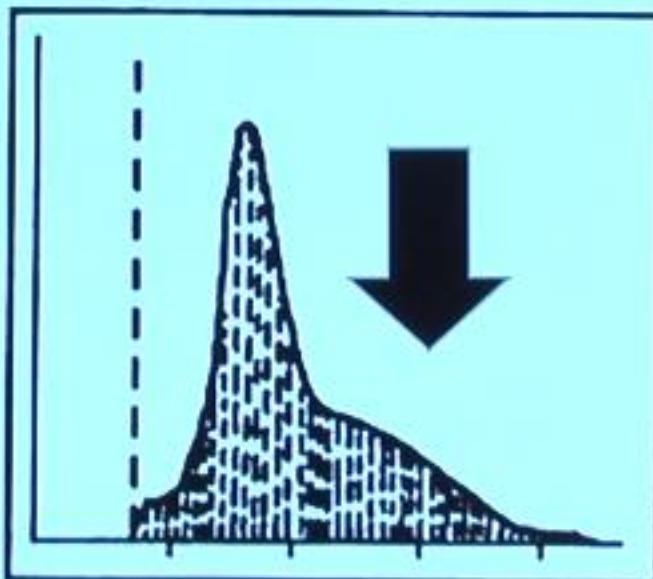
**RDW: 19,9**



	<b>Mulher</b>	<b>Homem</b>	<b>RDW</b>	<b>11,5 a 14,5%</b>
<b>ERI</b>	4,7 (4,0-5,4)	5,3 (4,6-6,0)	<b>VCM</b>	90,5 (82,7-98,3)
<b>HGB</b>	13,8 (12,0-15,6)	15,8 (13,5-18,2)	<b>HCM</b>	29,2 (26,3-32,2)
<b>HCT</b>	43 (37-48)	48 (42-55)	<b>CHCM</b>	32,3 (30,7-34,3)

# Histograma

**Histograma: Hemólise  
Desvio da Curva a direita**



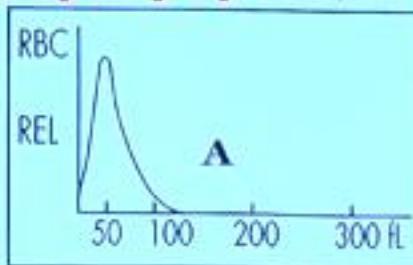
<b>ERI</b>	1,29 (4,6-6,0)
<b>HGB</b>	4,5 (13,5-18,2)
<b>HCT</b>	12,4 (42-55)
<b>VCM</b>	96,5 (82,7-98,3)
<b>HCM</b>	35,0 (26,3-32,2)
<b>CHCM</b>	36,2 (30,7-34,3)
<b>RDW</b>	17,5 11,5 @ 14,5%

# Histograma

A

## Histograma: Tratamento das anemias

### Dupla população



**ERI** 2,94  
(4,6-6,0)

**HGB** 4,5  
(13,5-18,2)

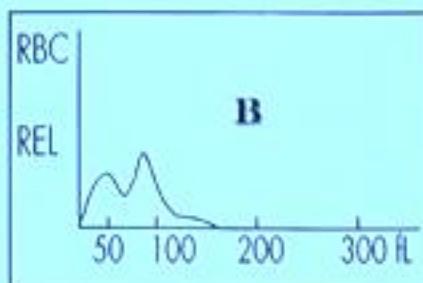
**HCT** 15,2  
(42-55)

**VCM** 51,7  
(82,7-98,3)

**HCM** 15,0  
(26,3-32,2)

**CHCM** 29,6  
(30,7-34,3)

**RDW** 29,4  
11,5 a 14,5%



**ERI** 5,14  
(4,6-6,0)

**HGB** 11,3  
(13,5-18,2)

**HCT** 38,2  
(42-55)

**VCM** 74,4  
(82,7-98,3)

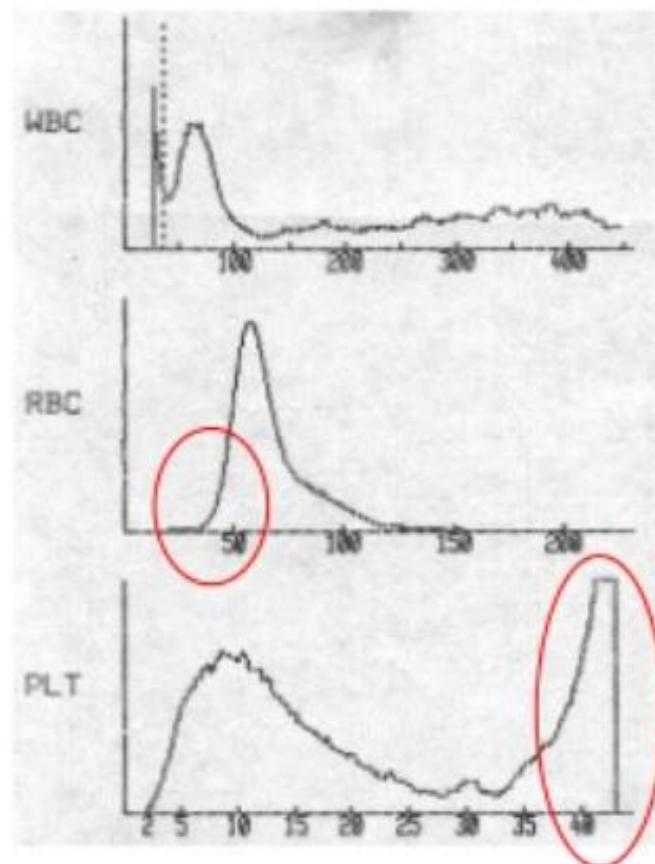
**HCM** 22,0  
(26,3-32,2)

