



Sociedad  
Chilena de  
Hematología



# **Detección y Análisis Inmuno hematológico de Subgrupos de A**

**Aplicando el Sexto Sentido**

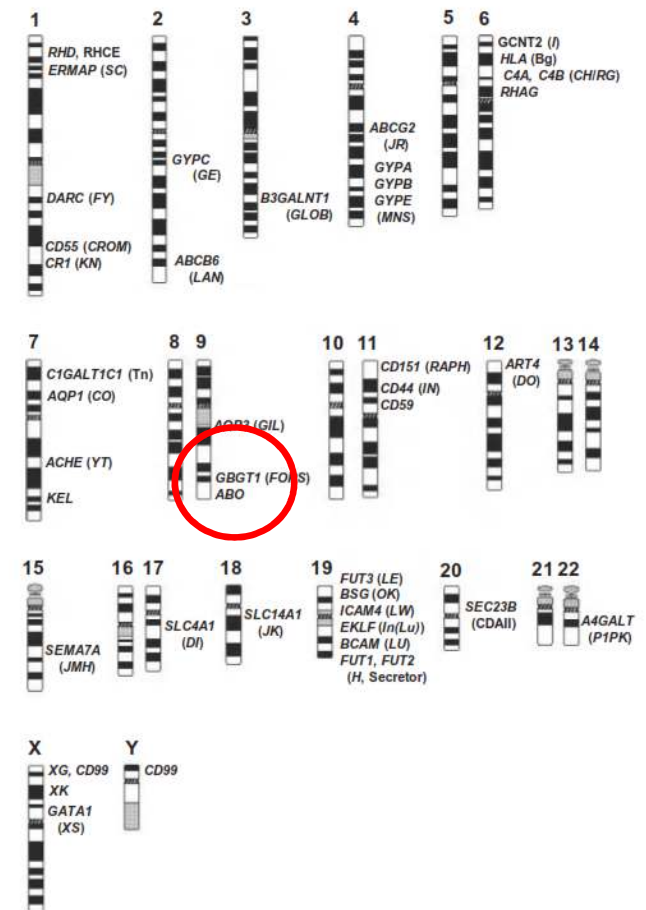
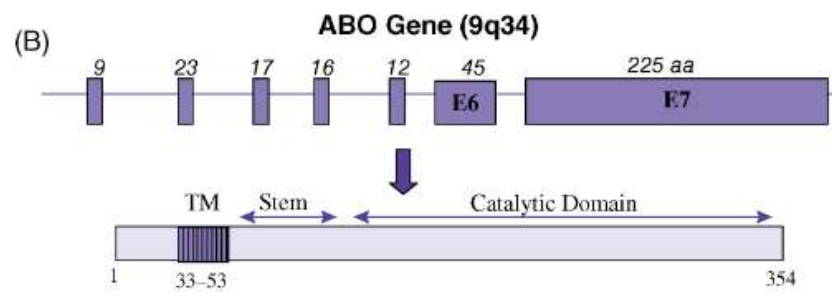
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**Marcelo Márquez Sandoval  
Tecnólogo Médico  
Centro de Sangre Valparaíso  
2019**

# Sistema Sanguíneo ABO

| ISBT System Name (Number) | Gene Name ISBT (HGNC)*    | Chromosome Location | Gene Product and Component Name [CD Number] | Associated Blood Group Antigens [Null Phenotype] |
|---------------------------|---------------------------|---------------------|---------------------------------------------|--------------------------------------------------|
| ABO (001)                 | <i>ABO</i> ( <i>ABO</i> ) | 9q34.2              | Glycosyltransferase, carbohydrate           | A; B; A,B; A1 [Group O]                          |

4

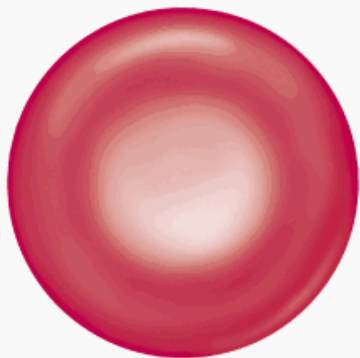


# Sistema Sanguíneo ABO



Side view

2.0  $\mu\text{m}$

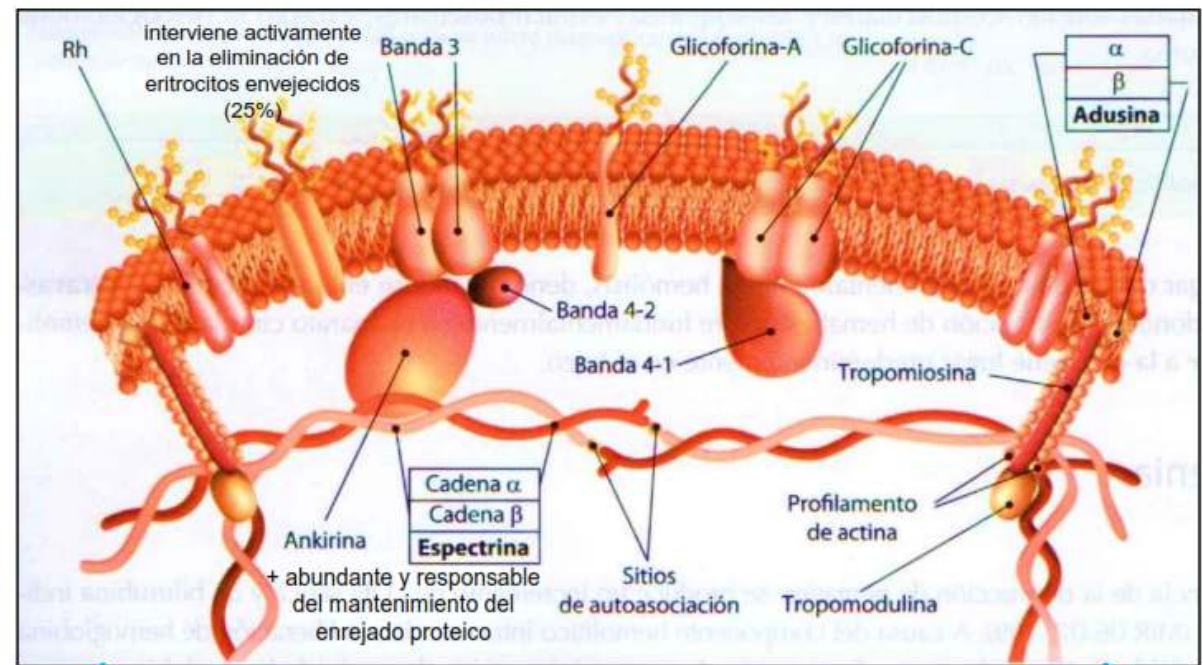


Top view

7.5  $\mu\text{m}$

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Interacciones Verticales



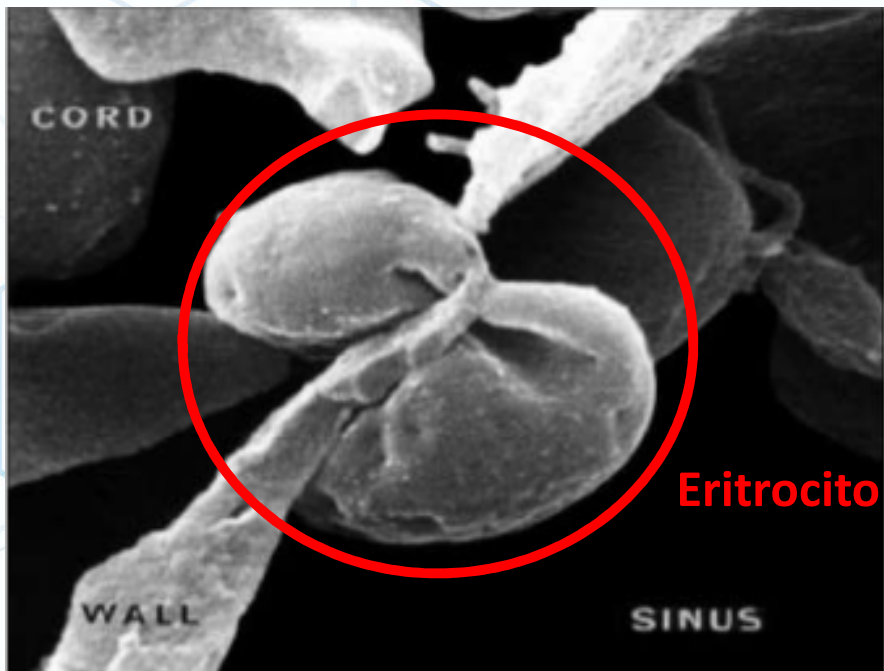
Interacciones Horizontales Rotura del citoesqueleto = hemolisis



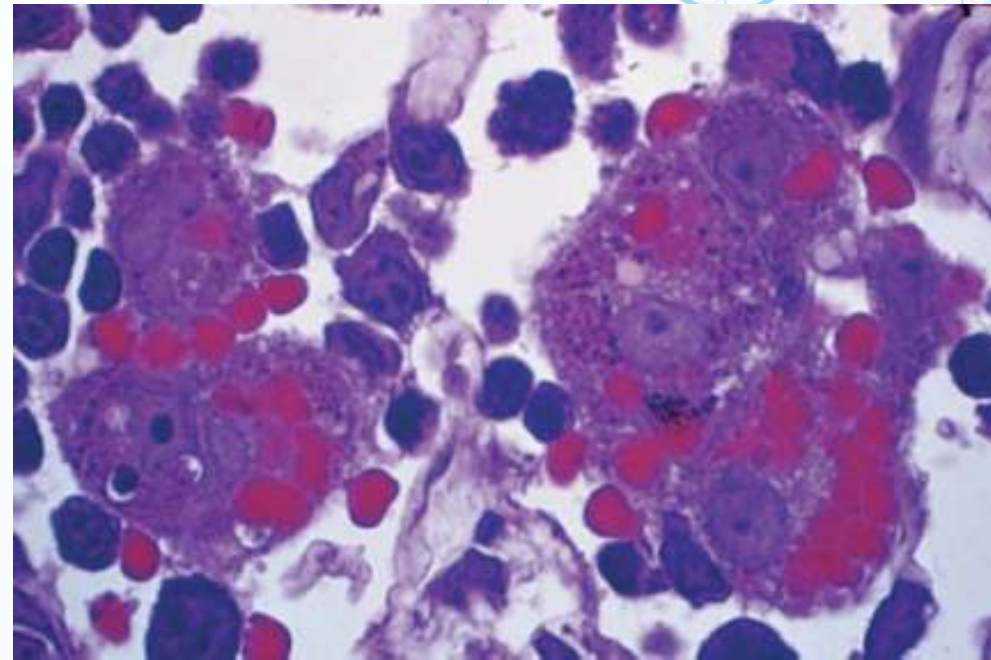
# Sistema Sanguíneo ABO

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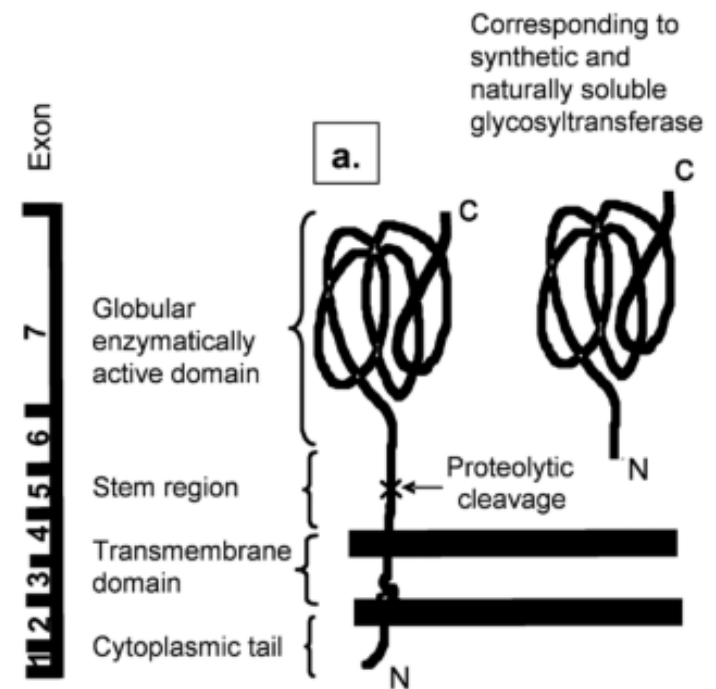
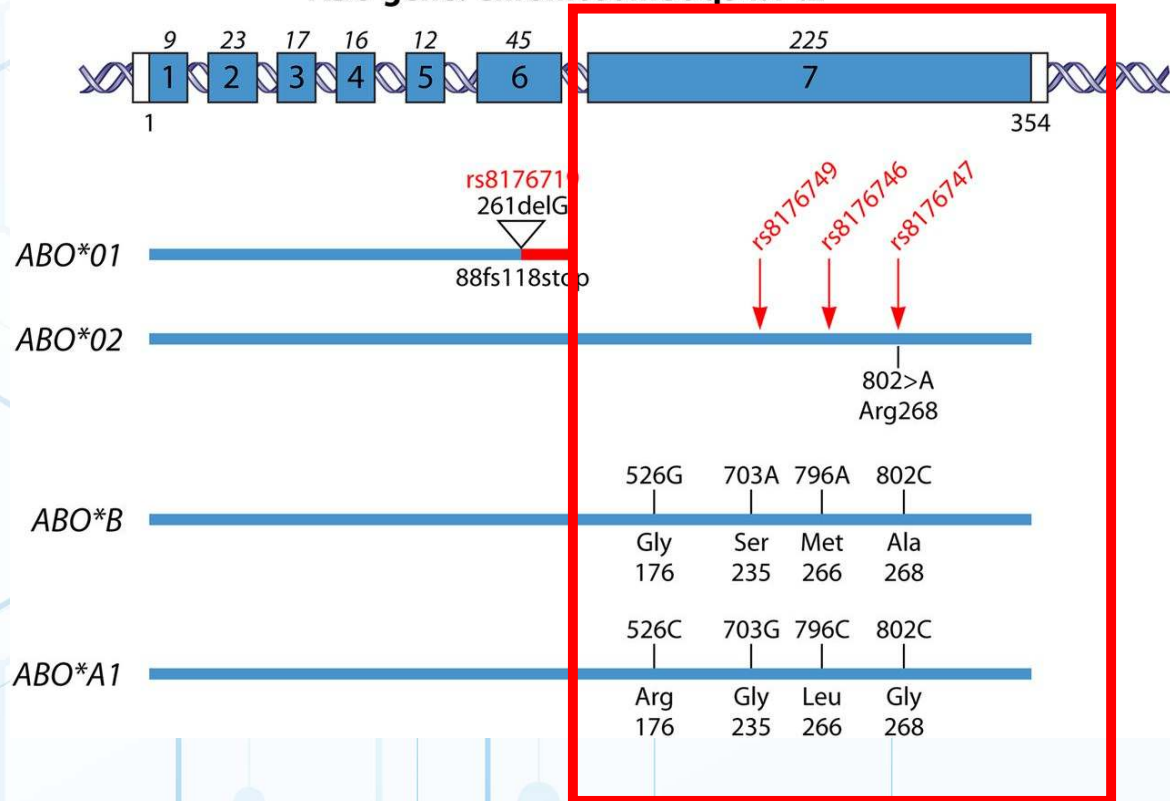
Cordones Esplénicos

