Rapid Blood Grouping
Using Lateral Flow Device with Stable End-Point without Centrifugation

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Prague, Czech Republic

Use of blood and blood products in disasters

Ramat Gan, Israel, November 24-25th, 2008

ÚHKT

Adverse Immunohaematological Effects of Blood Transfusion

- Immediate post-transfusion haemolytic reaction

  ...intravascular haemolysis

  ... main cause: ABO incompatibility

- Delayed post-transfusion haemolytic reaction

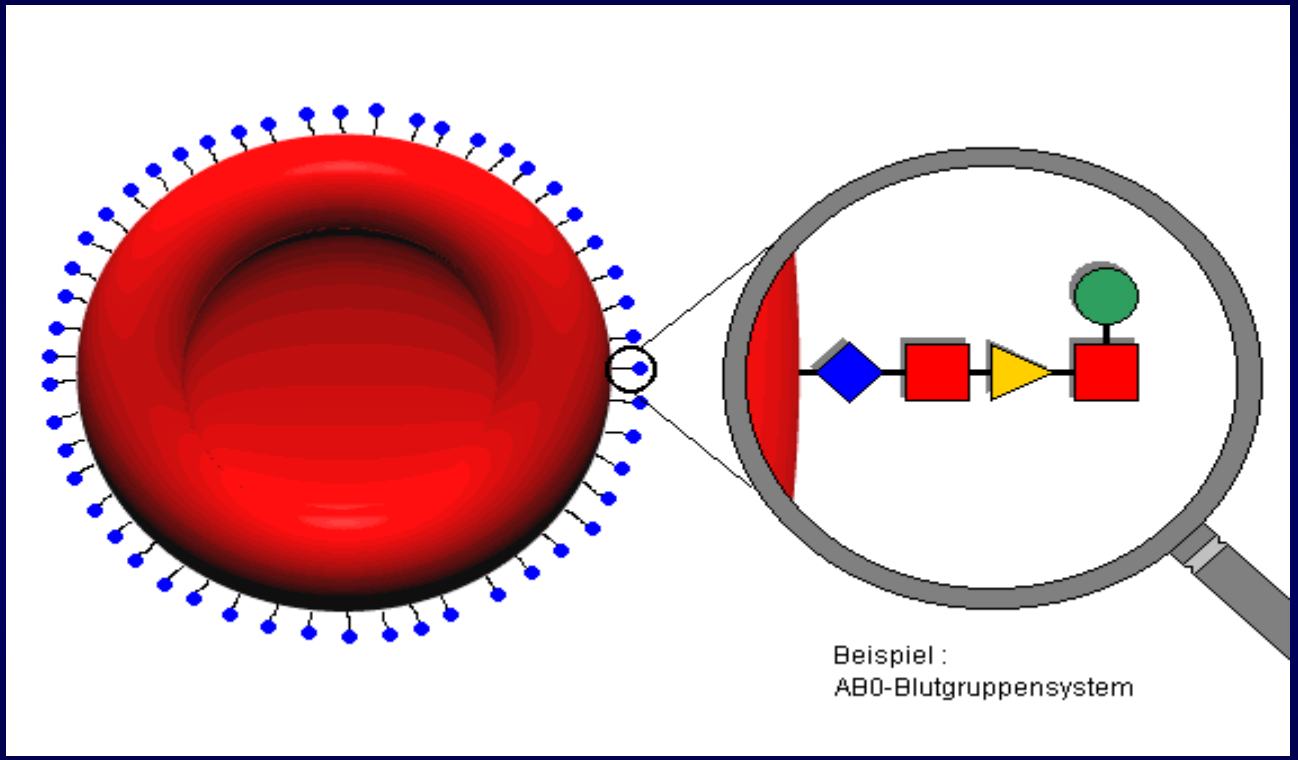
  ... extravascular haemolysis

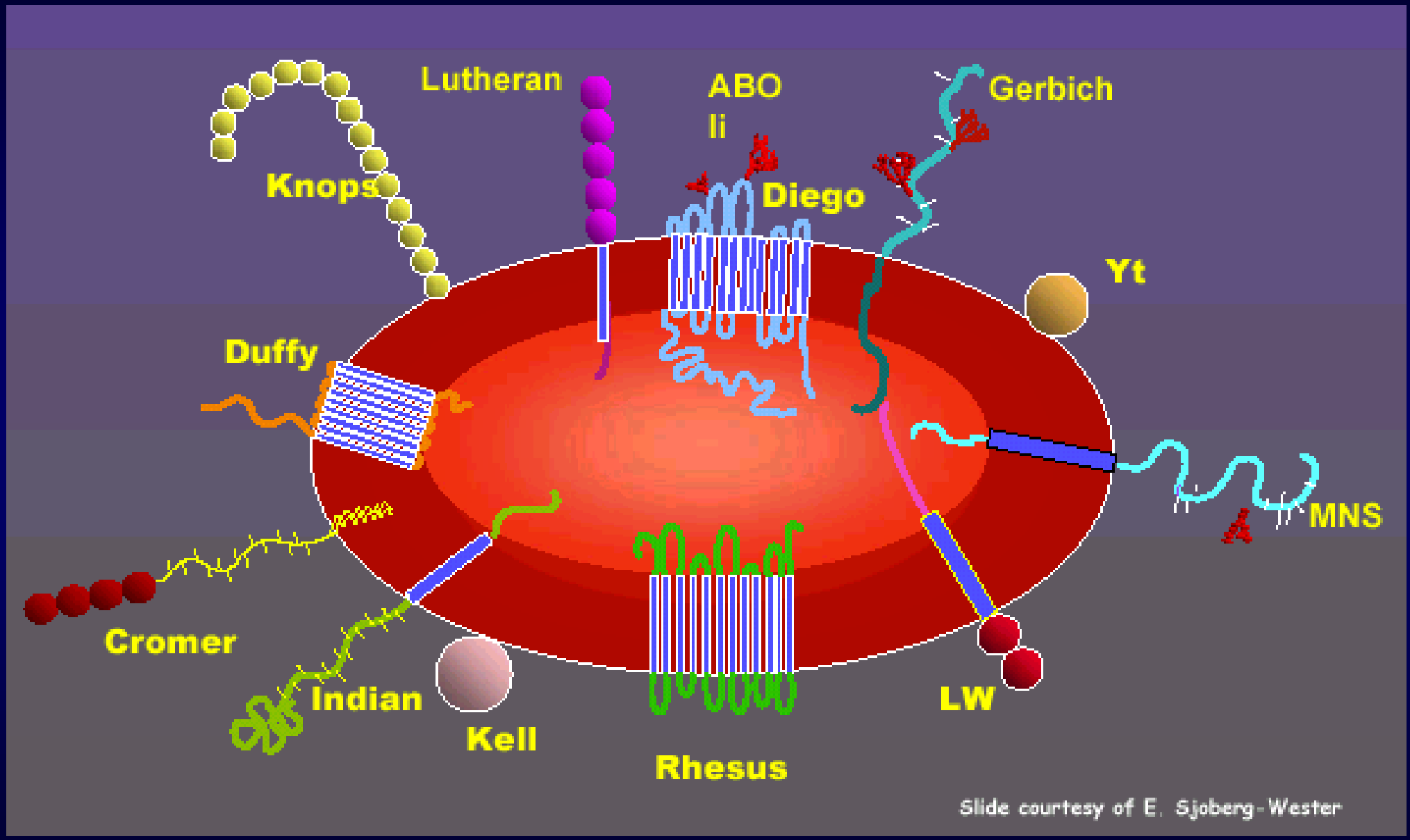
  ... main cause: alloantibodies to red cell antigens