**CHCM** 29,6  
(30,7-34,3)

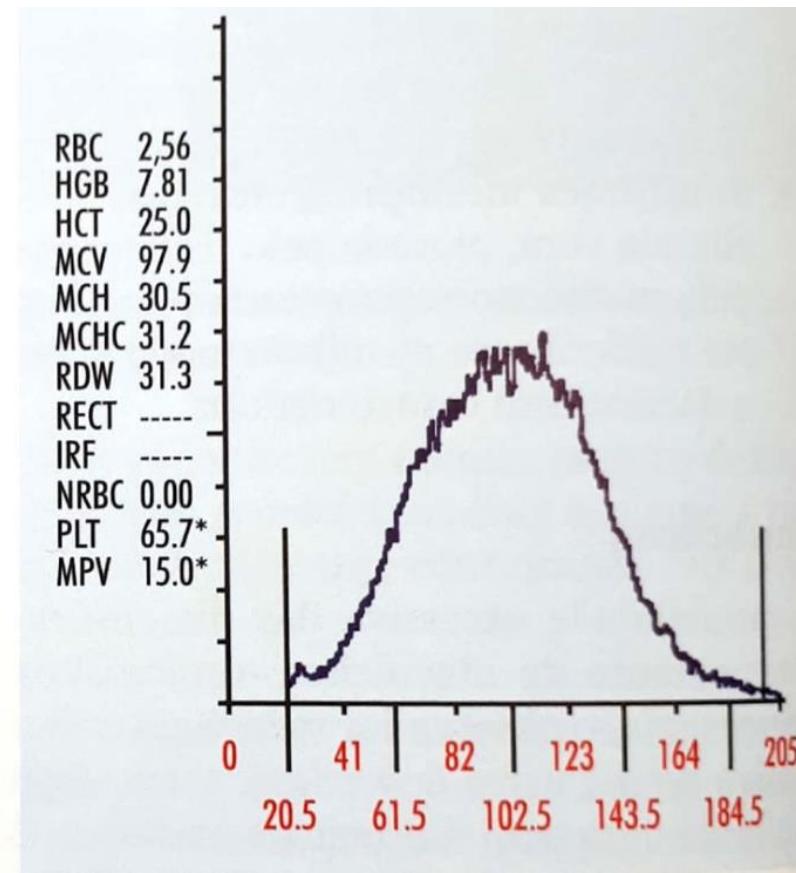
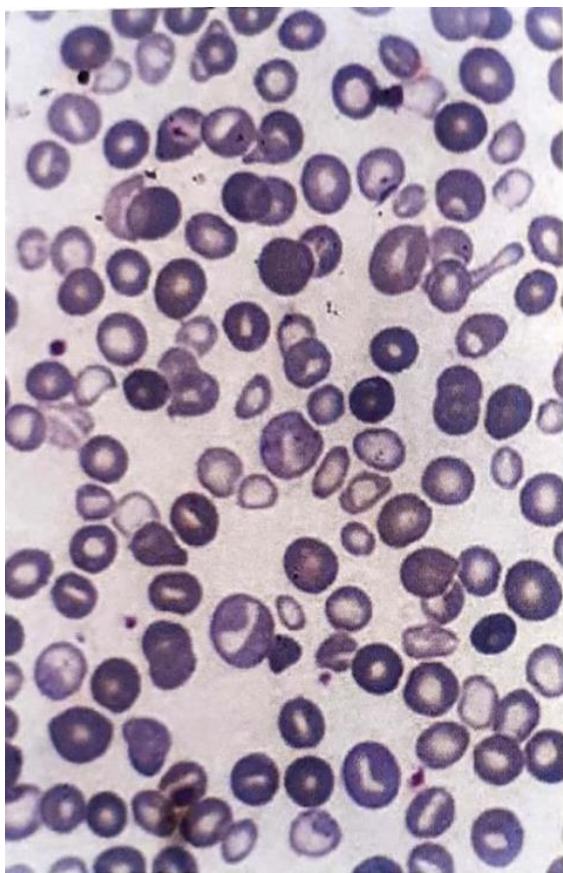
**RDW** 36,4  
11,5 a 14,5%

# Histograma – Talassemia menor

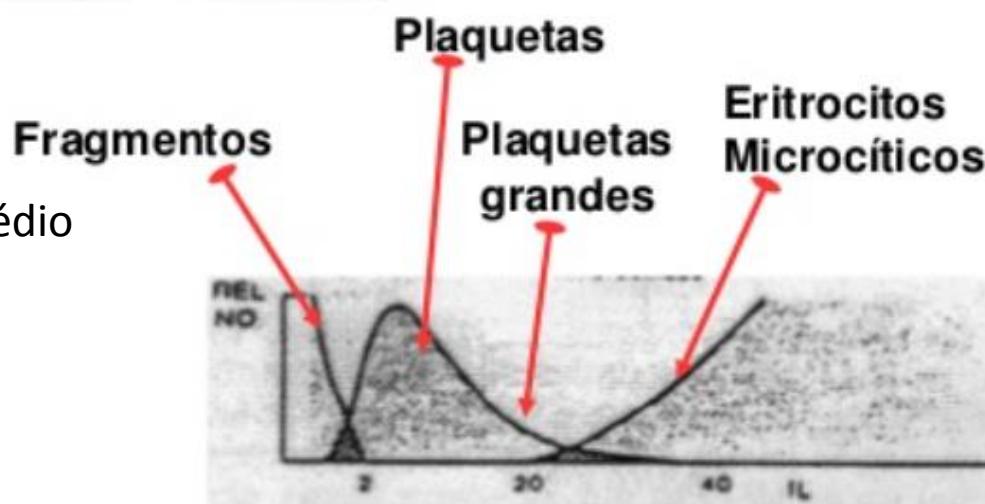
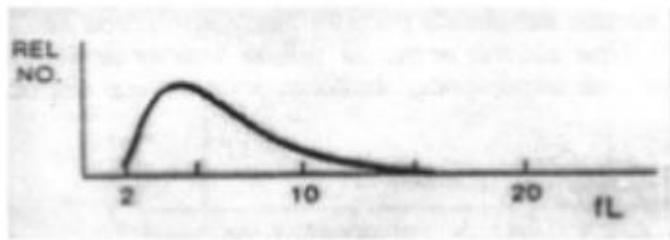
<b>WBC</b>	5,40	K/ul
<b>LYM</b>	1,80	%L
<b>*MID</b>	0,4	%M
<b>GRAN</b>	3,3	%G
<b>RBC</b>	5,20	M/ul
<b>HGB</b>	10,2	g/dl
<b>HCT</b>	31,1	%
<b>MCV</b>	59,8	fL
<b>MCH</b>	19,6	pg
<b>MCHC</b>	32,8	g/dl
<b>RDW</b>	15,2	%
<b>PLT</b>	263.	K/uL
<b>PDW</b>	14,2	10(GSD)