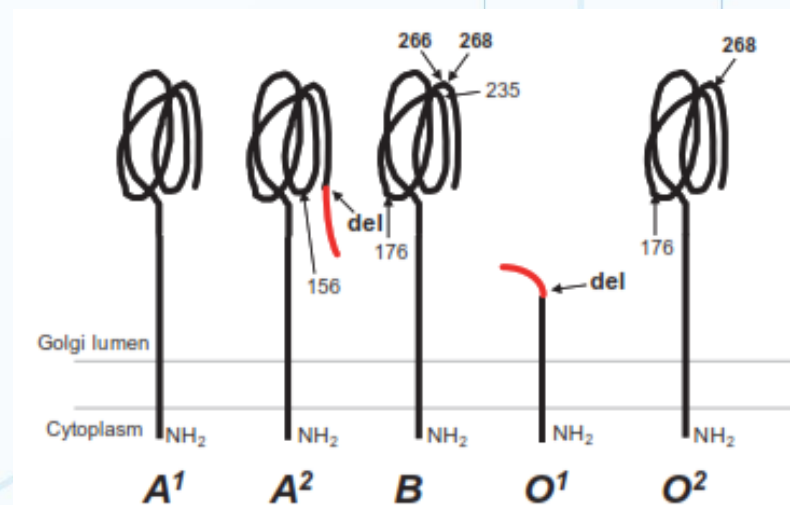
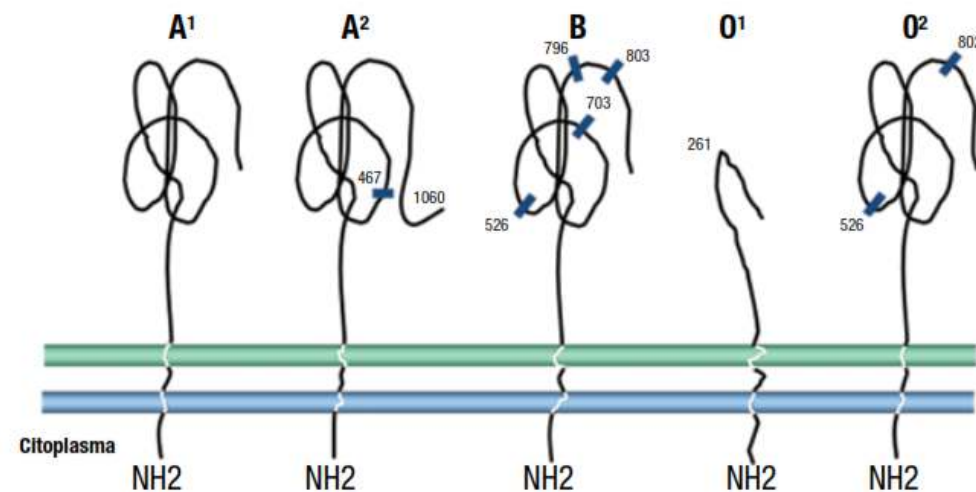
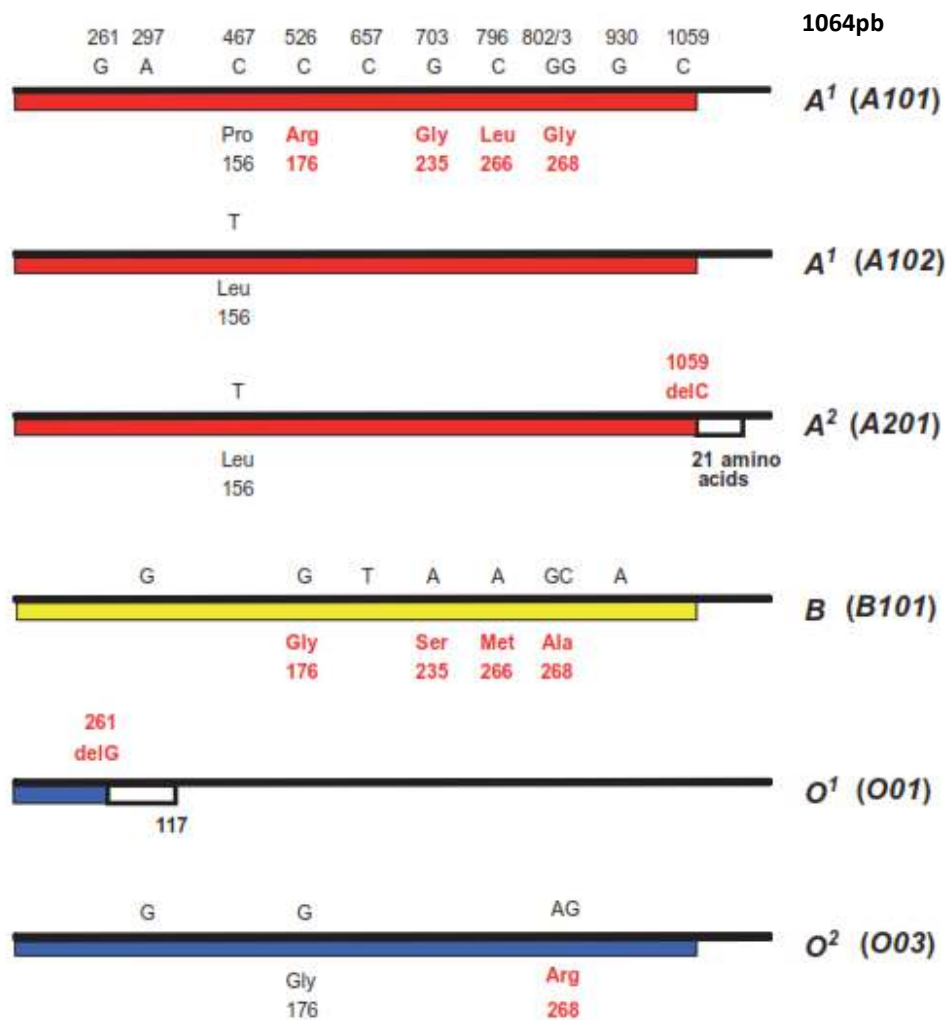


Senos Esplénicos

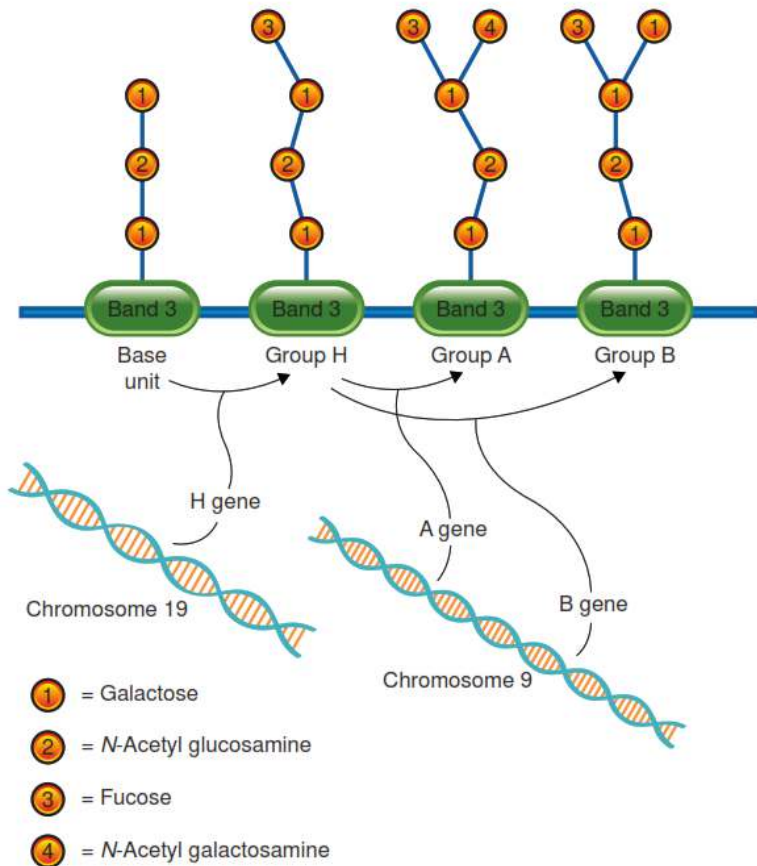


### ABO gene: Chromosome 9q34.1-.2

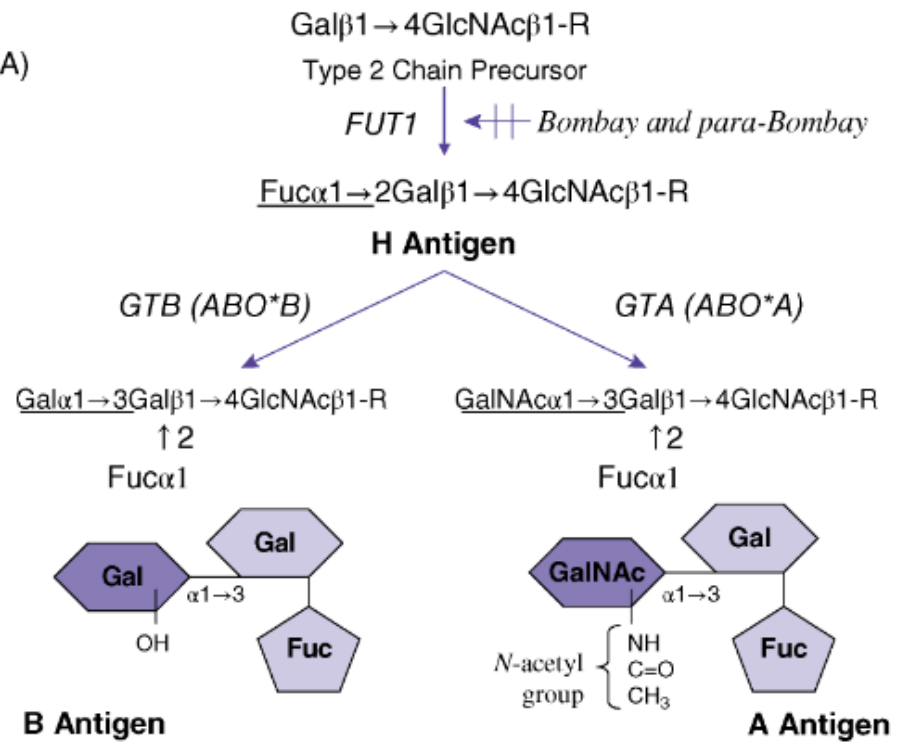




# Sistema Sanguíneo ABO



(A)





# Sistema Sanguíneo ABO

**TABLE 12-1.** Routine ABO Grouping

| Reaction of Red Cells with Antisera (Red Cell Grouping) |        | Reaction of Serum with Reagent Red Cells (Serum Grouping) |         |         | Interpretation | Prevalence (%) in US Population |                   |
|---------------------------------------------------------|--------|-----------------------------------------------------------|---------|---------|----------------|---------------------------------|-------------------|
| Anti-A                                                  | Anti-B | A <sub>1</sub> Cells                                      | B Cells | O Cells | ABO Group      | European Ethnicity              | African Ethnicity |
| 0                                                       | 0      | +                                                         | +       | 0       | O              | 45                              | 49                |
| +                                                       | 0      | 0                                                         | +       | 0       | A              | 40                              | 27                |
| 0                                                       | +      | +                                                         | 0       | 0       | B              | 11                              | 20                |
| +                                                       | +      | 0                                                         | 0       | 0       | AB             | 4                               | 4                 |
| 0                                                       | 0      | +                                                         | +       | +       | Bombay*        | Rare                            | Rare              |

\*H null phenotype (see section on H antigen).