- Alloimmunization to blood group antigens

… danger for next transfusions and pregnancies

Antigen




Lutheran
ABO
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Gerbich
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Indian
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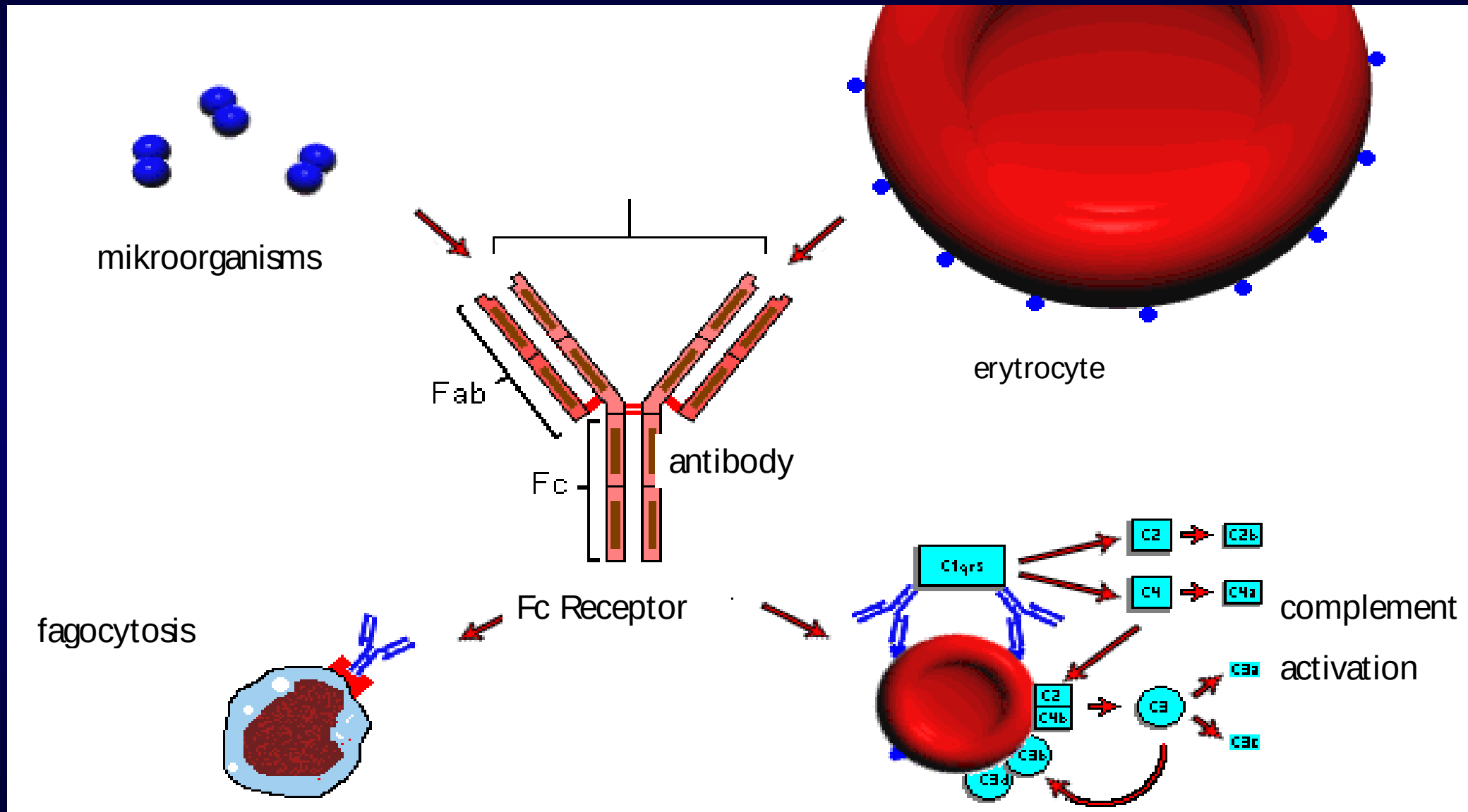
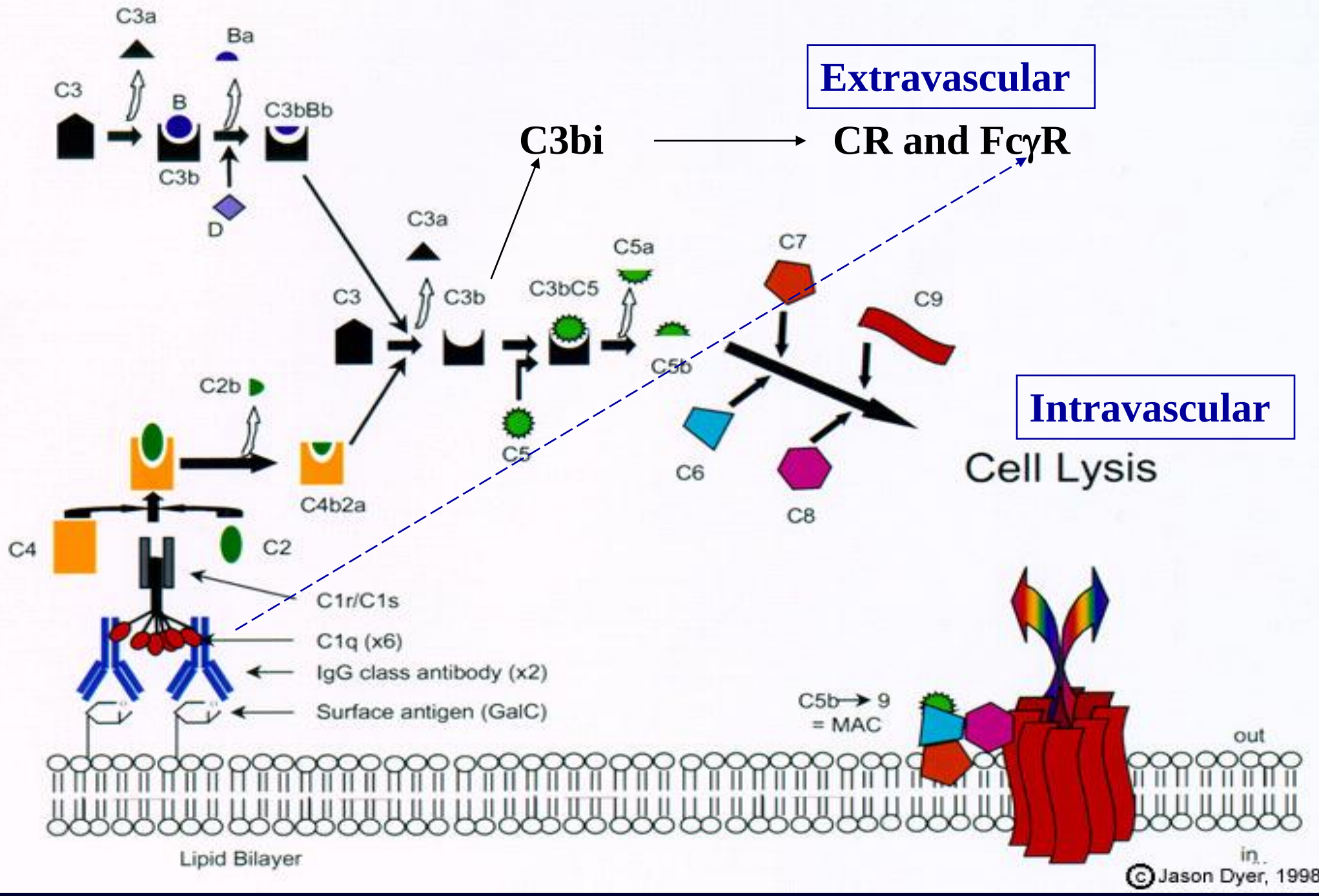
Rhesus
LW
Slide courtesy of E. Sjoberg-Wester