# Histograma – anisocitose



# Histograma de plaquetas



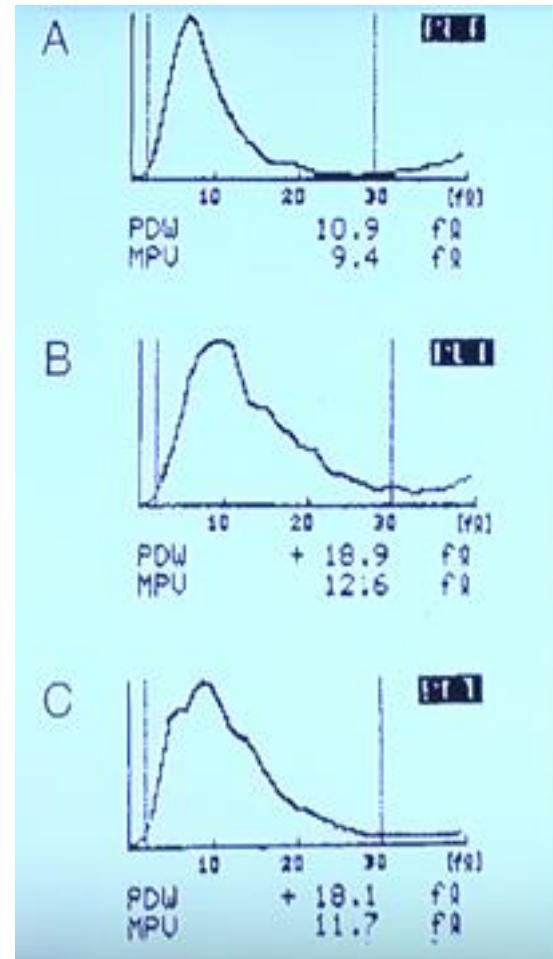
VPM: volume plaquetário médio  
8 fL a 13 fL

Plaquetórito  
0,13 a 0,43%

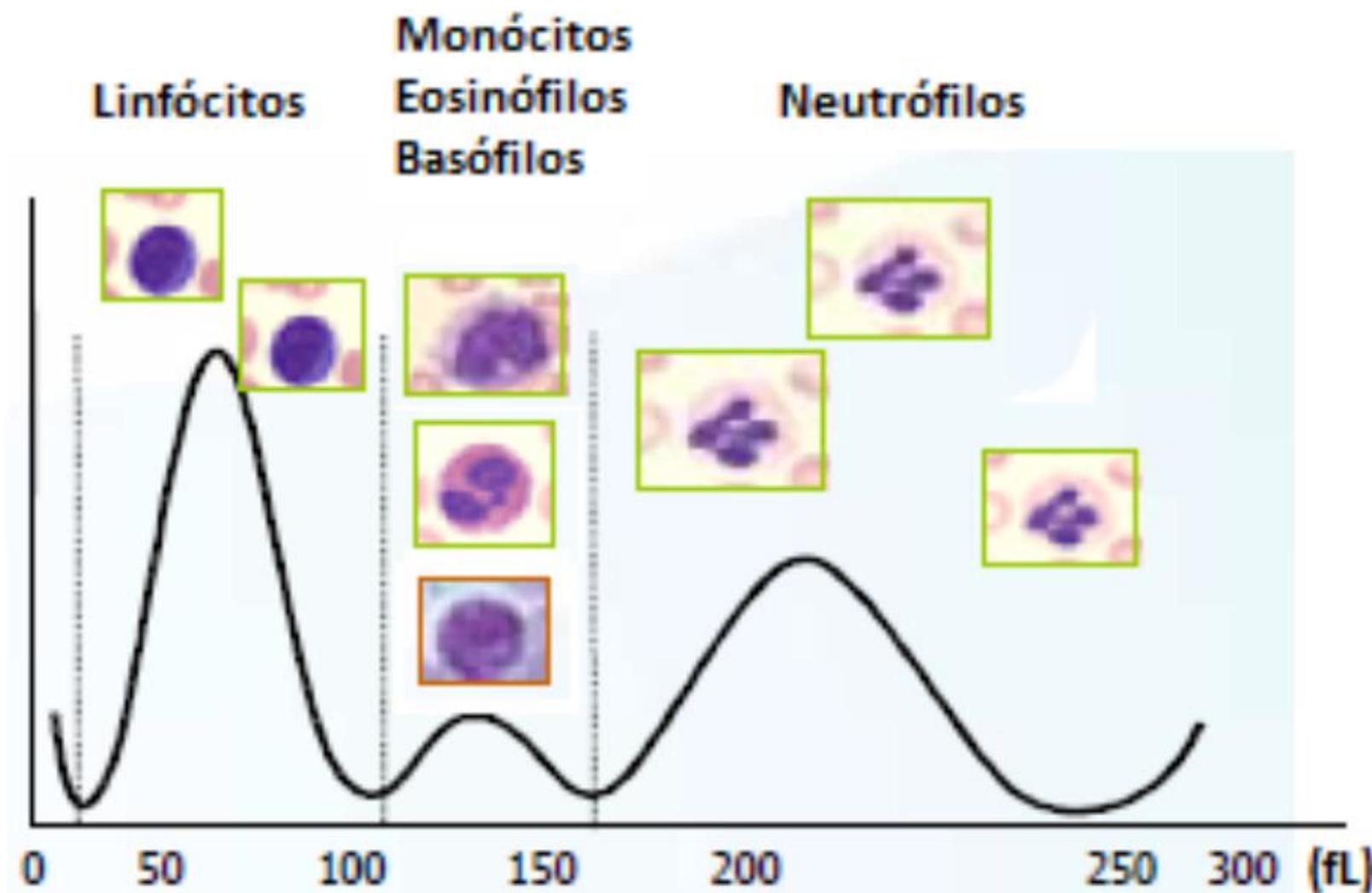
PDW: RDW das plaquetas  
9 a 16%

# Histograma de plaquetas

- VPM alto:
  - plaquetas reativas, plaquetas mais agregáveis, maior poder trombótico
- VPM baixo:
  - deficiência de ferro