+ = agglutination; 0 = no agglutination.

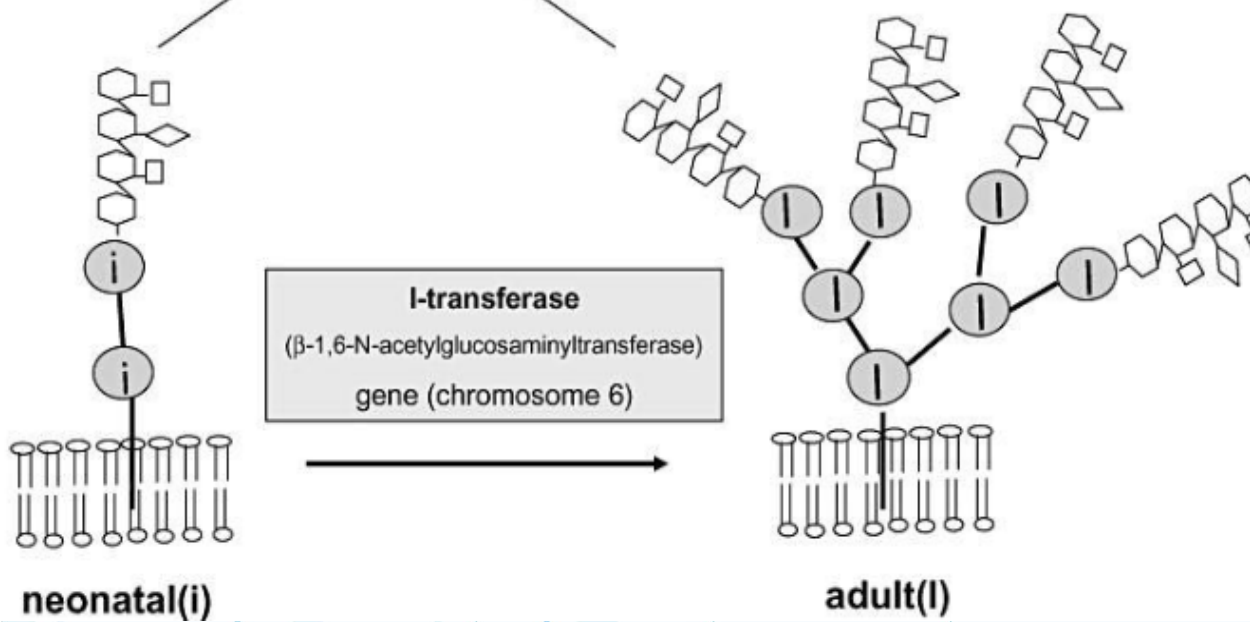


**Table 5.5: Number of ABH determinants per erythrocyte**

| Blood group of erythrocytes | A sites                         | B sites                                                      | H sites                                                          |
|-----------------------------|---------------------------------|--------------------------------------------------------------|------------------------------------------------------------------|
| <b>A<sub>1</sub></b>        | 0.81–1.17 x 10 <sup>6</sup> [a] | —                                                            | 0.07–0.17 x 10 <sup>6</sup> [c][e]                               |
| <b>B</b>                    | —                               | 0.61–0.83 x 10 <sup>6</sup> [a]<br>2.2 x 10 <sup>6</sup> [b] | 0.40–0.47 x 10 <sup>6</sup> [c][e]                               |
| <b>O</b>                    | —                               |                                                              | 1.59–1.74 x 10 <sup>6</sup> [c]<br>1.7–1.9 x 10 <sup>6</sup> [d] |

# Sistema Sanguíneo ABO

## blood group A

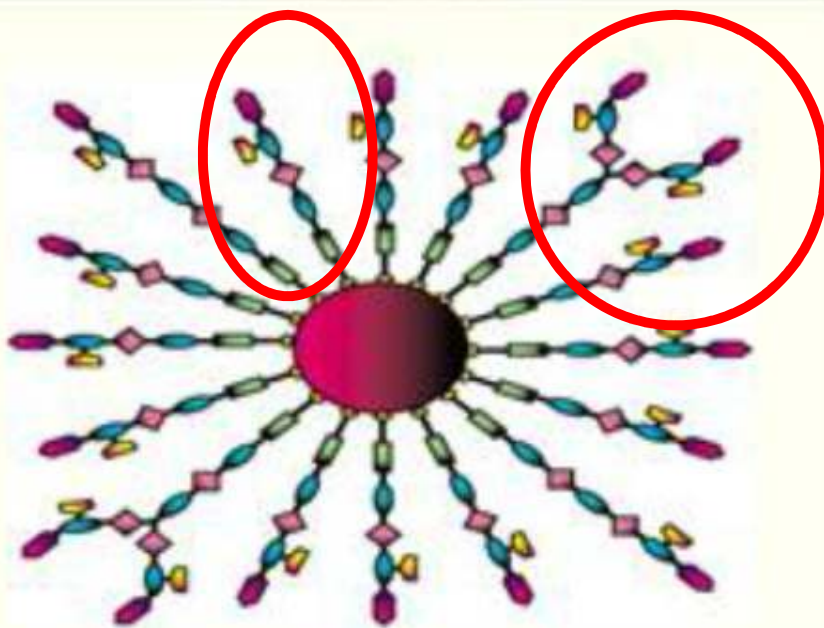


**Tabla 5.** Expresión de los antígenos ABO por eritrocito

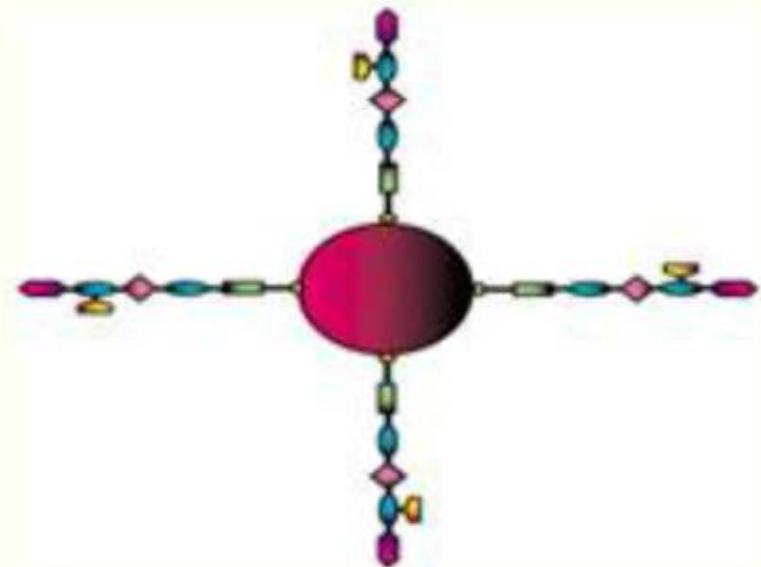
| Grupo sanguíneo  |               | Expresión |             |
|------------------|---------------|-----------|-------------|
| A <sub>1</sub>   | Adulto        | 810.000   | ~ 1.170.000 |
| A <sub>1</sub>   | Recién nacido | 250.000   | ~ 370.000   |
| A <sub>2</sub>   | Adulto        | 240.000   | ~ 290.000   |
| A <sub>2</sub>   | Recién nacido | 140.000   |             |
| A <sub>1</sub> B | Adulto        | 460.000   | ~ 850.000   |
| A <sub>1</sub> B | Recién nacido | 240.000   | ~ 290.000   |
| A <sub>2</sub> B | Adulto        | 120.000   |             |
| A <sub>3</sub>   |               | 7.000     | ~ 100.000   |
| A <sub>x</sub>   |               | 1.400     | ~ 10.000    |
| A <sub>end</sub> |               | 1.100     | ~ 4.400     |
| A <sub>m</sub>   |               | 200       | ~ 1.900     |
| A <sub>el</sub>  |               | 100       | ~ 1.400     |
| B                | Adulto        | 610.000   | ~ 830.000   |
| B                | Recién nacido | 200.000   | ~ 320.000   |
| A <sub>1</sub> B | Adulto        | 310.000   | ~ 560.000   |

## A1 and A2 Blood Cell and Antigens

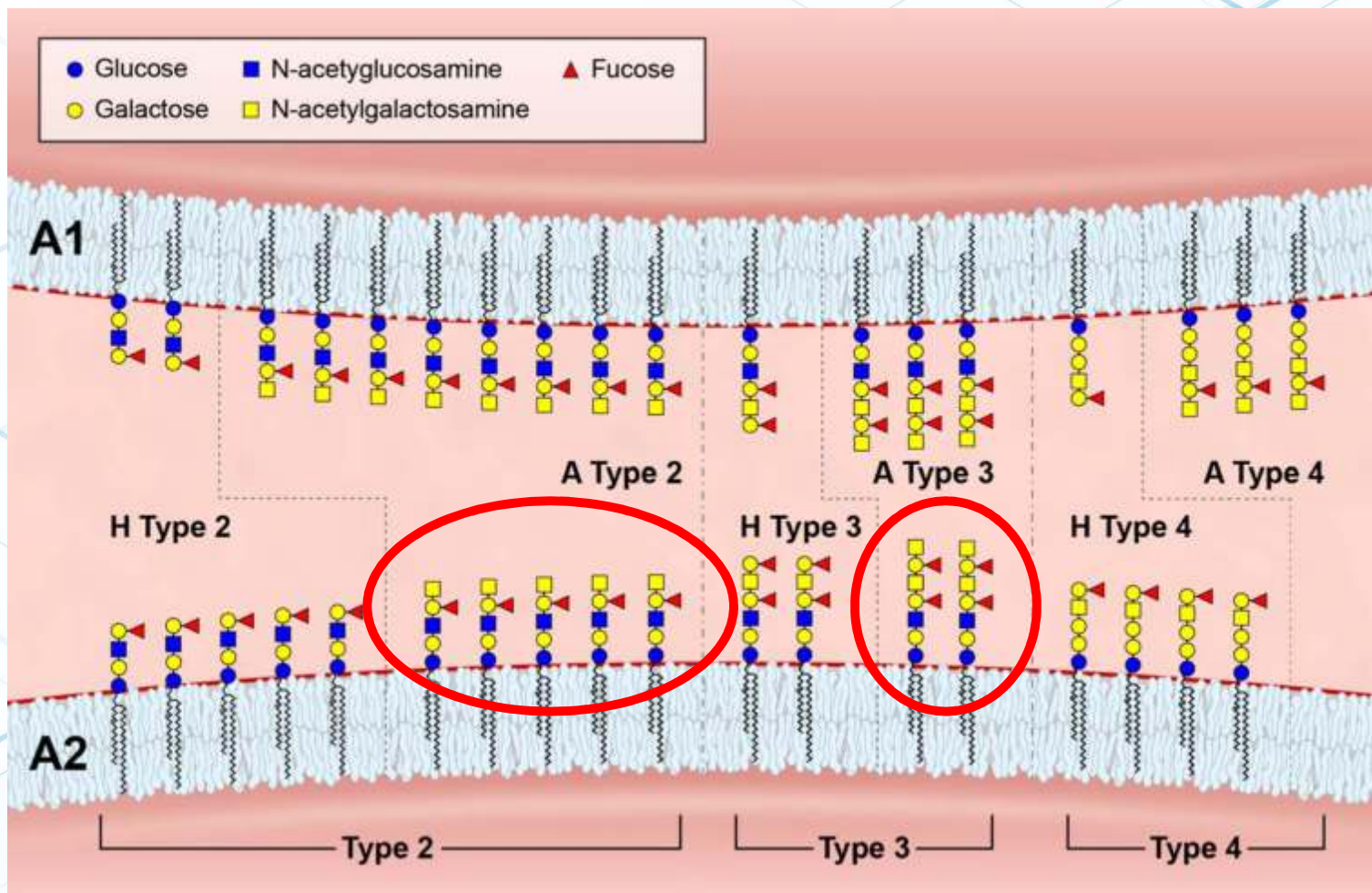
A1 Red Cell



A2 Red Cell









**Tabla 10.** Fenotipos débiles de A

| Subgrupo de A      | Reactividad* frente a: |                       |                     |        | Sustancias en saliva† | Suero Anti-A <sup>1</sup> | Frecuencia (%) |
|--------------------|------------------------|-----------------------|---------------------|--------|-----------------------|---------------------------|----------------|
|                    | Anti-A                 | Anti-A <sub>1</sub> B | Anti-A <sub>1</sub> | Anti-H |                       |                           |                |
| A <sub>1</sub>     | +++++                  | +++++                 | +++++               | 0      | A,H                   | No                        | ND             |
| A <sub>2</sub>     | +++++                  | +++++                 | 0                   | +++++  | A,H                   | A veces                   | ND             |
| A <sub>int</sub>   | +++++                  | +++++                 | ++(+)               | +++    | A,H                   | No                        | ND             |
| A <sub>3</sub>     | ++(+) <sup>mf</sup>    | ++(+) <sup>mf</sup>   | 0                   | +++++  | A,H                   |                           |                |
| A <sub>x</sub>     | 0/+                    | ++(+)                 | 0                   | +++++  | H                     |                           |                |
| A <sub>end</sub>   | +                      | +                     | 0                   | +++++  | H                     |                           |                |
| A <sub>m</sub>     | 0/+                    | 0/+                   | 0                   | +++++  | A,H                   |                           |                |
| A <sub>finn</sub>  | +                      | +                     | 0                   | +++++  | H                     |                           |                |
| A <sub>bantu</sub> | ++(+)                  | ++(+)                 | 0                   | +++++  | H                     |                           |                |
| A <sub>1ae</sub>   | 0 <sup>+</sup>         | 0                     | +++                 | +++++  | H                     |                           |                |
| A <sub>y</sub>     | 0 <sup>*</sup>         | 0                     | 0                   | +++++  | A,H                   |                           |                |
| A <sub>el</sub>    | 0 <sup>+</sup>         | 0                     | 0                   | +++++  | H                     |                           |                |