Antigen - Antibody interactions

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Extravascular
C3bi
CR and FcγR
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C5a
C7
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C3bC5
C9
C5b
C2b
C5
C6
C8
Cell Lysis
Intravascular
C4b2a
C4
C2
C1r/C1s
C1q (x6)
IgG class antibody (x2)
Surface antigen (GalC)
C5b→ 9
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out
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Lipid Bilayer
© Jason Dyer, 1998


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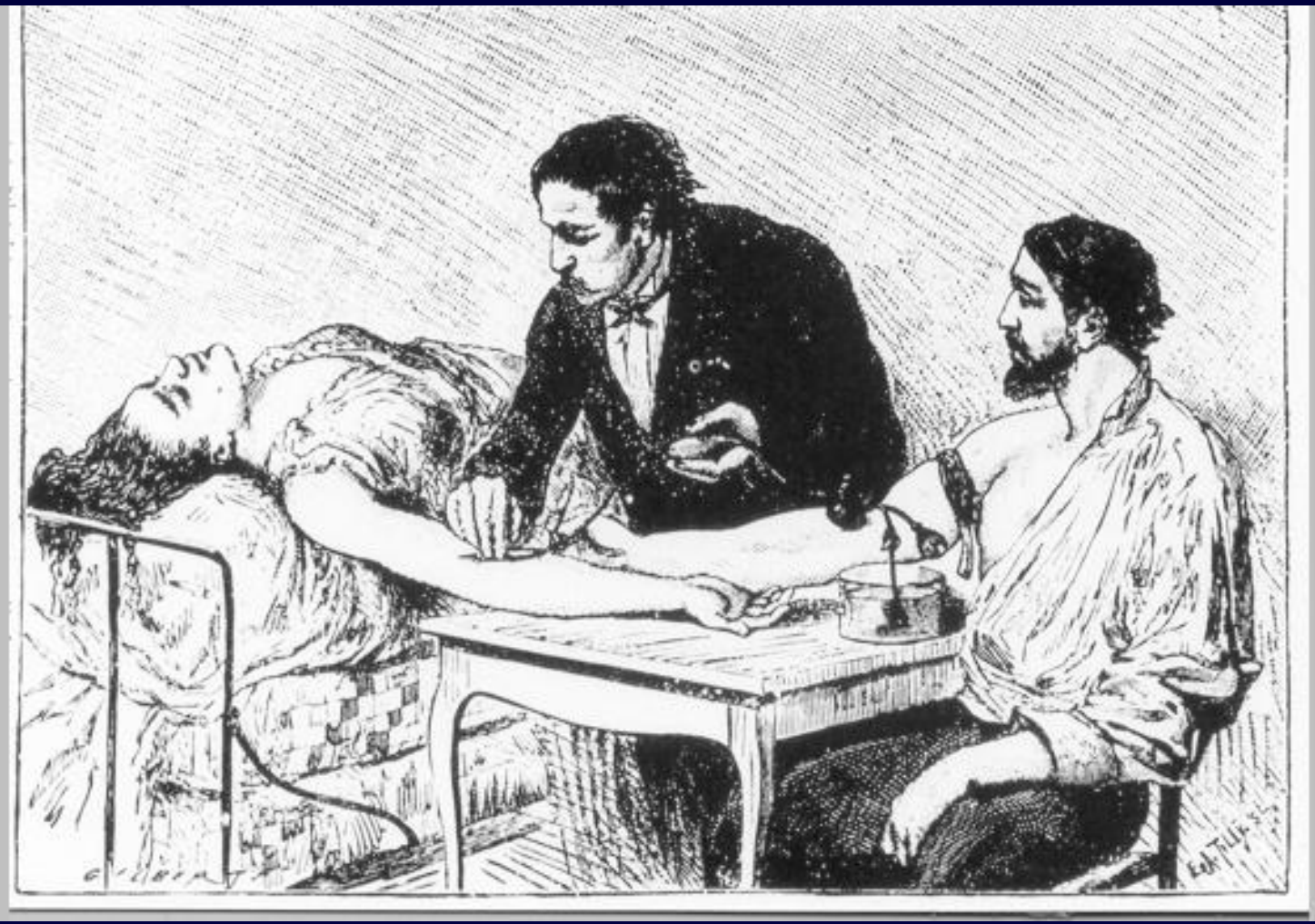


Historical Aspects of Laboratory Compatibility Testing (1)

Overview of major contributions:

- I.