# Histograma de leucócitos



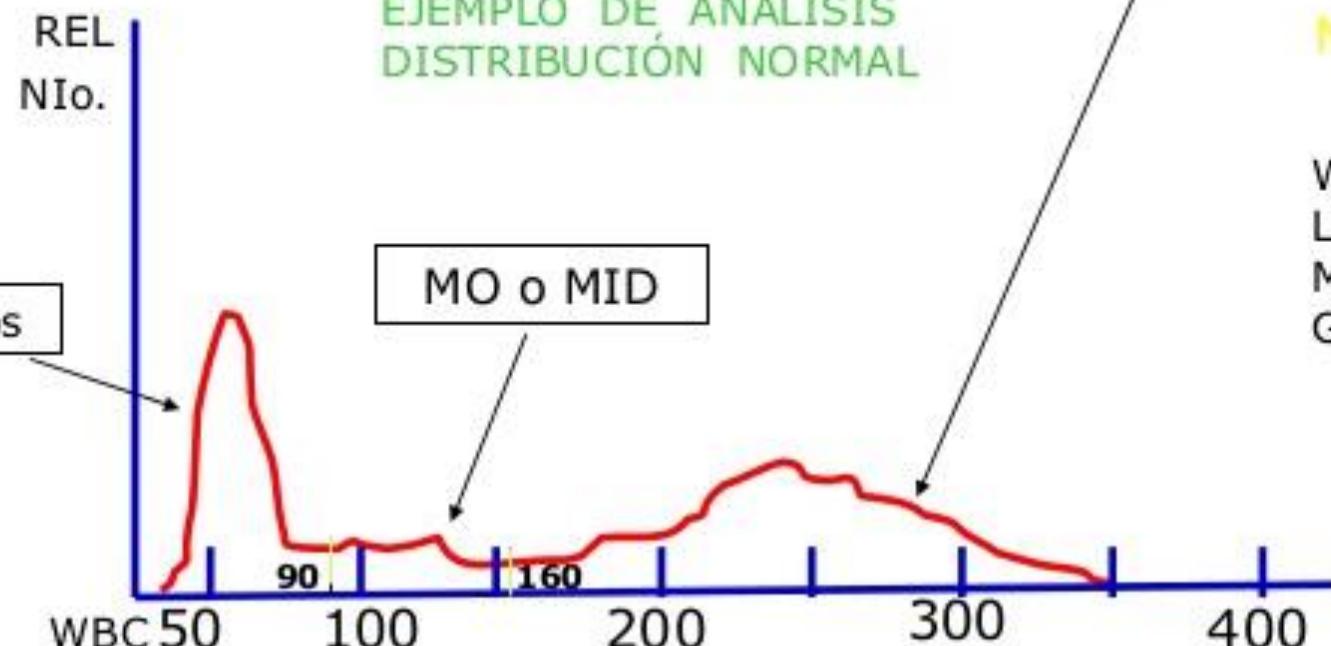
# HISTOGRAMA DE LEUCOCITOS

Recuento total de Leucocitos

Granulocitos

EJEMPLO DE ANALISIS  
DISTRIBUCIÓN NORMAL

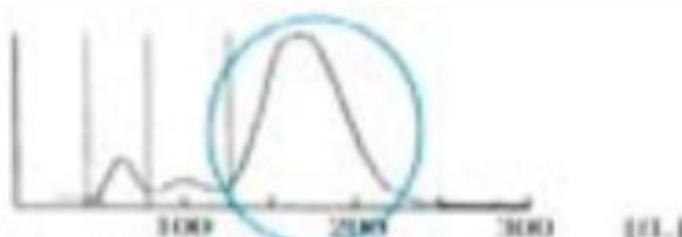
Neutrófilos



MO - MID = Eosinófilo, Basófilo, Monocito

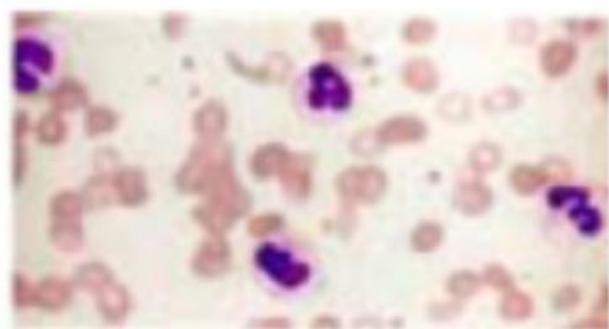
## Neutrofilia

Histograma WBC



Resultados

		Diferencial	
WBC	+ $23.8 \times 10^9/L$	Band	8 %
LYM%	8.1%	Seg	77 %
MXD%	7.9%	Lymph	7 %
NEUT%	84.0%	Mono	7 %
		Eo	1 %
		Baso	0 %

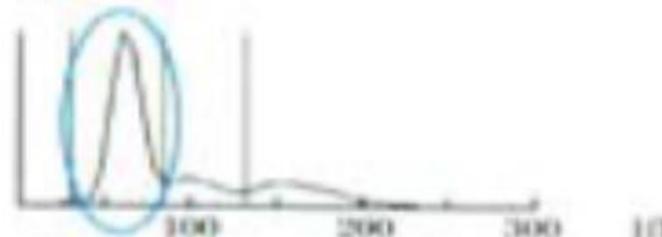


Diagnóstico clínico: Neutrofilia (x 400)

Pico proeminente e distribuição mais larga (NEUT%) na região dos grandes leucócitos.  
Nos casos de linfopenia, ocorrerá uma curva similar