**Table 5.12: Number of blood group A determinants on erythrocytes from adults belonging to different A subgroups.**

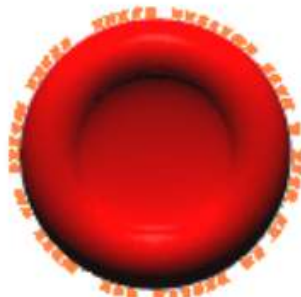
| Blood group      |                        | Number of A determinants |           |
|------------------|------------------------|--------------------------|-----------|
| A <sub>1</sub>   |                        | 810,000 –                | 1,170,000 |
| A <sub>2</sub>   |                        | 160,000 –                | 440,000   |
| A <sub>3</sub>   | average value          | 40,600 –                 | 118,000   |
|                  | agglutinated cells     | 98,700 –                 | 187,000   |
|                  | non-agglutinated cells | 21,300 –                 | 38,000    |
| A <sub>x</sub>   | average value          | 7,500 –                  | 10,500    |
|                  | agglutinated cells     | 10,800 –                 | 22,500    |
|                  | non-agglutinated cells | 7,300 –                  | 8,800     |
| A <sub>end</sub> | average value          | 2,100 –                  | 2,700     |
|                  | agglutinated cells     | 69,000 –                 | 137,000   |
|                  | non-agglutinated cells | 0                        |           |
| A <sub>m</sub>   |                        | 100 –                    | 1,900     |
| A <sub>el</sub>  |                        | 100 –                    | 1,400     |
| A <sub>y</sub>   |                        | 100 –                    | 1,900     |

## Densidad Antigénica en Subgrupos A



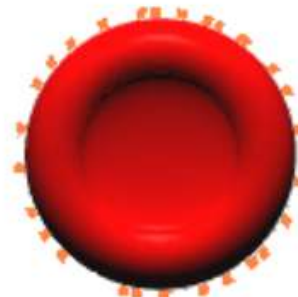
Eritrocito **A<sub>1</sub>**

800.000 - 900.000 Ags



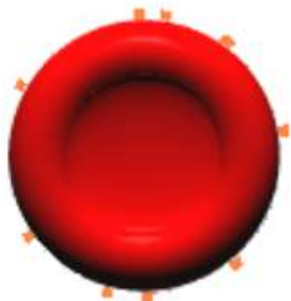
Eritrocito **A<sub>2</sub>**

160.000 - 440.000 Ags



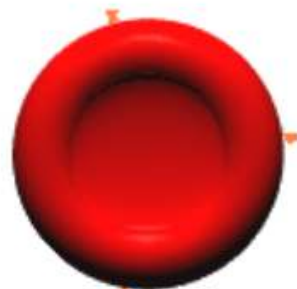
Eritrocito **A<sub>3</sub>**

35.000 - 100.000 Ags



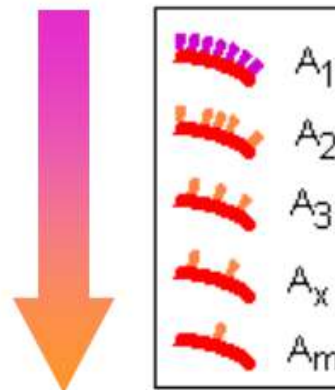
Eritrocito **A<sub>x</sub>**

1.400 - 10.300 Ags



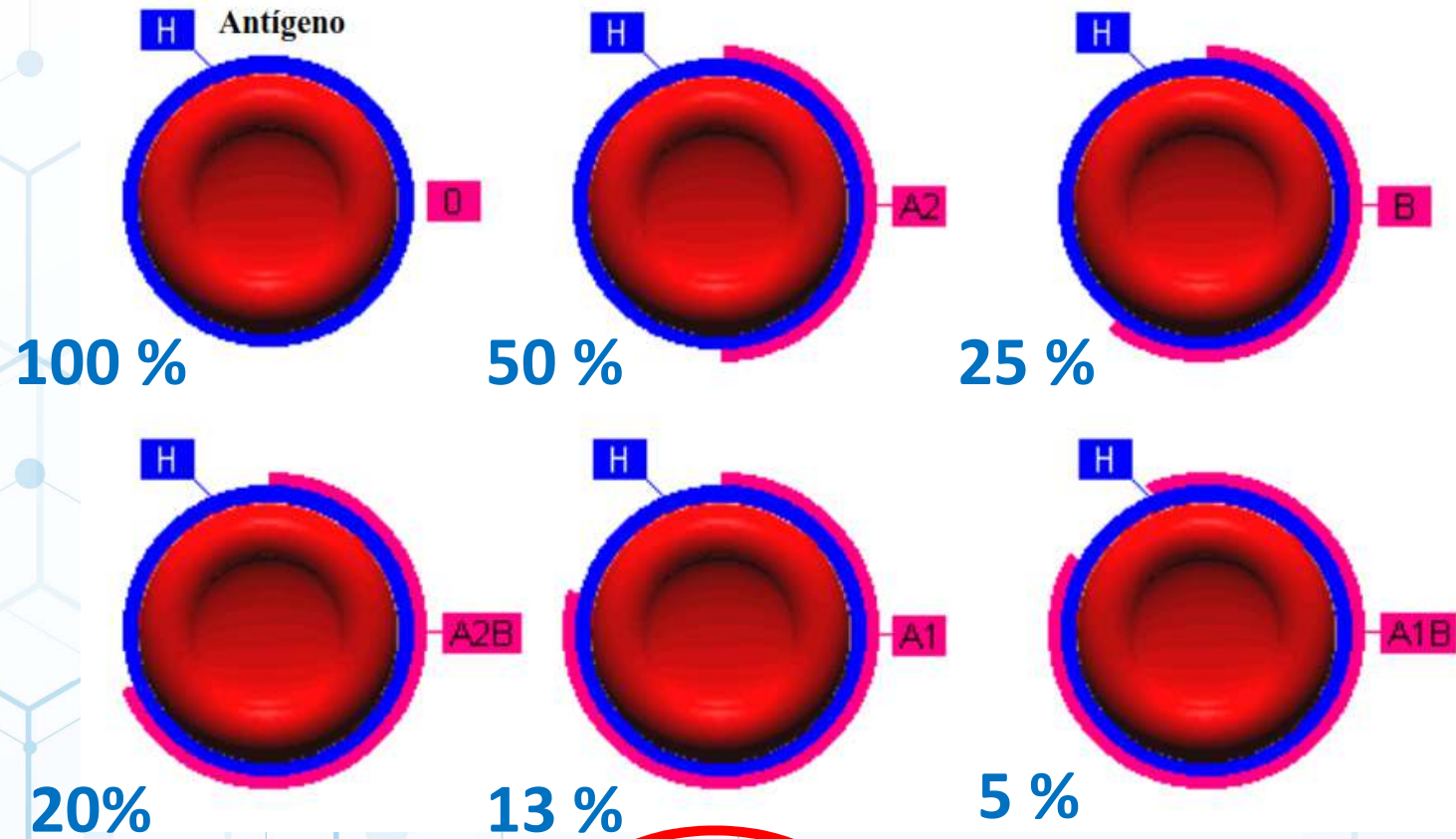
Eritrocito **A<sub>m</sub>**

200 - 1.090 Ags



| Sitios Antigénicos | Frecuencia (%) |
|--------------------|----------------|
| A1                 | 100            |
| A2                 | 24             |
| A3                 | 6,5            |
| Ax                 | 0,89           |
| Am                 | 0,089          |

## Cantidad expresada de Sustancia H según el Fenotipo ABO

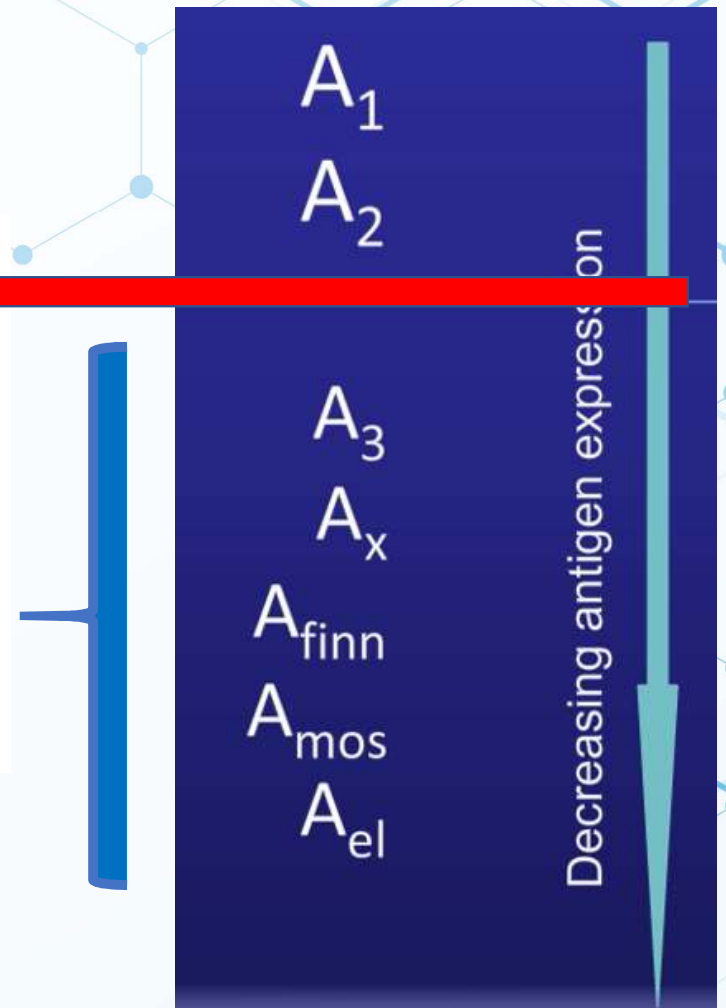


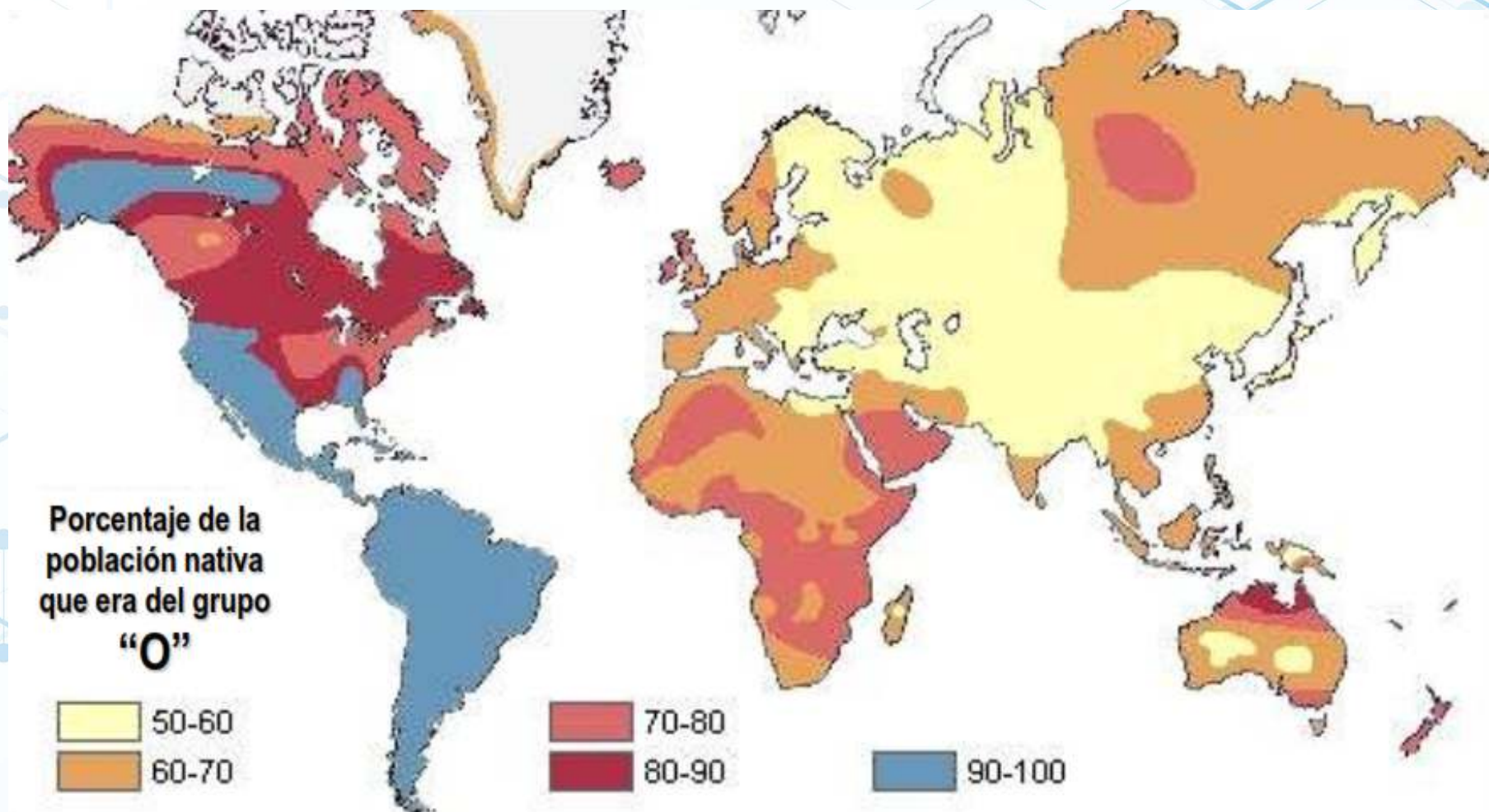
O > A<sub>2</sub> > A<sub>2</sub>B > B > A<sub>1</sub> > A<sub>1</sub>B