1900 - Landsteiner's discovery of A,B and O groups

= Beginning of Immunohaematology and Transfusion Medicine

1902 - Group AB (Decastello and Sturli)

(Independent parallel discovery of the four groups /I-II-III-IV/ by a Czech doctor Jan Jánský)

1900-1944 - Compatibility based on the knowledge of ABO status of donor and recipient and on test methods detecting „in-vitro" agglutination or haemolysis in a simple saline system

= Prevention of Fatal Transfusion Reactions - Intravascular Haemolysis Due to AB0 Incompatibility

Historical Aspects of Laboratory Compatibility Testing (2)

- II.

1939 - Rh system described by Levine and Stetson

= Prevention of Alloimmunization Against RhD

- III.

1945 - Agglutination enhancement with bovine albumin (Diamond et al)

1945 - Antiglobulin Test (Coombs et al)

1947 - Enzyme Test (Morton and Pickles)

1974 - LISS antigen- antibody interaction enhancement (Low and Messeter)

= Prevention of „In Vivo“ Red Cell Destruction Caused by Incomplete (IgG) Antibodies

Historical Aspects of Laboratory Compatibility Testing (3)

- IV.

Last decades:

- attempts to increase the sensitivity and robustness of serologic methods

1984 - Plapp et al. - Solid Phase Test

1990 - Lapierre et al.: Gel Agglutination Test

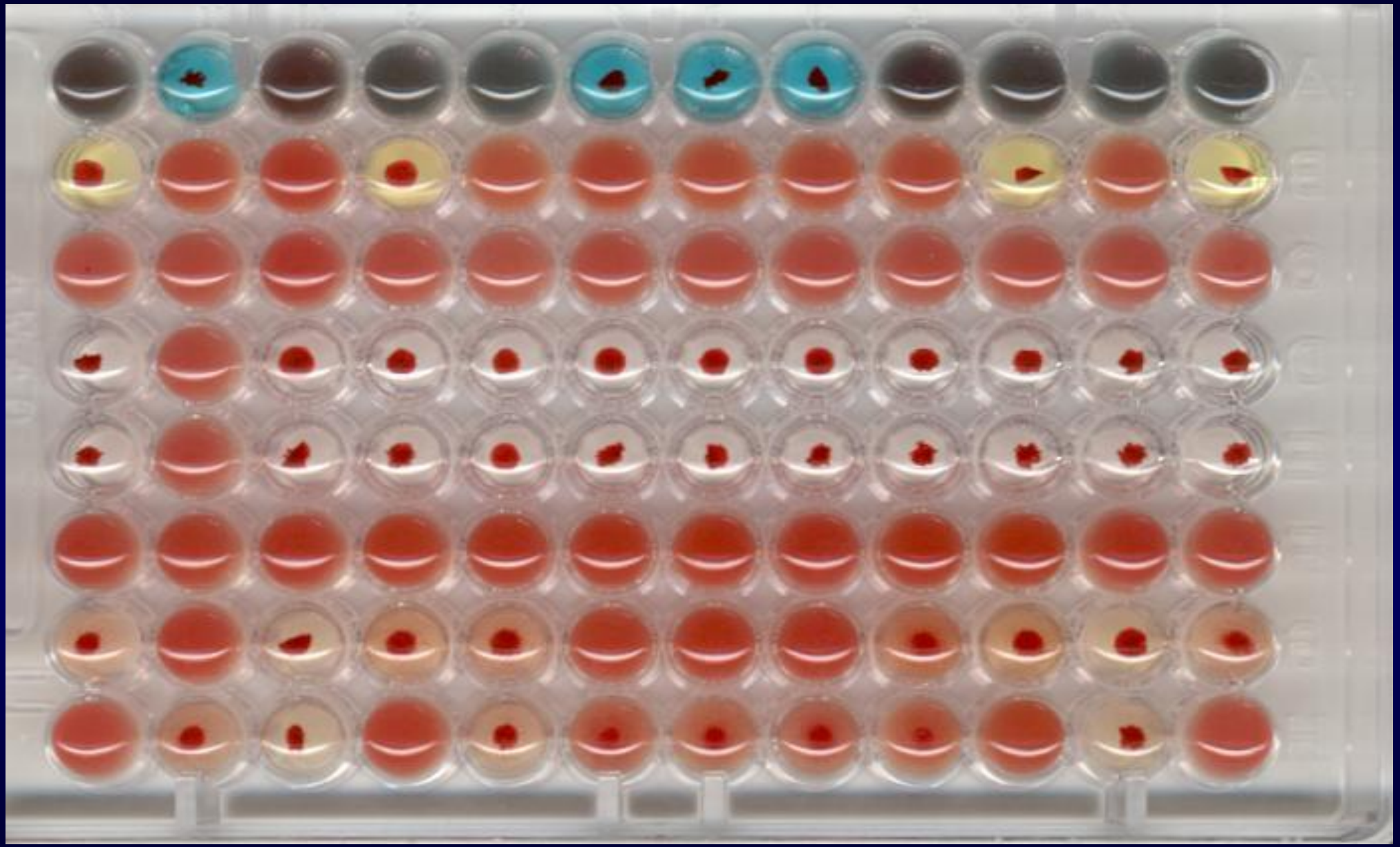
= Increased Sensitivity, Reproducibility and Reliability of Serologic Methods