## Linfocitose

Histograma WBC



Resultados

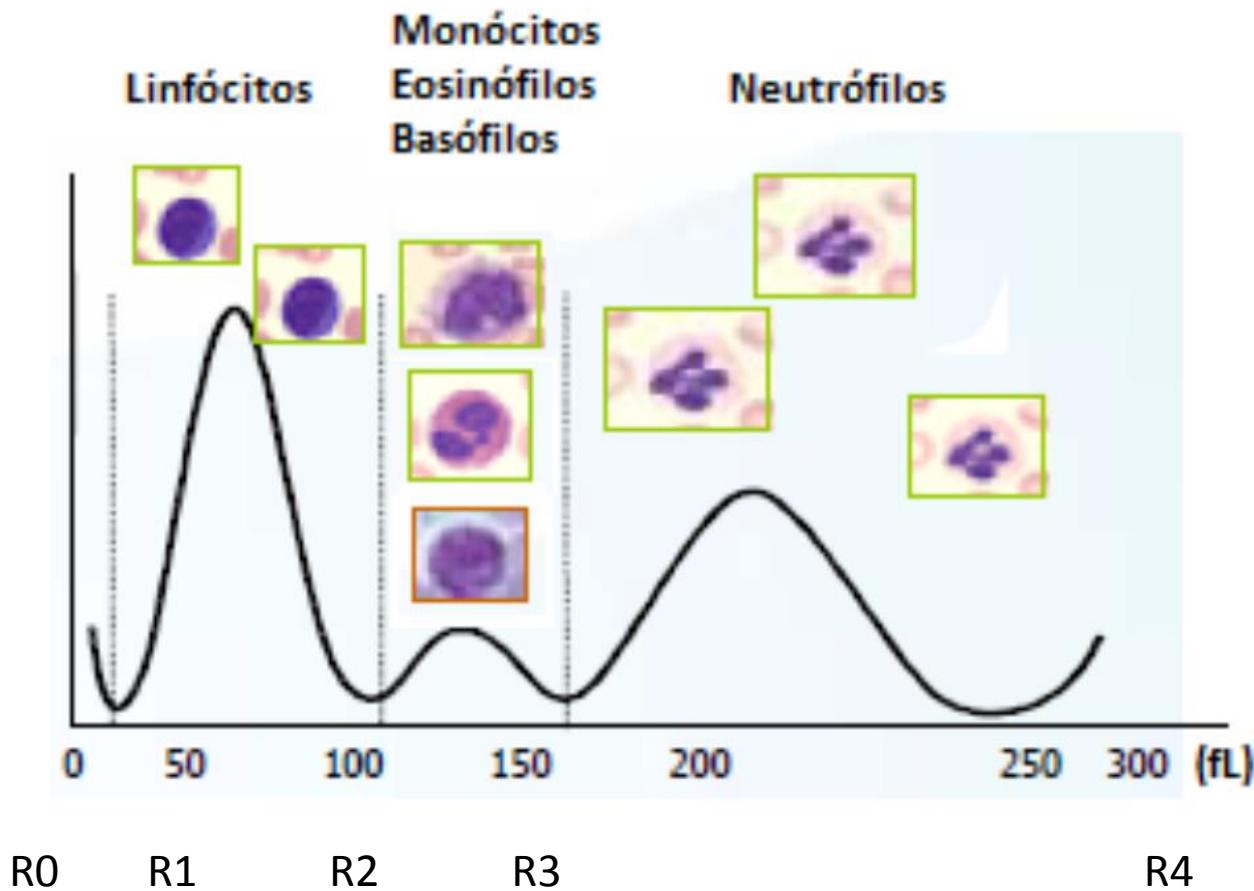
		Diferencial	
WBC	+ $7.9 \times 10^9/L$	Band	4 %
LYM%	+ 64.7%	Seg	20 %
MXD%	15.8%	Lymph	64 %
NEUT%	- 19.5%	Mono	4 %
		Eo	5 %
		Baso	0 %
		Aty-Lym	3 %

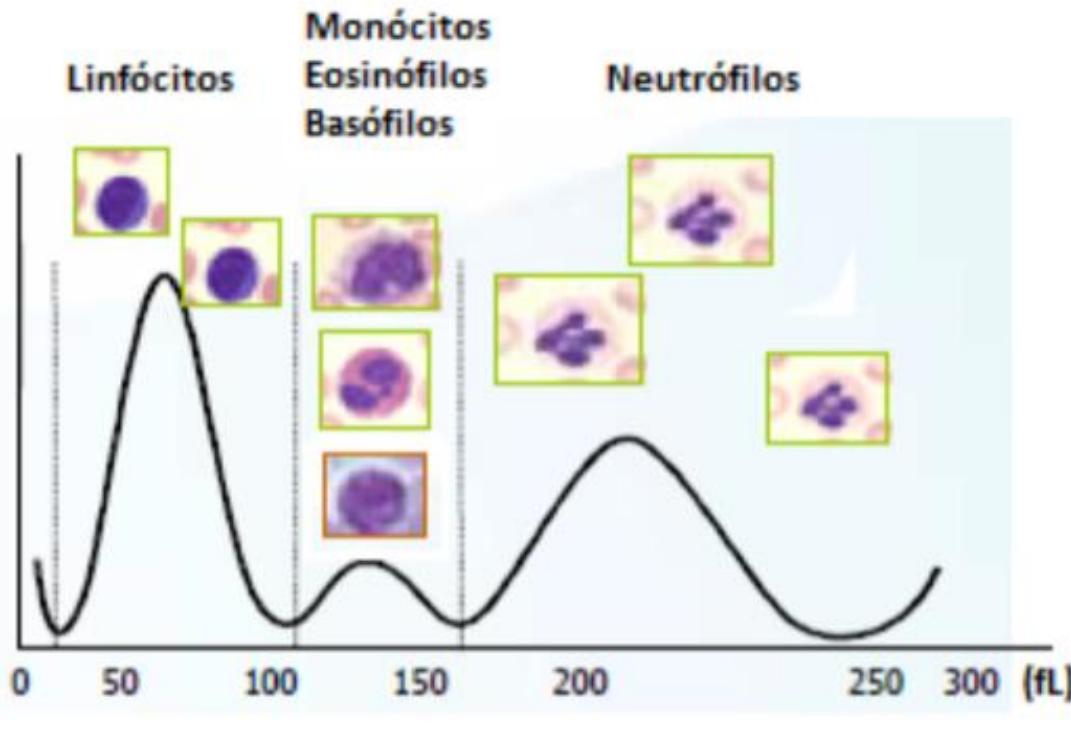


Diagnóstico clínico: Linfocitose (x 1000)