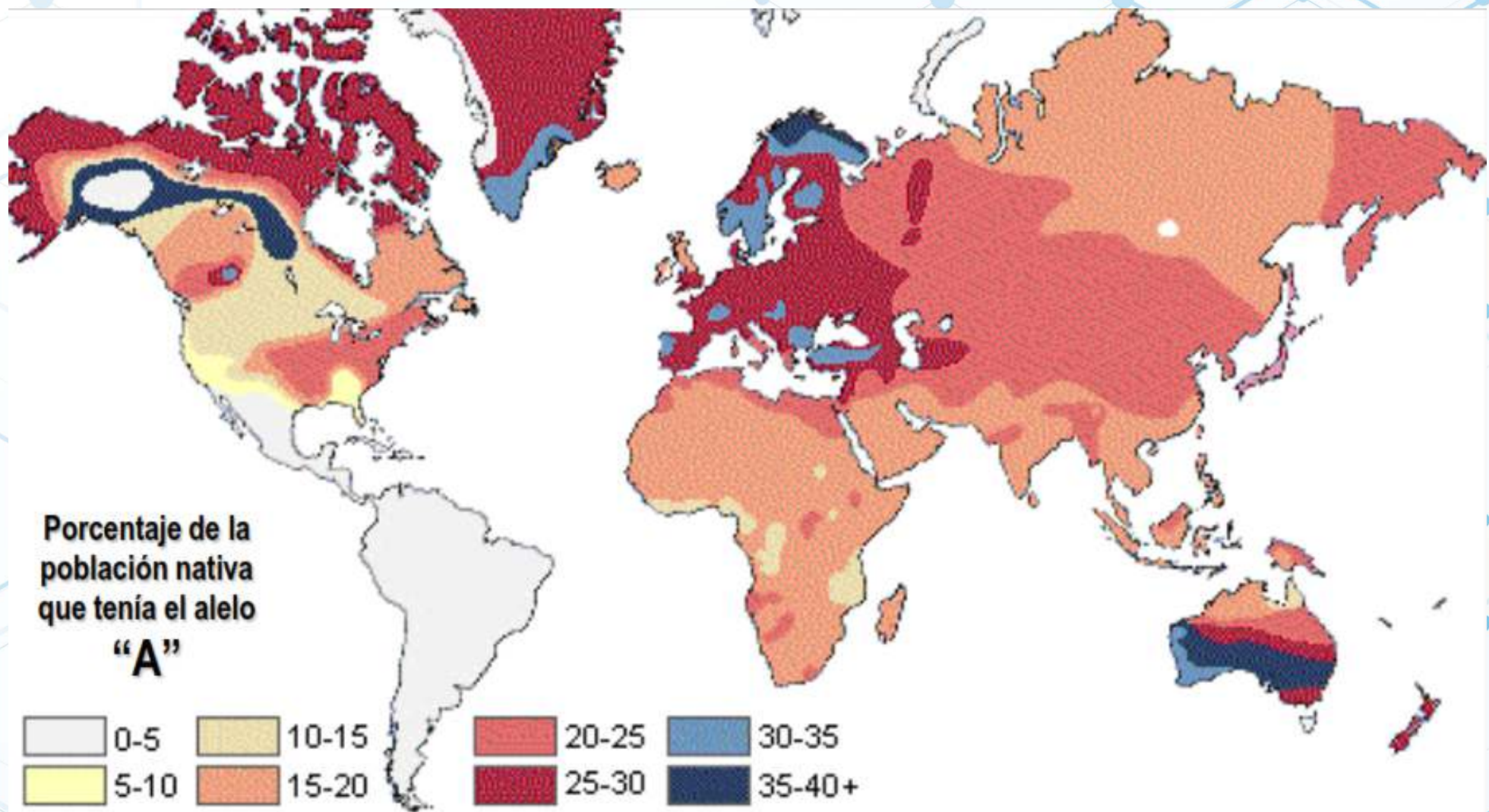


## Subgrupos A:

- Aproximadamente 80% individuos A/AB son  $A_1$ ;
- 19%  $A_2$ ,
- 1% otros subgrupos - A débiles
  - ( $A_3$ ,  $A_{int}$ ,  $A_{el}$ ,  $A_m$ ,  $A_x$ ,  $A_y$ , etc)
  - » (Molisson, 1992).

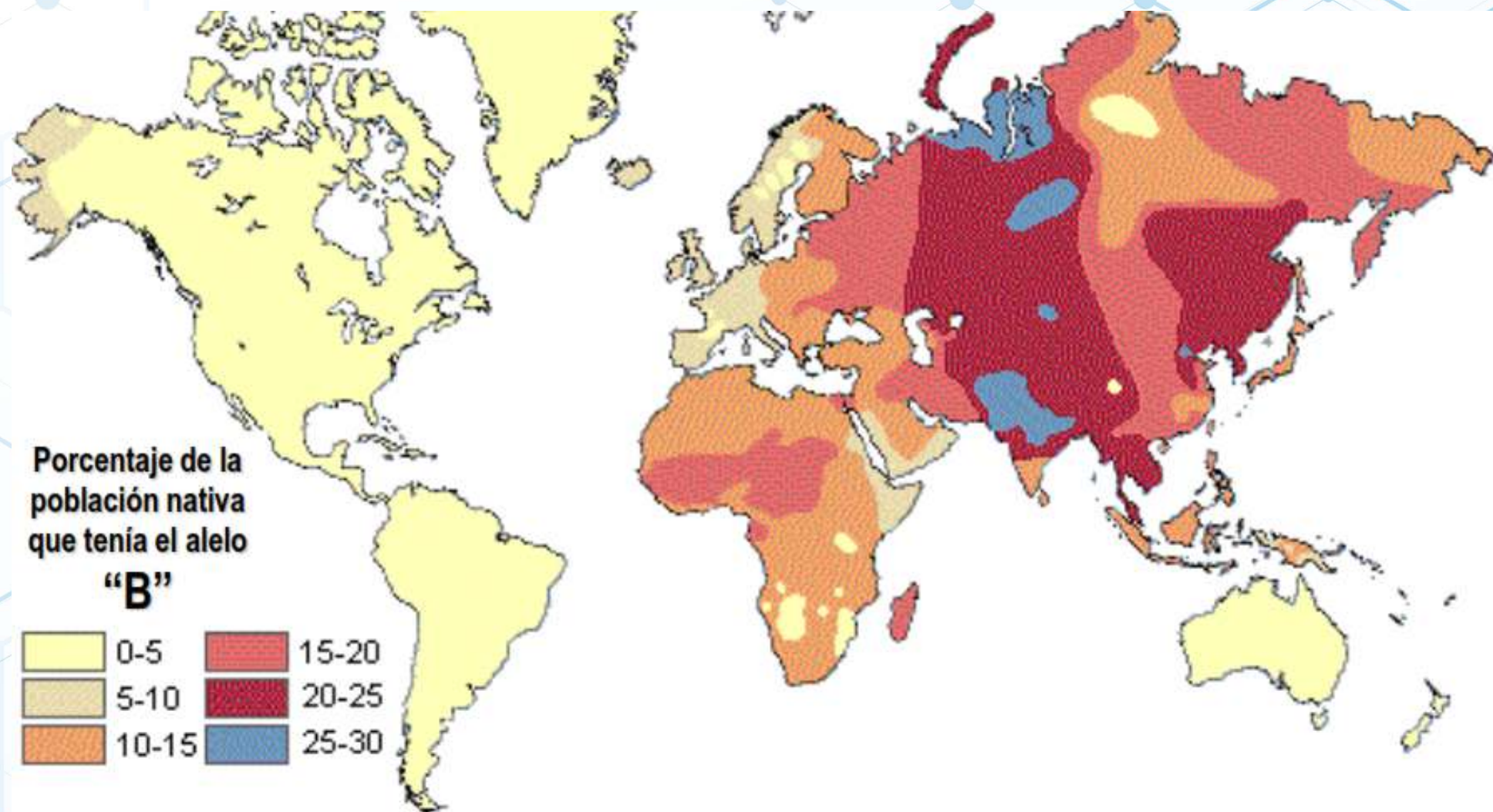
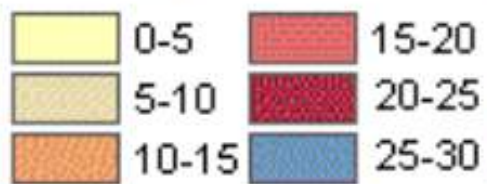






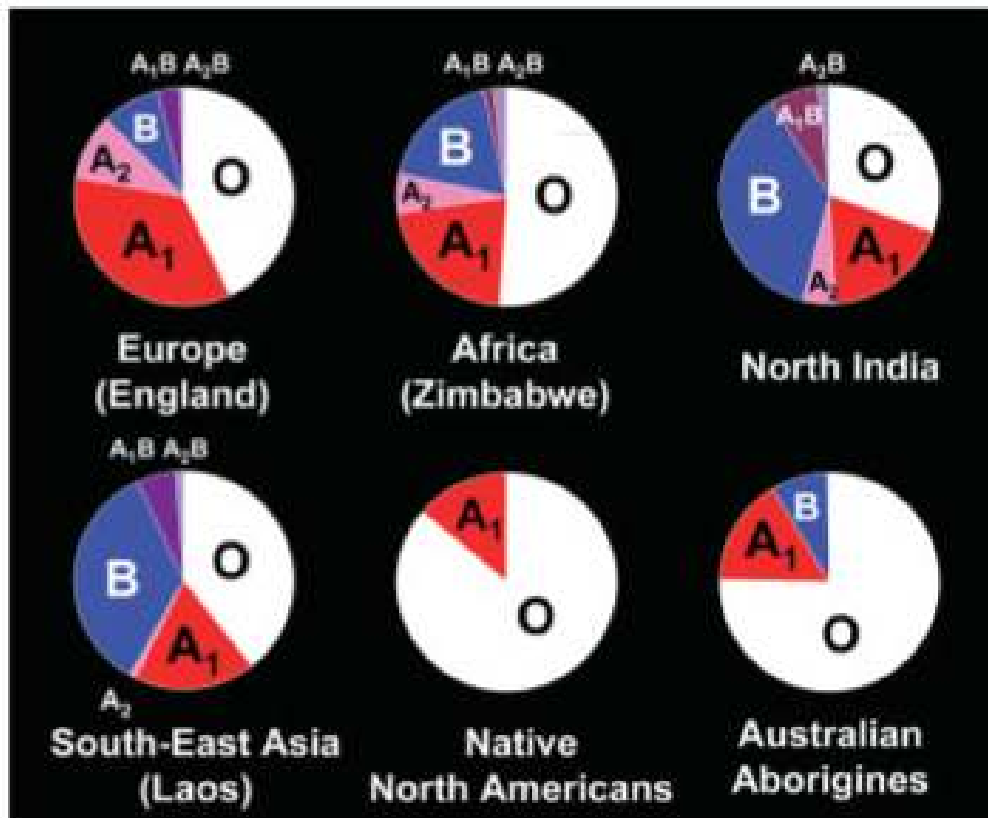


Porcentaje de la  
población nativa  
que tenía el alelo  
"B"