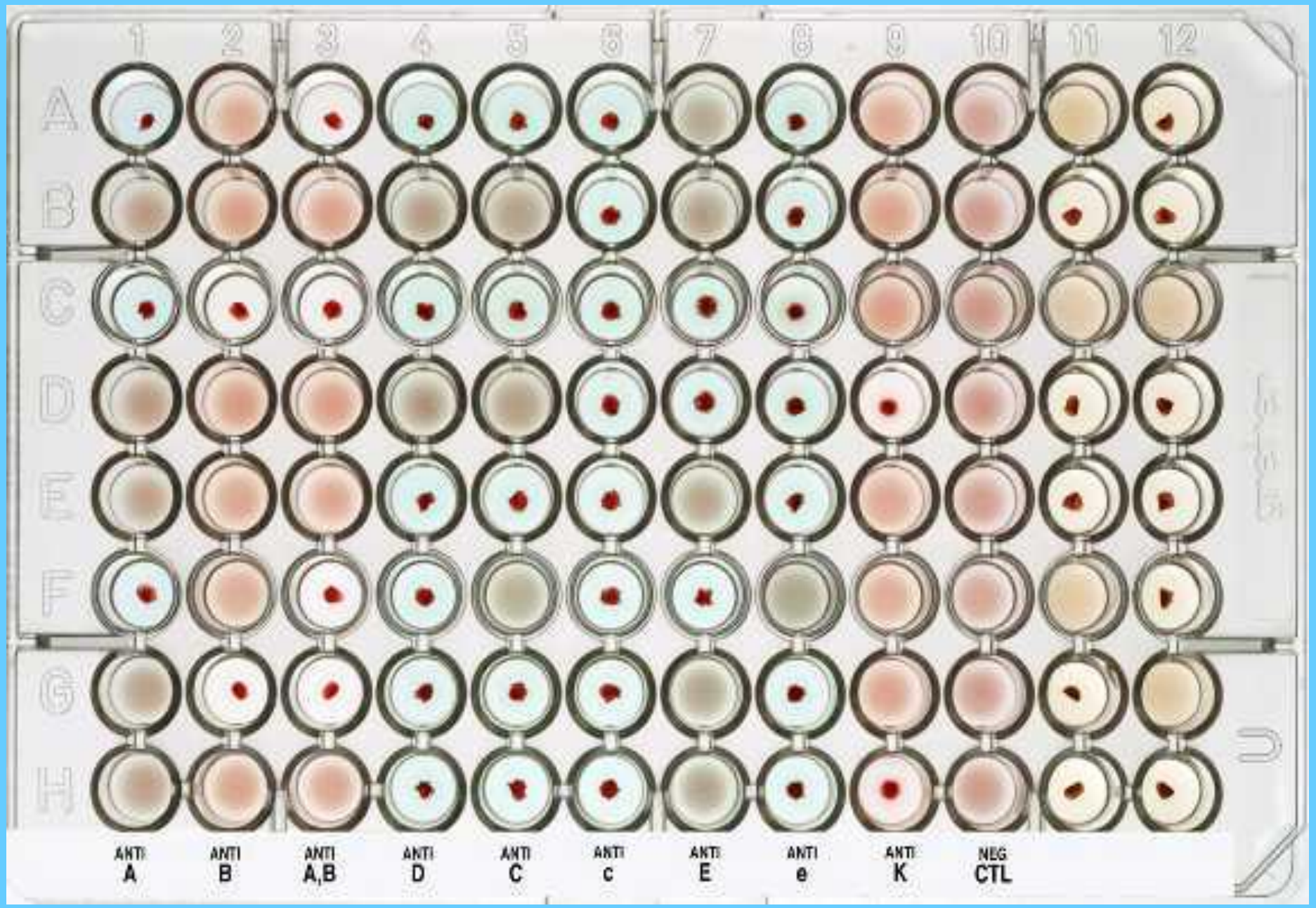
- automation of blood grouping and pretransfusion testing

= high throughput, large scale testing, reducing human work and subjective errors

Routine Blood Grouping

- Transfusion service centres
- Hospital Blood Banks
- Fully- or semiautomated instruments based on different principles
  - agglutination with centrifugation
  - column /gel/ test
  - solid phase test, etc.
- Highly accurate, sensitive and specific
- But dependent on complicated instruments, computers, precise organisation and sample identification and electric power supply
- Electric power necessary also for manual versions of above tests

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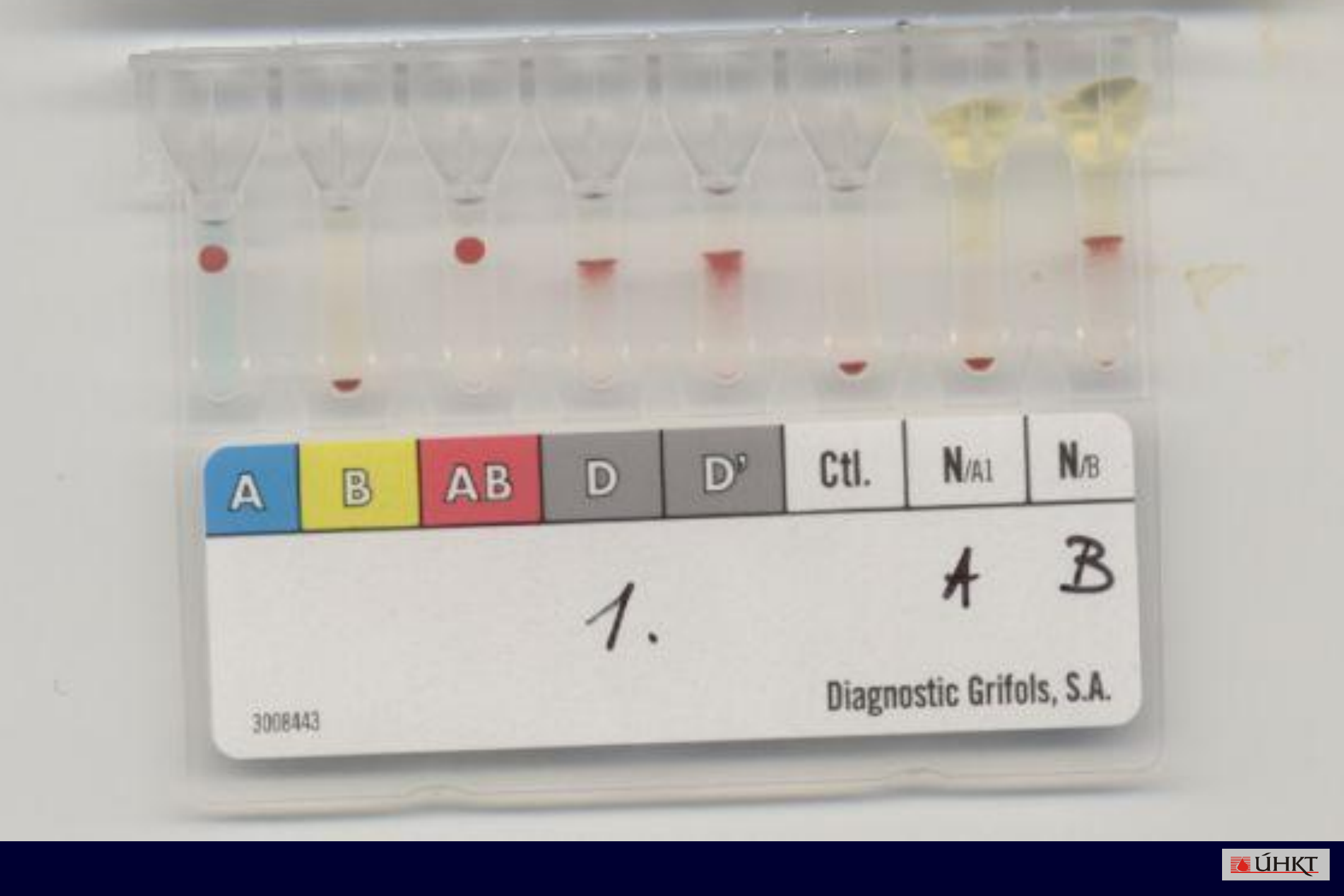
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Diagnostic Grifols, S.A.