Pico agudo na região de linfócitos (LYM%).  
Nos casos de neutropenia, ocorrerá uma curva similar

# Flag- áreas de alarme





R0

R1

R2

R3

R4

Flag R0: esquerda  
30 fL

- Agregado plaquetário
- Macroplaqueta
- Eritroblasto

Flag R1: direita do 30 fL

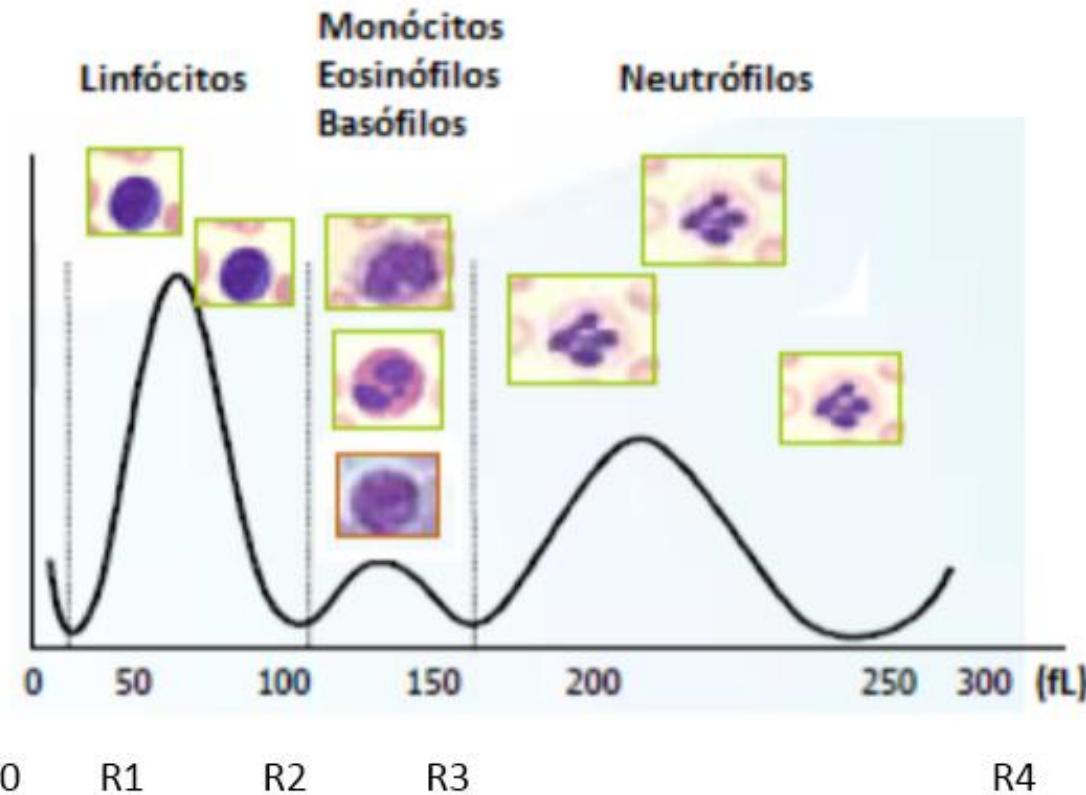
- Linfocitose
- linfopenia

Flag R2: esquerda  
de 98 fL

- Linfócito atípico
- Basofilia
- Blastos
- Linfocitose
- Linfopenia

Flag R2: direita de  
98 fL

- Basofilia
- Blastos
- eosinofilia



Flag R3: esquerda dos 135 fL

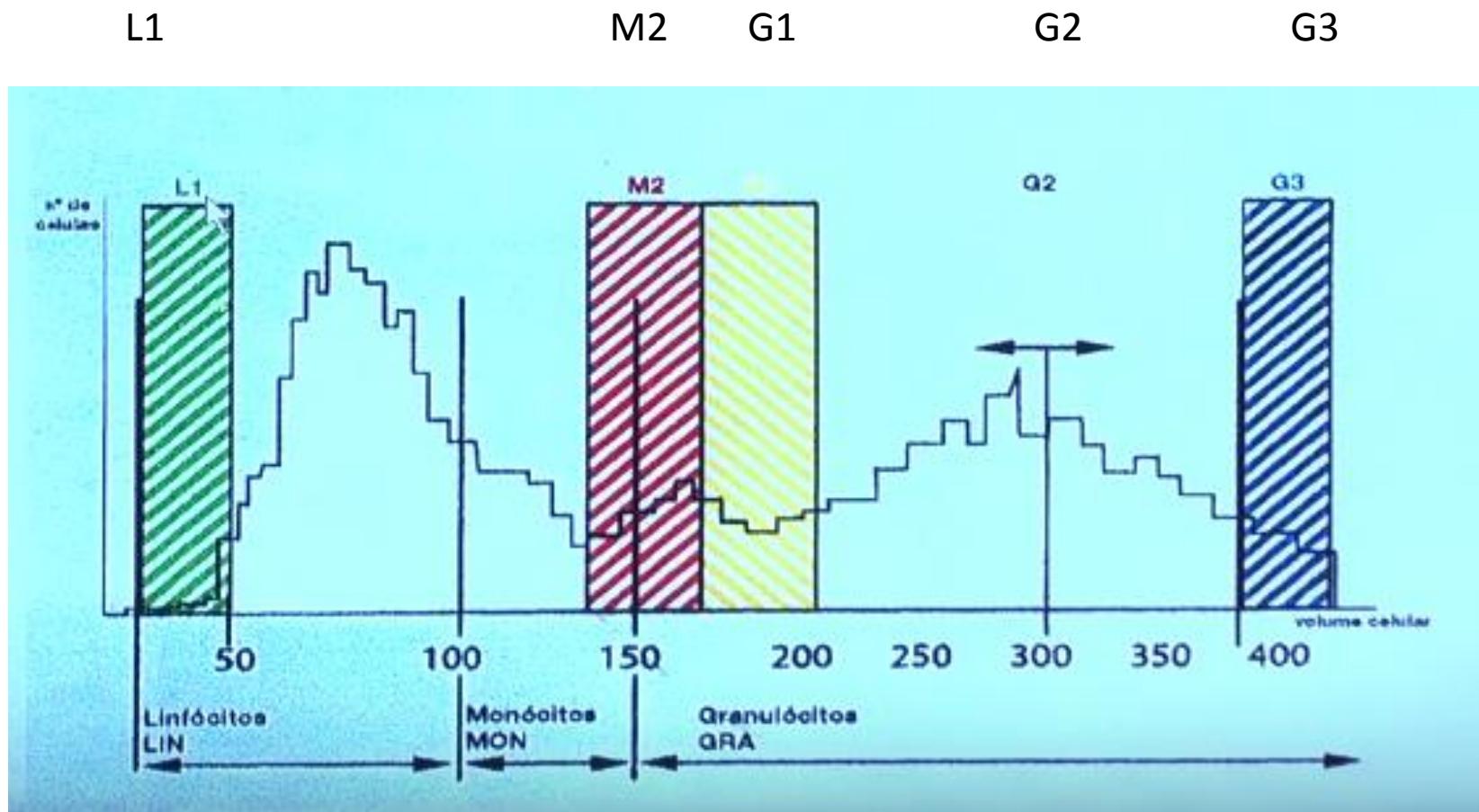
- Bastonete
- Blastos
- Basofilia
- Eosinofilia