# Sistema Sanguíneo ABO



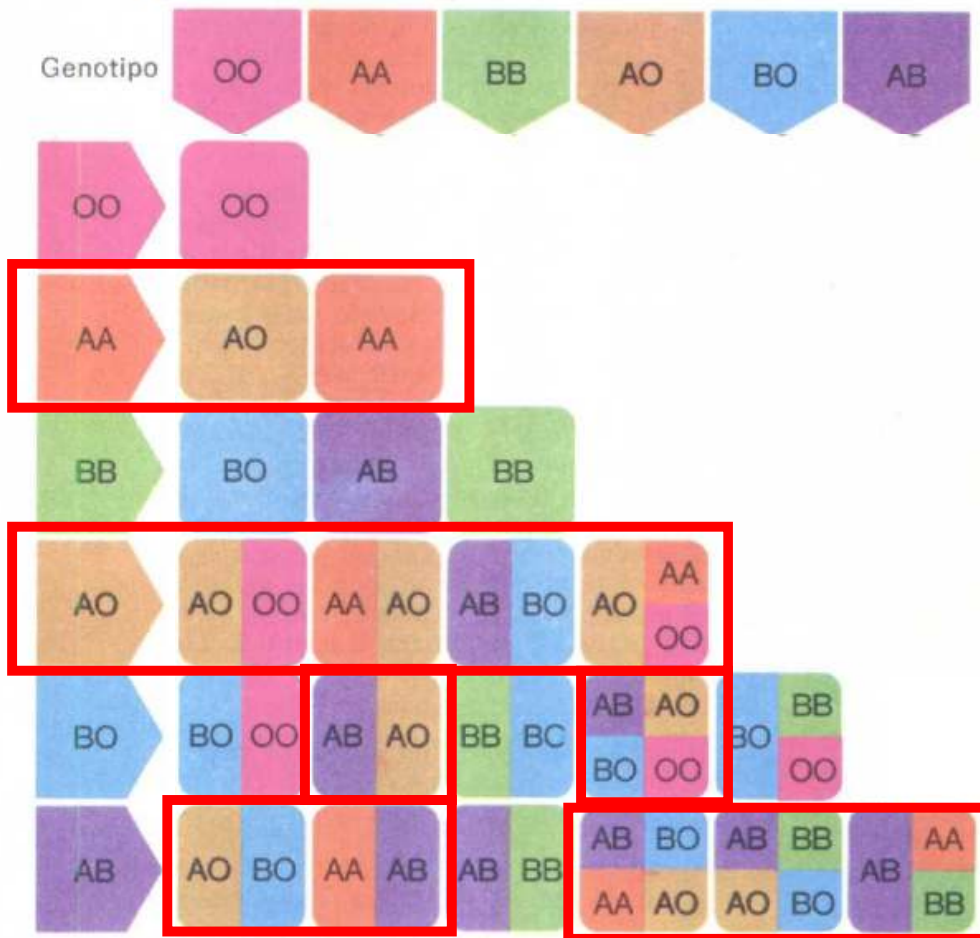
## Centro de Sangre Valparaíso

| Grupo ABO | Frecuencia (%) |
|-----------|----------------|
| O         | 61,11          |
| A         | 27,79          |
| B         | 9,07           |
| AB        | 2,01           |



INFORME DE RESULTADOS DEL ESTUDIO DE  
INDICADORES INMUNOHEMATOLÓGICOS EN  
POBLACIÓN CHILENA. Año 2015

## Posibles Genotipos ABO según cómo se forman las parejas



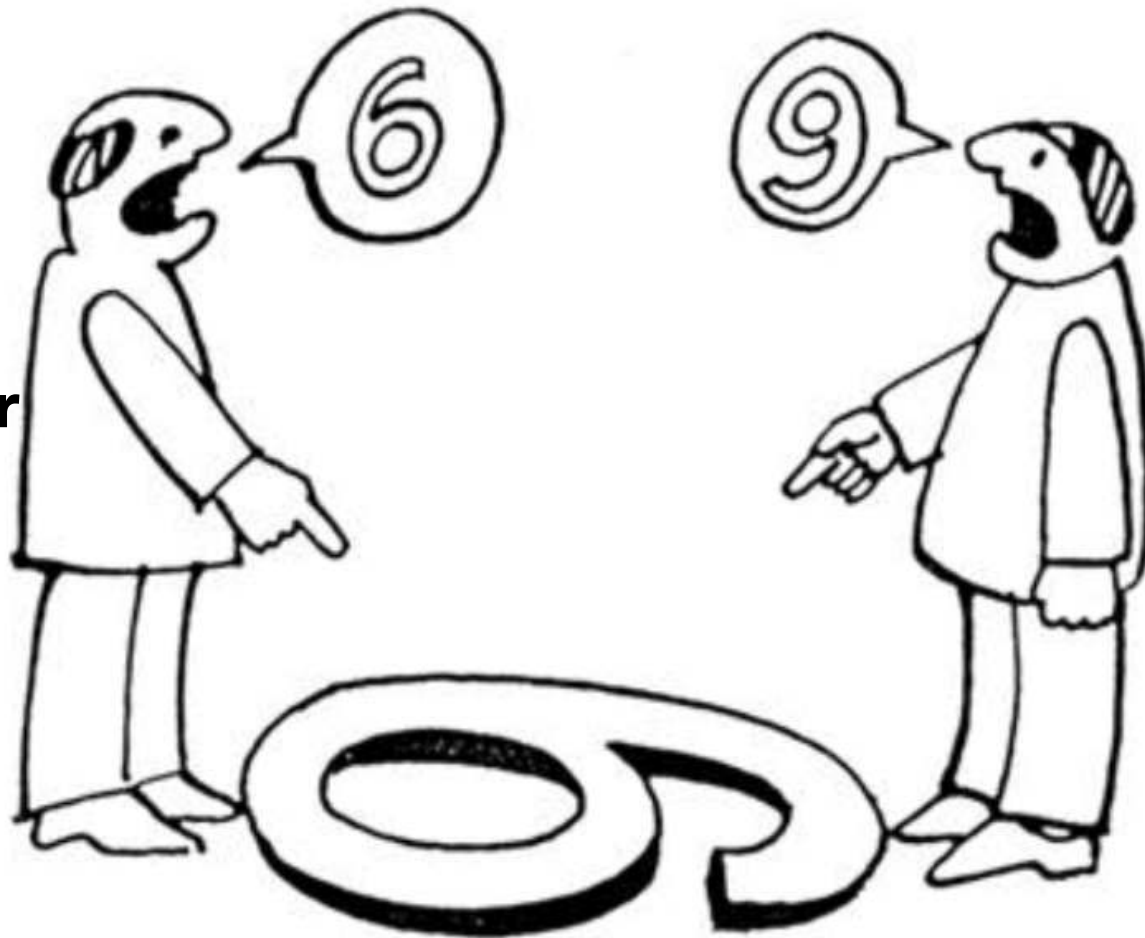
**Tabla 10.** Fenotipos débiles de A

| Subgrupo de A      | Reactividad* frente a: |                     |                   |        | Sustancias en saliva† | Suero Anti-A <sup>1</sup> | Frecuencia (%) |
|--------------------|------------------------|---------------------|-------------------|--------|-----------------------|---------------------------|----------------|
|                    | Anti-A                 | Anti-A,B            | Anti-A1           | Anti-H |                       |                           |                |
| A <sub>1</sub>     | +++++                  | +++++               | +++++             | 0      | A,H                   | No                        | ND             |
| A <sub>2</sub>     | +++++                  | +++++               | 0                 | +++++  | A,H                   | A veces                   | ND             |
| A <sub>int</sub>   | +++++                  | +++++               | ++(+)             | +++    | A,H                   | No                        | ND             |
| A <sub>3</sub>     | ++(+) <sup>mf</sup>    | ++(+) <sup>mf</sup> | 0                 | +++++  | A,H                   | A veces                   | 0.01           |
| A <sub>x</sub>     | 0/+                    | ++(+)               | 0                 | +++++  | H                     | A menudo                  | 0.03           |
| A <sub>end</sub>   | +                      | +                   | 0                 | +++++  | H                     | A veces                   | 0.003          |
| A <sub>m</sub>     | 0/+                    | 0/+                 | 0                 | +++++  | A,H                   | No                        | 0.0007         |
| A <sub>finn</sub>  | +                      | +                   | 0                 | +++++  | H                     | Sí                        | ND             |
| A <sub>bantu</sub> | ++(+)                  | ++(+)               | 0                 | +++++  | H                     | Sí                        | ND             |
| A <sub>1ae</sub>   | 0 <sup>+</sup>         | 0                   | +++ <sup>**</sup> | +++++  | H                     | Sí <sup>***</sup>         | ND             |
| A <sub>y</sub>     | 0 <sup>*</sup>         | 0                   | 0                 | +++++  | A,H                   | No                        | ND             |
| A <sub>el</sub>    | 0 <sup>+</sup>         | 0                   | 0                 | +++++  | H                     | A veces                   | ND             |



## Discrepancias ABO

**Prueba Celular  
o Hemática**



**Prueba Sérica**

**Sexto sentido???**



**Veo Glóbulos Extra!!!  
Veo Anticuerpos  
Extra!!!**

# Discrepancias ABO

**Grupo I**

**Grupo II**

**Grupo III**

**Grupo IV**

**Grupo Sérico**

**Grupo Celular**

**Anormalidades proteicas o de plasma**

**Problemas diversos**



# Discrepancias ABO

## Grupo II

## Grupo Celular

- I. Subgrupos de A o B
- II. **Enfermedades Oncológicas que pueden debilitar a un antígeno A o B (Leucemia)**
- III. Fenotipo Adquirido
- IV. **Transfusión de Grupo Diferente o Transplante de CMH con diferencias de ABO**
- V. Neutralización de reactivo anti-A y/o anti-B por altas concentraciones de sustancias solubles de A o B en Suero ( RBC suspendidos en Suero o Plasma)
- VI. **Quimerismo en Gemelos fraternales, Mosaicismo derivado de Polispermia**

## Resolución de Grupo II de discrepancias

- a.** Las reacciones débiles con antisueros pueden ser resueltas mejorando la reacción del antígeno con su antisuero respectivo con incubación de la prueba a temperatura ambiente durante 15-30 minutos.
- b.** Subgrupos que causan discrepancias de grupo pueden resolverse mediante estudios de elución – adsorción.
- c.** El fenómeno de B adquirido puede resolverse mediante una disminución del PH del antisuero monoclonal. El Anti B en el suero de la persona B adquirido no aglutina con glóbulos rojos autólogos (autocontrol negativo).  
El estado secretor de una persona puede resolver el B adquirido, la saliva de una persona B adquirido contiene sustancia A y no sustancia B. El suero de una persona B adquirido contiene sustancia A.
- d.** Alta concentración de sustancia A o sustancia B causante de discrepancias de grupo puede resolverse mediante el lavado de los glóbulos rojos con solución salina.

| Anticuerpo             | Clon                          |
|------------------------|-------------------------------|
| Anti-A<br>(Anti-ABO1)  | 16243 G2 +<br>16247 E6        |
| Anti-B<br>(Anti-ABO2)  | 9621 A8                       |
| Anti-AB<br>(Anti-ABO3) | 16245F11D8+16247E6+<br>7821D8 |

| Título <sup>5</sup><br>(Fenotipo RBCs) | Variantes detectadas                               |
|----------------------------------------|----------------------------------------------------|
| 1:1024<br>(RBCs A1)                    | A1, A2, A3, Ax, Aw, Abantu, Ah, Amos, Afiin, cisAB |

- "DiaClon Anti-A" [línea celular A5]
- "DiaClon Anti-B" [línea celular G $\frac{1}{2}$ ]
- "DiaClon Anti-AB" [línea celular Birma-1, ES-4, ES 131 (ES-15)]

Columna 1: Reactivo de determinación del grupo sanguíneo Anti-A (Anti-ABO1)

Columna 2: Reactivo de determinación del grupo sanguíneo Anti-B (Anti-ABO2)

Mezcla de anticuerpos monoclonales Anti-A (IgM) de ratón (clones MHO4 y 3D3)

Anti-A FD&C azul N° 1

Mezcla de anticuerpos monoclonales Anti-B (IgM) de ratón (clones NB10.5A5 y NB1.19)

Anti-B FD&C amarillo N° 5

El **reactivo anti-A (Anti-ABO1)** puede detectar la mayoría de ejemplos de subgrupos débiles del antígeno A (como A<sub>2</sub>, A<sub>3</sub> y A<sub>x</sub>) y puede detectar el antígeno A previamente no reconocido en un pequeño porcentaje de los sujetos del grupo B, conocidos como B(A).<sup>5</sup> Este reactivo no reacciona con las células poliaglutinables Tn.



## Detección de Fenotipo Aw en el Centro de Sangre Valparaíso, presentación de un caso de discrepancia ABO.

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<sup>1</sup> Sección Inmunohematología del Centro de Sangre Valparaíso,

<sup>2</sup> Sección Inmunohematología Instituto de Salud Pública de Chile.