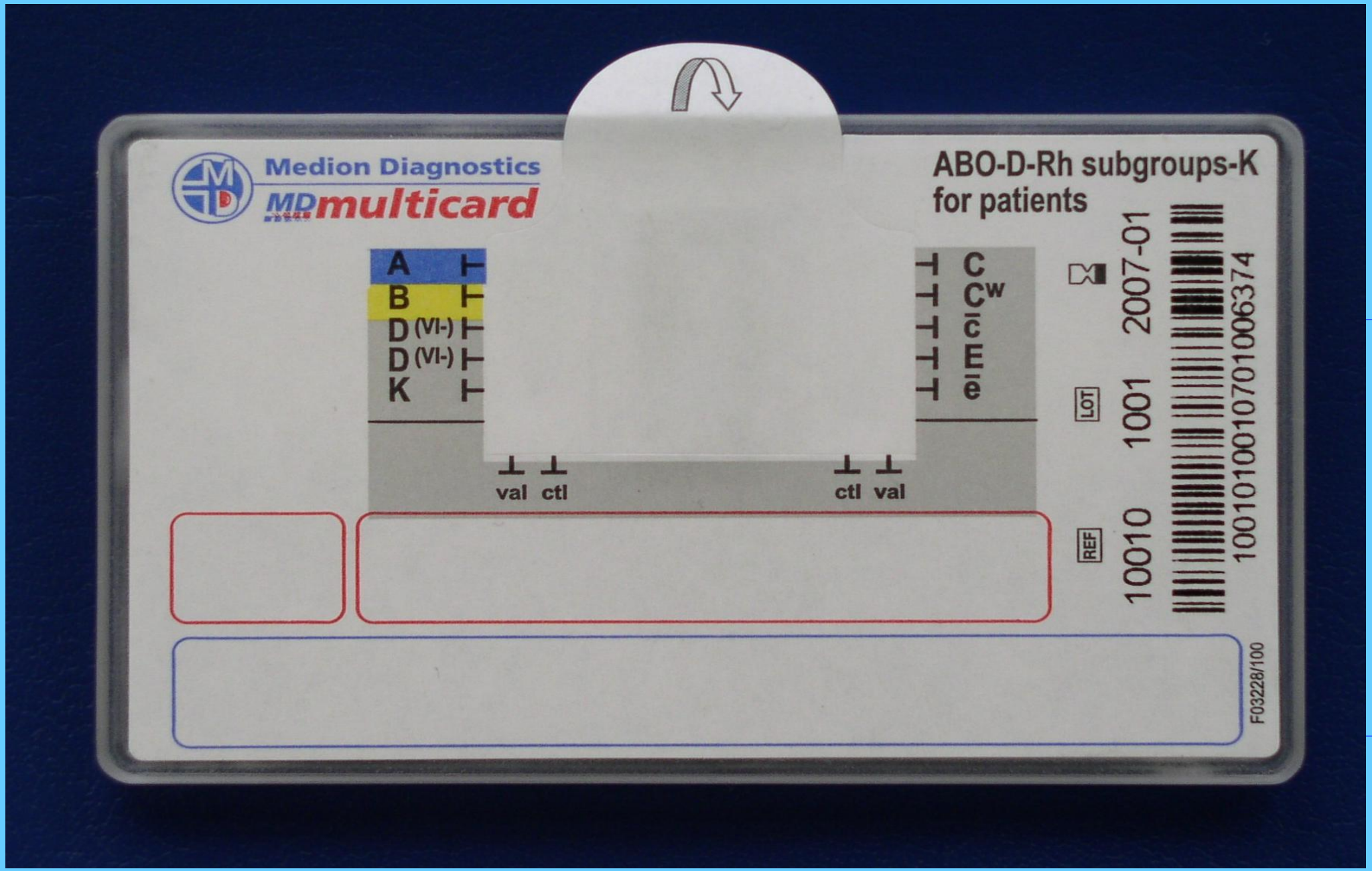
Simple Agglutination for AB0 and RhD

- Slide test
- For rapid orientation - results in few seconds
- Direct agglutnination – after mixing drop of blood and drop of reagent

- Less accurate
- Many disadvantages:
  - Infectious risk
  - Possible cross-contamination
  - Dots drying
  - Missing of weak reactions
  - Difficult identification and documentation

New rapid test – lateral flow method MD Multicard

- Principle:
  - Antigen – Antibody interaction during lateral diffusiom
  - similar to immunochromatografic methods, used in the fields of infectious disease testing, pregnancy tests and drug screening


Medion Diagnostics
MDmulticard
ABO-D-Rh subgroups-K
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MD Multicard – Medion Diagnostics

- Erythrocyte suspension flows into channels with immobilized specific antibodies and red cells with corresponding antigen adhere to the surface
- After 30 seconds the rinsing solution is added and unbound red cells are washed out

- Positive reactions are recognized as distinct red bands

- Negative reactions are recognized by the absence of the respective band

MD Multicard – Medion Diagnostics

- last channel has control function
- „Ctl“ control point near the application zone
  - Red dot will occure when erythrocytes are not able to come through the channels /autoantibodies, nonspecific reactions, etc./
- „Val“ control point at the end of antibody zone
  - Red dot occuring here signalize uneventfull passage of red cells through channels

- Only cards with negative „Ctl“ point and positive „Val“ point are considered to provide valid results
- When „Ctl“ is positive and/or „Val“ negative
  - Repeat test with other card
  - Washing/warming the sample