Flag R3: direita dos 135 fL

- Eosinofilia
- Granulócitos imaturos
- Granulocitose
- Neutropenia

Flag R4: esquerda dos 300 fL

- granulocitose



A nomenclatura dos Flags depende dos fabricantes, mas apresentam o mesmo significado

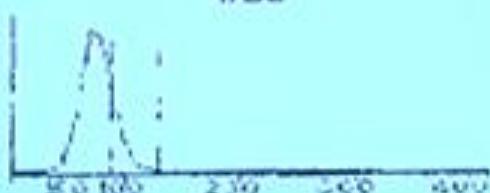
PLT Flags : SCH  
 WBC : 6.1  $10^3/\text{mm}^3$  (3.5 - 10.0 ) MCV : 90  $\text{fm}^3$  (85 - 97 )  
 RBC : 2.96 L  $10^6/\text{mm}^3$  (3.80 - 5.80 ) MCH : 29.1 pg (26.5 - 33.5 )  
 HGB : 8.6 L g/dl (11.0 - 16.5 ) MCHC: 32.5 g/dl (31.5 - 35.5 )  
 HCT : 26.5 L % (35.0 - 50.0 ) RDW : 13.0 % (10.0 - 19.0 )  
 PLT : 111 L  $10^3/\text{mm}^3$  (150 - 330 ) MPV : 8.8  $\text{fm}^3$  (6.5 - 11.0 )  
 PCT : .097 L % ( .100 - .500 ) PDW : 14.1 % (10.0 - 18.0 )

WBC Flags : M2 G1 G2

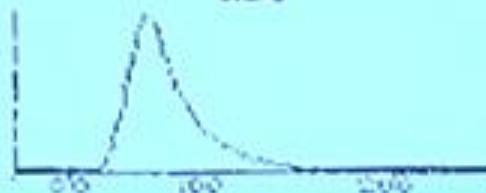
DIFF :

%LYM:	78.0 H %	(17.0 - 43.0 )	%LYM:	4.7 H $10^3/\text{mm}^3$	( 1.2 - 3.2 )
%MON:	20.2 H %	( 1.0 - 10.0 )	%MON:	1.2 H $10^3/\text{mm}^3$	( 0.2 - 2.2 )
%GRA:	1.8 L %	( 1.0 - 7.0 )	%GRA:	0.2 L $10^3/\text{mm}^3$	( 1.2 - 6.8 )

WBC



RBC



PLT

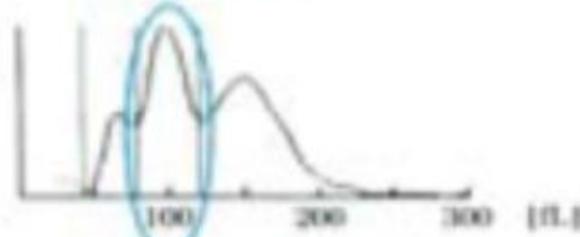


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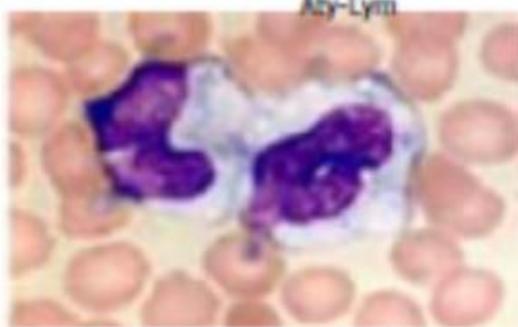
## Monocitose

Histograma WBC



### Resultados

		Diferencial	
WBC	7.7 x 10 <sup>9</sup> /L	Stab	8 %
LYM%	13.2%	Seg	37 %
MXD%	37.7%	Lymph	17 %
NEUT%	49.1%	Mono	35 %
		Eo	1 %
		Baso	0 %
		Met	1 %
		Aty-Lym	1 %



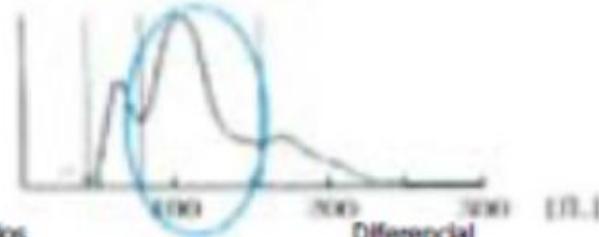
### Diagnóstico clínico: Monocitose

(x 1000)

Monócitos, os maiores leucócitos do sangue normal, ficam menores que os neutrófilos devido ao reativo lisante. No histograma, eles se posicionam na região das células de tamanho médio (MXD%).