**O**

**A**

| Prueba Celular |        |          |        |         |      | Prueba Sérica |       |
|----------------|--------|----------|--------|---------|------|---------------|-------|
| anti-A         | anti-B | anti-A,B | anti-D | anti-D' | Ctl. | GR. A1        | GR. B |
| 0              | 0      | 0        | 4+     | 4+      | 0    | 0             | 4+    |

Anti-A (Mezcla de anticuerpos IgM monoclonales/murino, clones 16243 G2 y 16247 E6)

Anti-B (Anticuerpo monoclonal IgM origen murino, clon 9621 A8)

Anti-A,B (Mezcla de anticuerpos IgM origen murino, clones 16245 F11 D8; 16247 E6 y 7821 D9)

Anti-D (Anticuerpos IgM origen murino, clon P3x61)

Anti-D' (Mezcla de anticuerpos IgG/IgM origen humano, clones P3x290, P3x35, P3x61 y P3x21223 B10)



|                              |                 |
|------------------------------|-----------------|
| Anti-A (Clon BIRMA-1)        | : Negativo.     |
| Anti-B (Clon LB-2)           | : Negativo.     |
| Anti-A,B (Clones ES-4/ES-15) | : Positivo (2+) |
| Anti-A1                      | : Negativo.     |
| Anti-H                       | : Positivo (4+) |

Se solicita nueva muestra y se vuelve analizar Grupo ABO/RhD, obteniendo los siguientes resultados:

| Prueba Celular |        |          |        |         |      | Prueba Sérica |       |
|----------------|--------|----------|--------|---------|------|---------------|-------|
| anti-A         | anti-B | anti-A,B | anti-D | anti-D' | Ctl. | GR. A1        | GR. B |
| 0              | 0      | 0        | 4+     | 4+      | 0    | 1+            | 4+    |

**O Rhd positivo (Automatizado)**



CLINICAL AND  
LABORATORY  
STANDARDS  
INSTITUTE®

December 2009

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# I/LA33-A

Validation of Automated Systems for  
Immunohematological Testing Before  
Implementation; Approved Guideline

| ABO TYPE |     |            |     |
|----------|-----|------------|-----|
| 1        | 2   | 3          | 4   |
| POS      | POS | <b>NEG</b> | POS |

Genotipo ABO\*O

| ABO TYPE variant |     |            |     |          |
|------------------|-----|------------|-----|----------|
| 1                | 2   | 3          | 4   | 5        |
| POS              | POS | <b>NEG</b> | POS | <b>M</b> |

| ABO TYPE variant (BAG) |            |            |     |
|------------------------|------------|------------|-----|
| 11                     | 12         | 13         | 14  |
| POS                    | <b>NEG</b> | <b>NEG</b> | POS |

| ABO TYPE variant (BAG HealthCare) Tabla 1 |     |            |     |            |     |            |     |            |            |
|-------------------------------------------|-----|------------|-----|------------|-----|------------|-----|------------|------------|
| 1                                         | 2   | 3          | 4   | 5          | 6   | 7          | 8   | 9          | 10         |
| POS                                       | POS | <b>NEG</b> | POS | <b>NEG</b> | POS | <b>NEG</b> | POS | <b>NEG</b> | <b>NEG</b> |

| ABO TYPE variant (BAGHealth Care) Tabla 2 (Continuación) |            |            |     |                    |            |            |            |
|----------------------------------------------------------|------------|------------|-----|--------------------|------------|------------|------------|
| 11                                                       | 12         | 13         | 14  | 15                 | 16         | 17         | 18         |
| POS                                                      | <b>NEG</b> | <b>NEG</b> | POS | <b>NEG</b>         | <b>NEG</b> | <b>NEG</b> | <b>NEG</b> |
| Genotipo O <sup>1</sup> /A <sup>w</sup>                  |            |            |     | <b>Fenotipo Aw</b> |            |            |            |

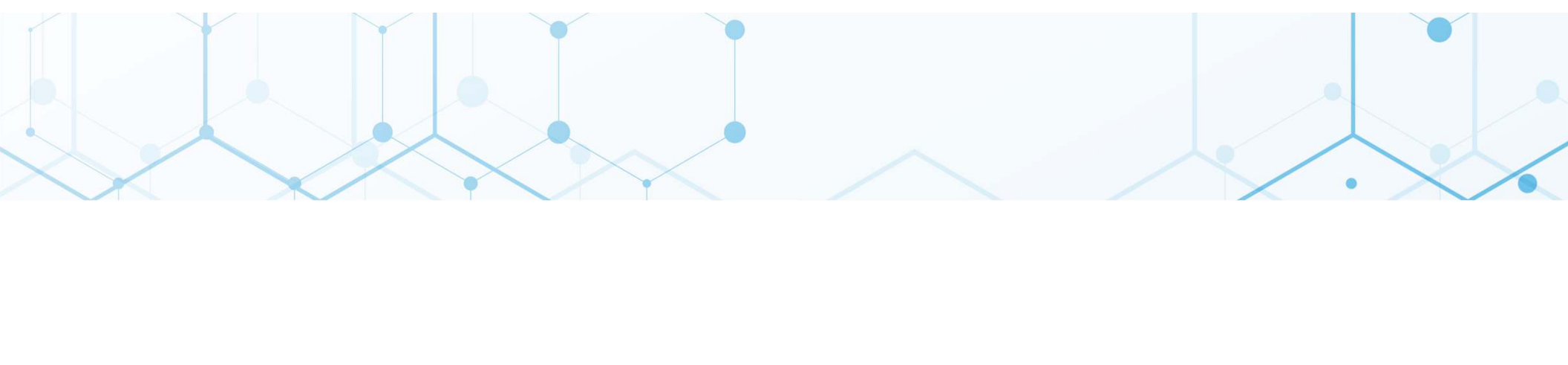


## CASE REPORT

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# Acute hemolytic transfusion reaction due to a warm reactive anti-A<sub>1</sub>

*Floris Helmich,<sup>1</sup> Inge Baas,<sup>2</sup> Peter Ligthart,<sup>3</sup> Milou Bosch,<sup>4</sup> Femke Jonkers,<sup>4</sup> Masja de Haas,<sup>3,5</sup> and Fedde van der Graaf<sup>‡</sup>*





## Policy for patients with an anti-A<sub>1</sub>

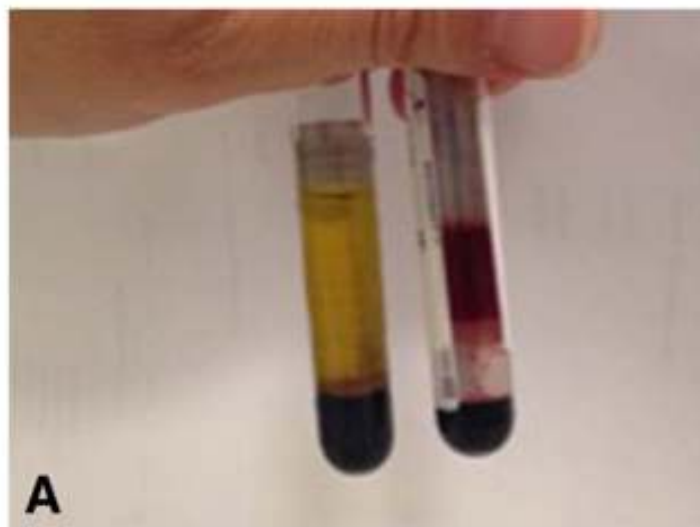
In case an anti-A<sub>1</sub> is found, the Dutch transfusion guideline advises to test its reactivity at 37°C.<sup>3</sup> If reactivity is possible at this temperature, RBCs of blood group A may be selected after a negative crossmatch in the indirect antiglobulin test (IAT).

**TABLE 1. Biochemical variables measured 1 day before transfusion and after transfusion of the 4 units of RBCs\***

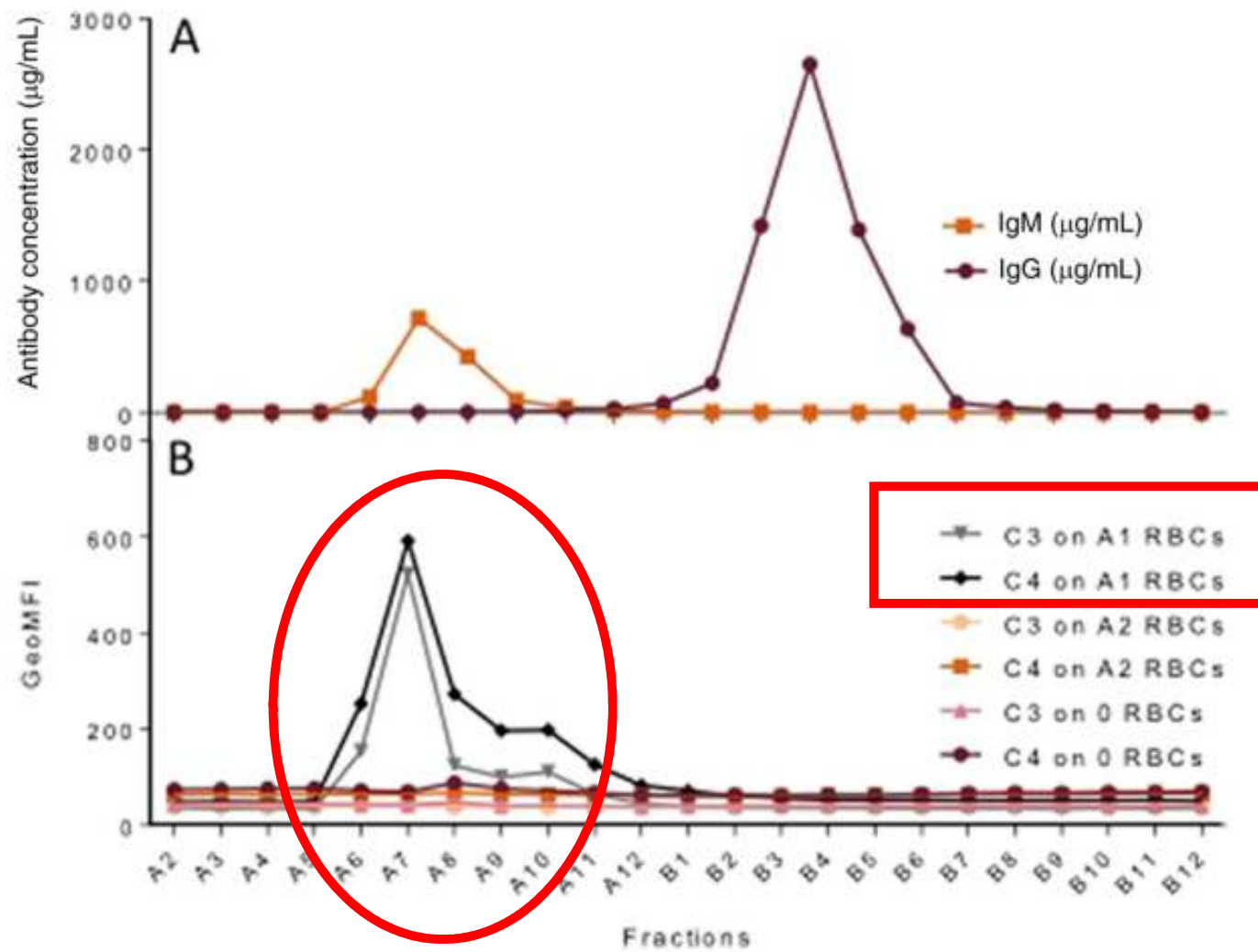
| Test            | Reference | Unit   | 1 DB | 10:34                     | 12:10                      | 14:30 | 15:49      | 16:09 | 20:57                                           | 22:57 | 1:11                                            | 2:46         |
|-----------------|-----------|--------|------|---------------------------|----------------------------|-------|------------|-------|-------------------------------------------------|-------|-------------------------------------------------|--------------|
| Hb              | 12.1-16.1 | g/dL   | 6.4  | Transfusion 1:            | Transfusion 2:             | 7.4   | NA         | 7.4   | Transfusion 3:                                  | ND    | Transfusion 4:                                  | NA           |
| Free Hb         | NA        | mg/dL  | 0.01 | A <sub>1</sub> R0r, 50 mL | A <sub>1</sub> R1r, 150 mL | 0.54  | 0.47       | 0.51  | O R <sub>1</sub> R <sub>1</sub> , 280 mL (100%) | 0.23  | O R <sub>1</sub> R <sub>1</sub> , 280 mL (100%) | 0.35         |
| Na              | 135-145   | mmol/L | 137  | (20%)                     | (55%)                      | 136   | INR sample | 135   |                                                 | 136   |                                                 | Urine sample |
| K               | 3.5-5.0   | mmol/L | 3.6  |                           |                            | 4.0   |            | 4.2   |                                                 | 5.1   |                                                 |              |
| Creatinine      | 0.55-1.02 | mg/dL  | 0.90 |                           |                            | 0.92  |            | 1.31  |                                                 | 1.65  |                                                 |              |
| Urea            | 7.0-17.9  | mg/dL  | 20.2 |                           |                            | 21.0  |            | 21.0  |                                                 | 24.4  |                                                 |              |
| Bilirubin total | <1.00     | mg/dL  | 0.53 |                           |                            | 2.56  |            | 2.87  |                                                 | 4.47  |                                                 |              |
| LDH             | <247      | U/L    | 152  |                           |                            | 1386  |            | 1327  |                                                 | 1563  |                                                 |              |
| Haptoglobin     | 37-221    | mg/dL  | 150  |                           |                            | 91    |            | 85    |                                                 | 38    |                                                 |              |
| C3              | 90-180    | mg/dL  | 62   |                           |                            | ND    |            | ND    |                                                 | 40    |                                                 |              |
| C4              | 10-40     | mg/dL  | 18   |                           |                            | ND    |            | ND    |                                                 | 15    |                                                 |              |