  - Use other method for blood grouping

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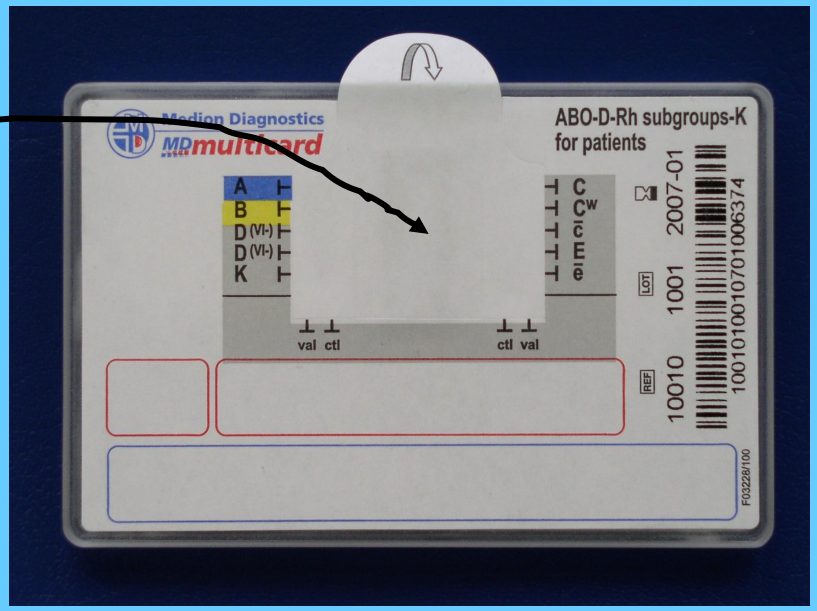
MDmulticard

1) MDmulticard



2) Diluent F

⇨ 2 reagents for the determination of 10 parameters

⇨ 10 parameter blood typing + internal controls in 1 device

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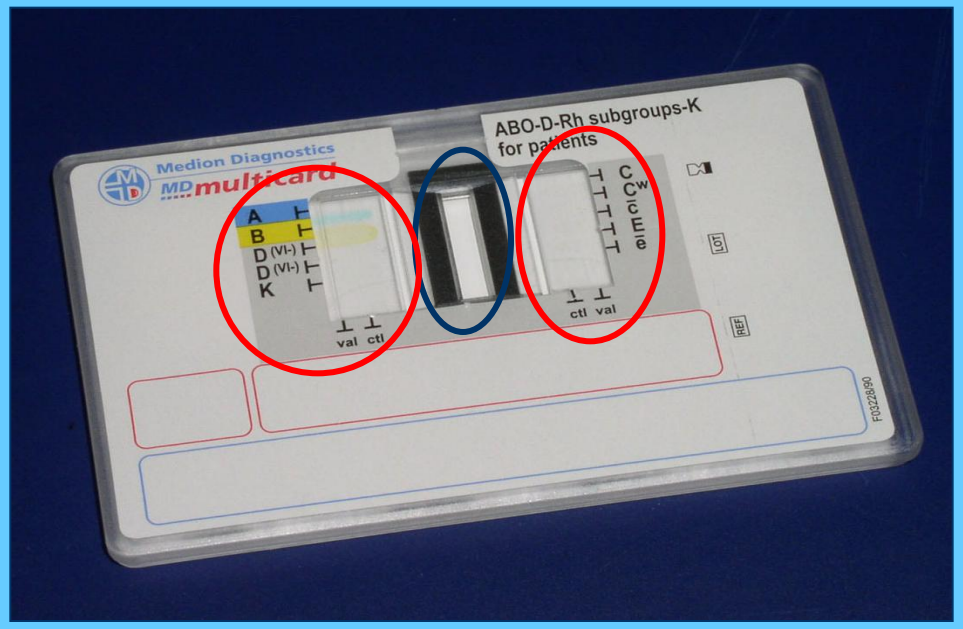
MDmulticard



Principle: Lateral Flow

Format: Credit card

MDmulticard

- 1 central application zone
- 2 reading windows

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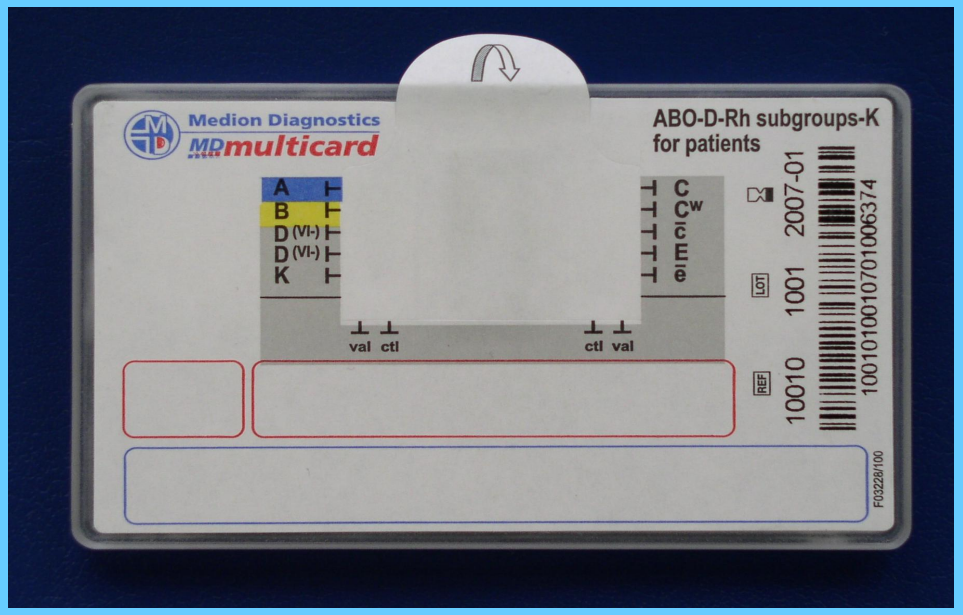
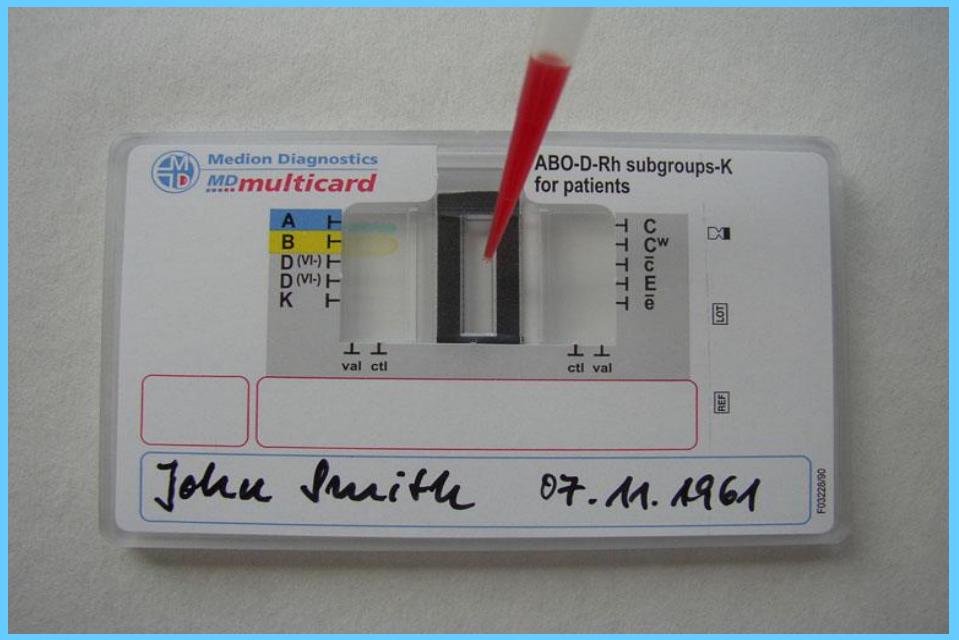
Test Procedure