## Eosinofilia

Histograma WBC



### Resultados

WBC	4.3 x 10 <sup>9</sup> /L	Stab	1 %
LYM%	18,3%	Seg	19 %
MXD%	+ 62,2%	Lymph	20 %
NEUT%	- 19,5%	Mono	9 %
		Eo	47 %
		Baso	1 %
		My	1 %
		Met	1 %
		Aty-Lym	1 %



### Diagnóstico clínico: Eosinofilia

Eosinófilos e basófilos, são granulócitos como os neutrófilos, mas ficam menores devido a sua contrição na presença do reativo lisante. No histograma, eles se posicionam na região das células de tamanho médio, junto com os monocitos. Portanto, eosinofilia ou monocitose devem ser diferenciados manualmente.

WBC:  
LYM:  
\*MID:  
GRAN:

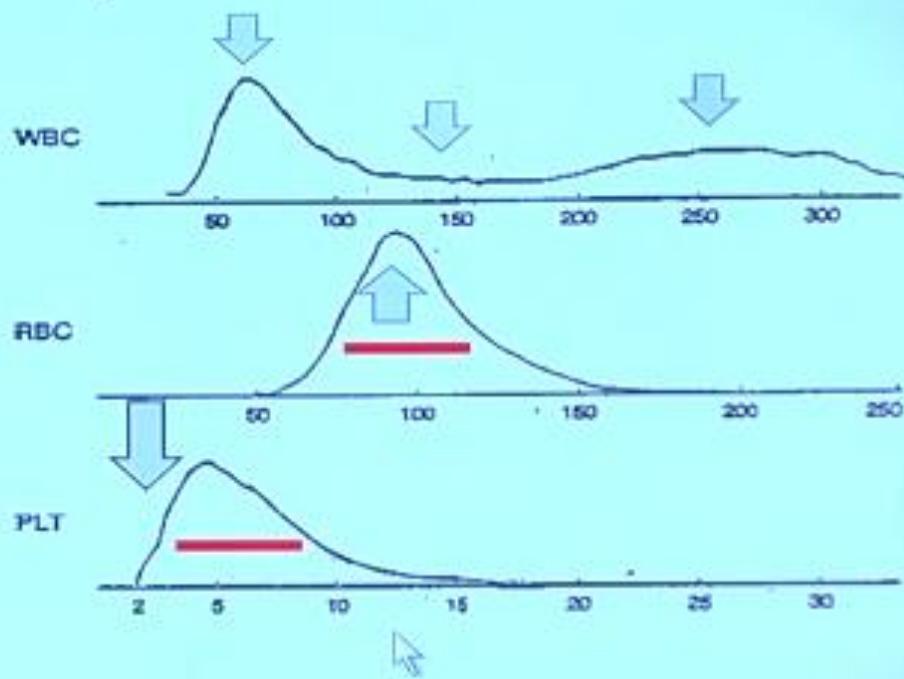
5.5 K/uL  
1.9 34.9 %L  
0.4 8.1 %M  
3.1 57.0 %G

RBC:  
HGB:  
HCT:  
MCV:  
MCH:  
MCHC:  
RDW:

3.38 M/uL  
10.5 g/dL  
31.8 %  
84. fL  
31.1 pg  
33.0 g/dL  
13.9 %

PLT:  
MPV:  
PCT:  
PDW:

334. K/uL  
6.2 fL  
0.21 %  
16.7 10(GSD)



## Positive

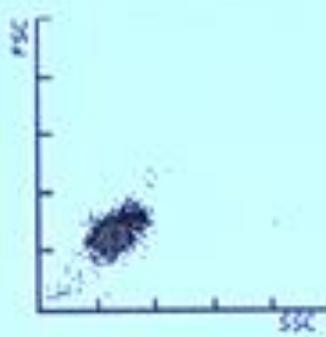
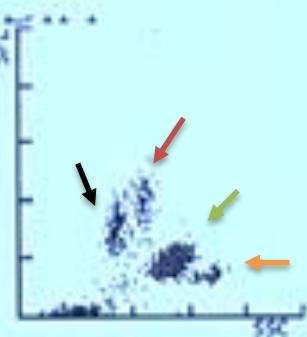
### Diff. Morph. Count

RBC	2.16	-	[ $10^6/\mu\text{L}$ ]
HGB	7.9	-	[g/dL]
HCT	22.2	-	[%]
MCV	102.8	[fL]	
MCH	36.6	[pg]	
MCHC	35.6	[g/dL]	
RDW-SD	72.2	+	[fL]
RDW-CV	20.8	+	[%]
WBC	3.32	[ $10^3/\mu\text{L}$ ]	
NEUT	79.6	+	[%]
LYMPH	9.3	-	[%]
MONO	6.9	[%]	
EO	3.9	[%]	
BASO	0.3	[%]	
NRBC	0.0	[/100WBC]	

RBC



...



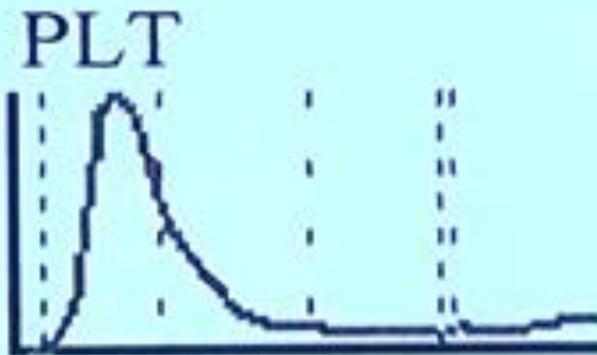
MI



NRBC



PLT &	51	[ $10^3/\mu\text{L}$ ]
MPV	10.1	[fL]
RET	6.44	[%]
IRF	17.6	[%]
IPF	2.1	[%]
RET-He	42.7	[pg]



Parametros de pesquisa		
PDW	10.4	[fL]
P-LCR	24.3	[%]
PCT	0.06	- [%]
LFR	82.4	[%]
MFR	12.3	[%]
HFR	5.3	[%]