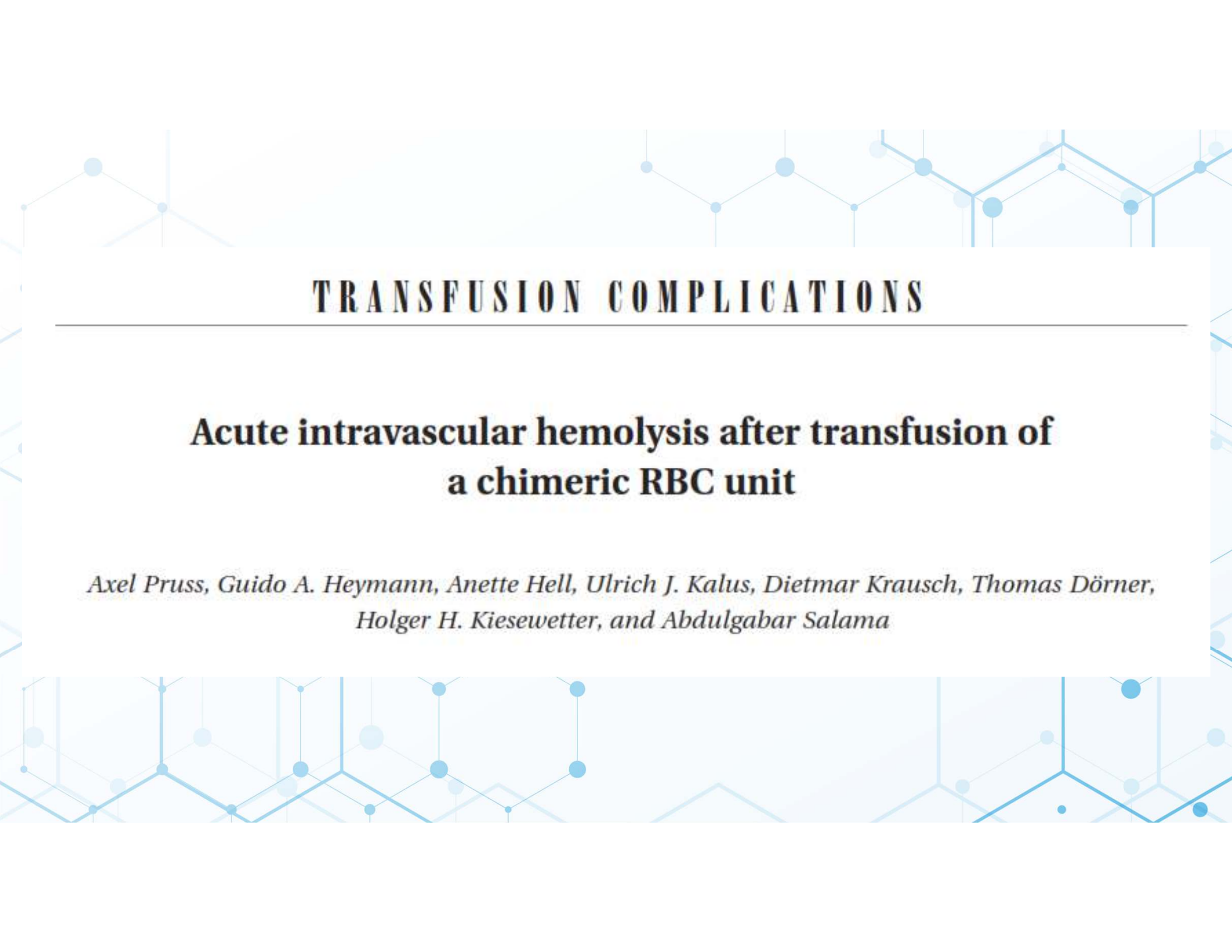
\* In all samples reticulocytes were not determined.

DB = day before admission; NA = not applicable; ND = not determined.



**Fig. 1.** Heparin plasma before and after transfusion (A) and urine after transfusion (B). [Color figure can be viewed at [wiley-onlinelibrary.com](http://wiley-onlinelibrary.com)]





# TRANSFUSION COMPLICATIONS

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## **Acute intravascular hemolysis after transfusion of a chimeric RBC unit**

*Axel Pruss, Guido A. Heymann, Anette Hell, Ulrich J. Kalus, Dietmar Krausch, Thomas Dörner,  
Holger H. Kieseewetter, and Abdulgabar Salama*



**TABLE 1. Results of serologic re-examination\***

| Test                    | Patient                   | Transfused RBC units |                      |
|-------------------------|---------------------------|----------------------|----------------------|
|                         |                           | 1                    | 2                    |
| ABO                     | O                         | O                    | O (B)<br>mix field   |
| Rh (D)                  | D+                        | D+                   | D- (D+)<br>mix field |
| anti-A                  | ++++                      | NT                   | NT                   |
| anti-B (isoagglutinins) | ++++<br>(anti-B-titer: 4) | NT                   | NT                   |
| Antibody screening      | -                         | NT                   | NT                   |
| DAT                     | C3d ++, IgG +             | NT                   | NT                   |
| Eluate                  | -                         | NT                   | NT                   |
| Crossmatch              | (+)                       |                      |                      |

\* Agglutination score: + + + + = very strong, + + + = strong, + + = moderate, + = weak, (+) = very weak, - = negative. NT = not tested.

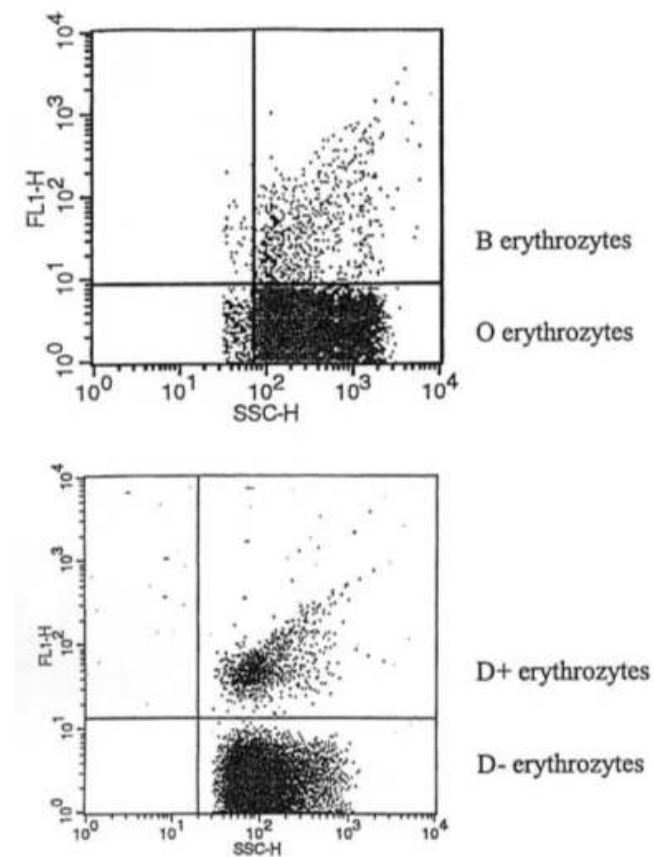
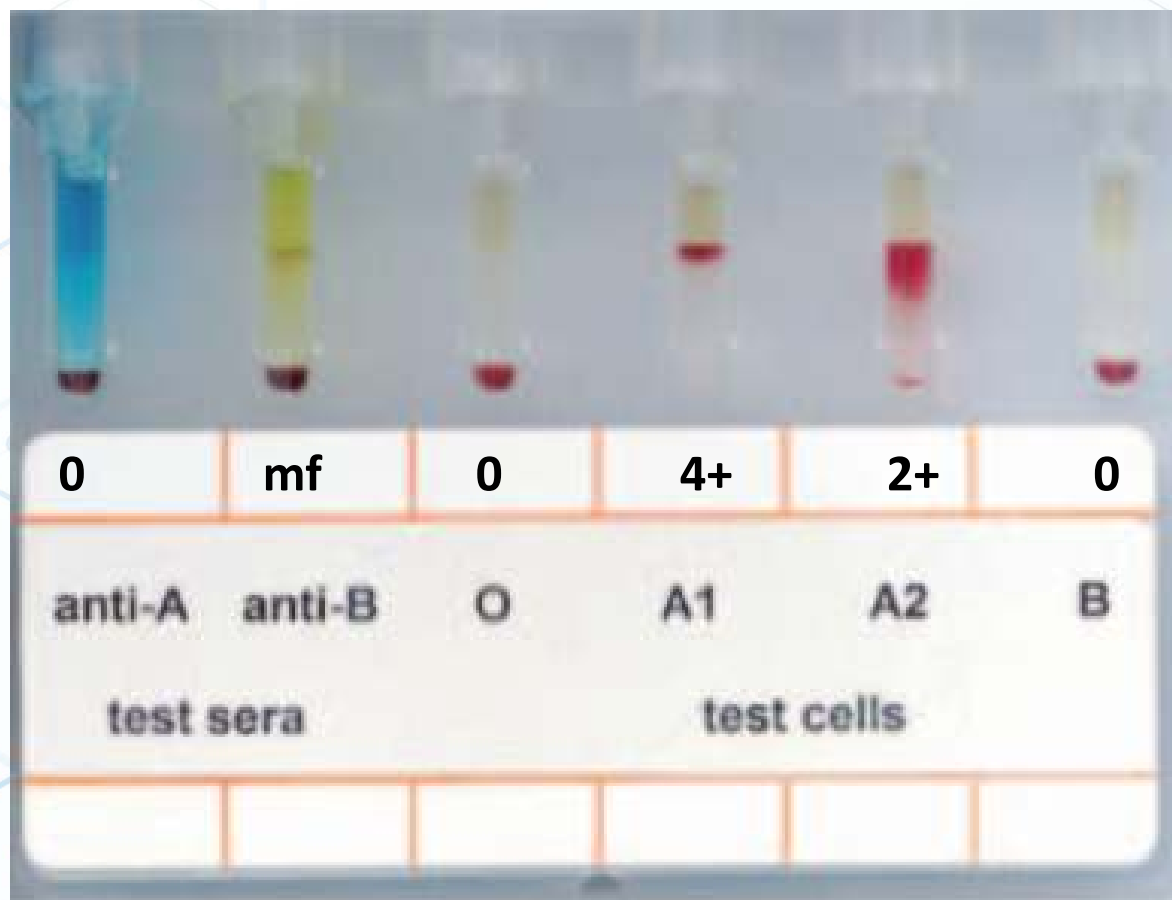


Fig. 2. ABO and D populations of the chimeric donor (FACS).

95% RBC Group O , 5% RBC Group B

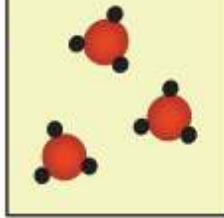
# Modifying the red cell surface: towards an ABO-universal blood supply

Martin L. Olsson<sup>1,2</sup> and Henrik Clausen<sup>3</sup>

*<sup>1</sup>Division of Haematology and Transfusion Medicine, Department of Laboratory Medicine, Lund University and University Hospital Blood Centre, Lund, Sweden, <sup>2</sup>Department of Pathology, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, MA, USA, and <sup>3</sup>Department of Cellular and Molecular Medicine, University of Copenhagen, Copenhagen N, Denmark*

## 1. Pre-Wash

A, B or AB  
red cells



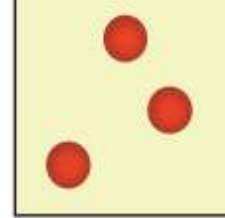
+ ECO-zyme

## 2. Convert

Multi-unit  
automated  
conversion  
device

Incubate at RT  
for 1 h

Functional  
ECO cells

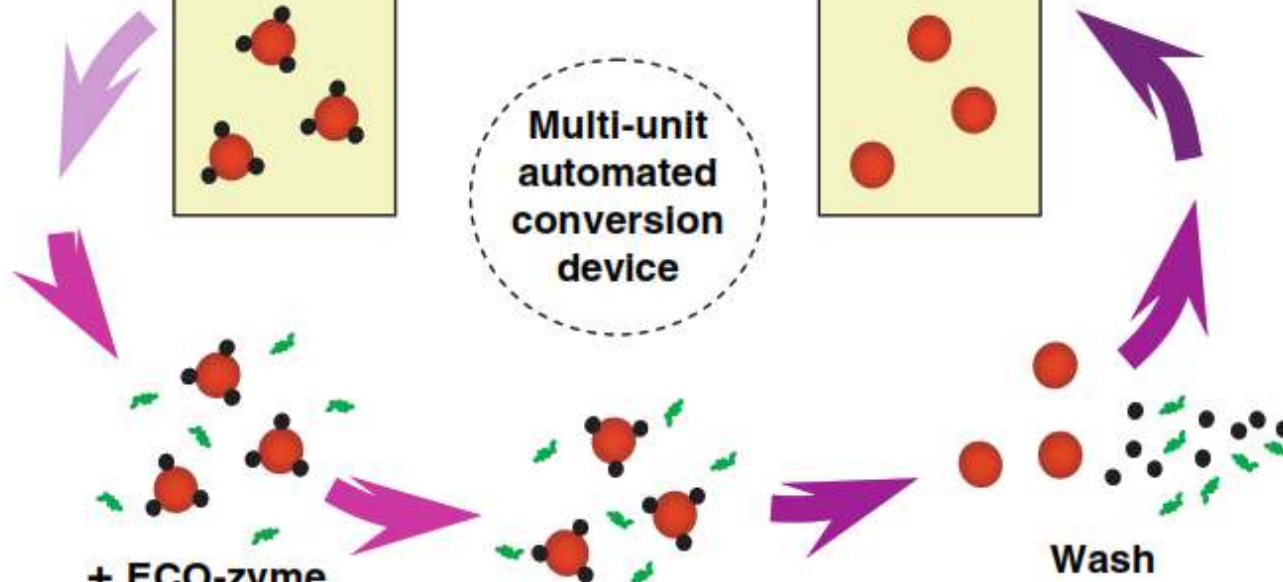


## 4. Re-suspend

-In additive solution  
of choice

Wash

## 3. Wash





Anti-A



Anti-B



RBC:

A<sub>1</sub>

A<sub>1</sub>-E

B

B-E

O

O-E



Sociedad  
Chilena de  
Hematología



# **Detección y Análisis Inmunohematológico de Subgrupos de A**

**Aplicando el Sexto Sentido**

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Tecnólogo Médico  
Centro de Sangre Valparaíso  
2019**