1. Remove protective label.

Test Procedure



- 1. Remove protective label.
- 2. To the application zone: add 2 drops (100 µl) of a suspension of Diluent F and:
  - anticoagulated whole blood
  - native blood
  - erythrocyte sediment from clotted blood

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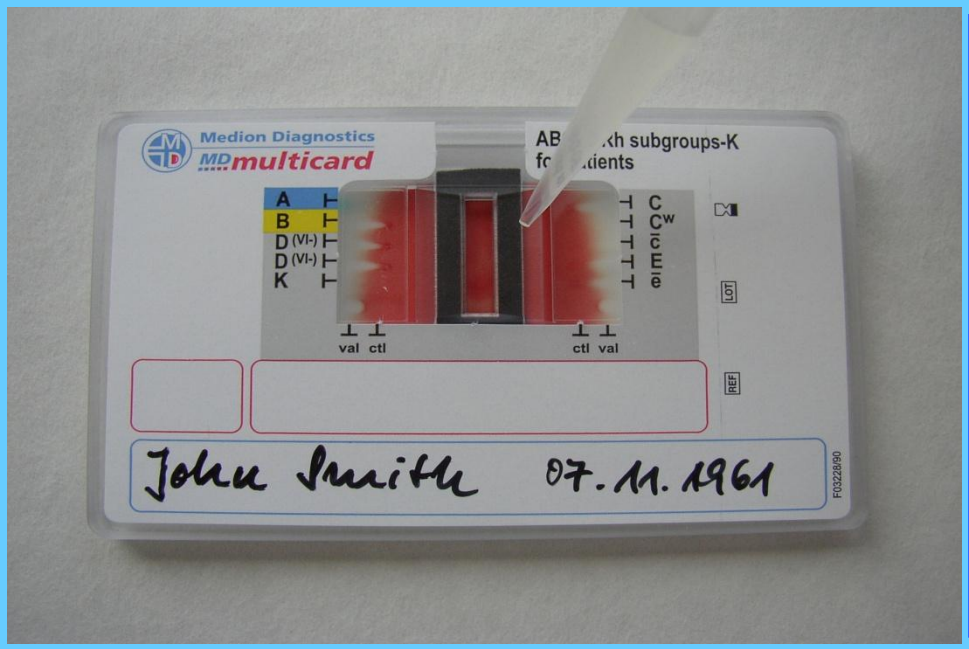
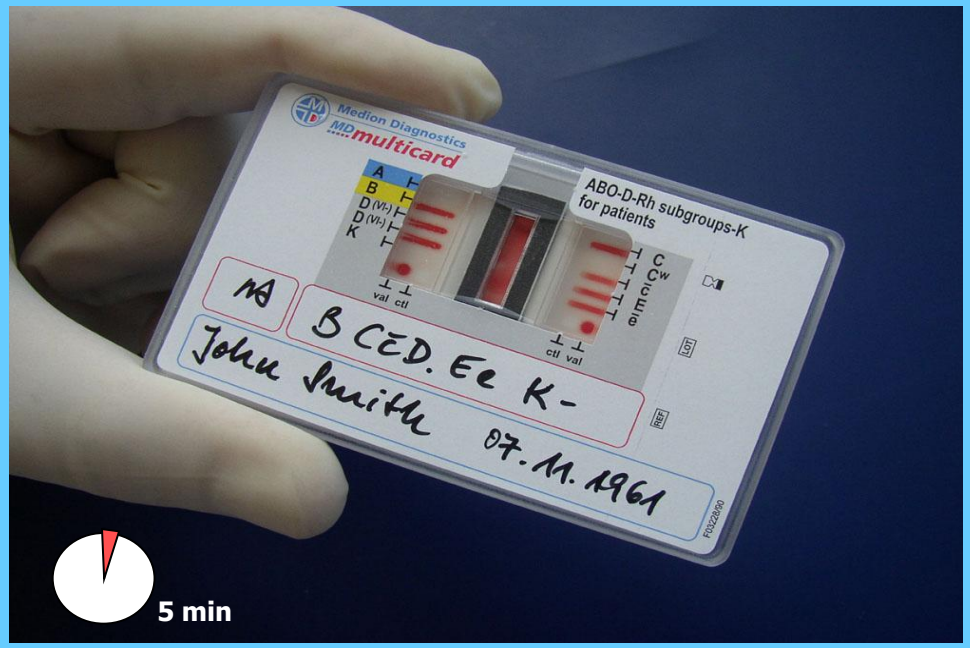
Test Procedure



1. Remove protective label.
2. To the application zone: add 2 drops (100 µl) of a suspension of Diluent F and:
   - anticoagulated whole blood
   - native blood
   - erythrozyte sediment.
3. After 30 s: Add 6 drops (300 µl) of Diluent F to the application zone.

Test Procedure



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  - erythrozyte sediment.
- 3. After 30 s: Add 6 drops (300 µl) of Diluent F to the application zone.
- 4. After 5 min: Read and record results

B **CcD.Ee kk**

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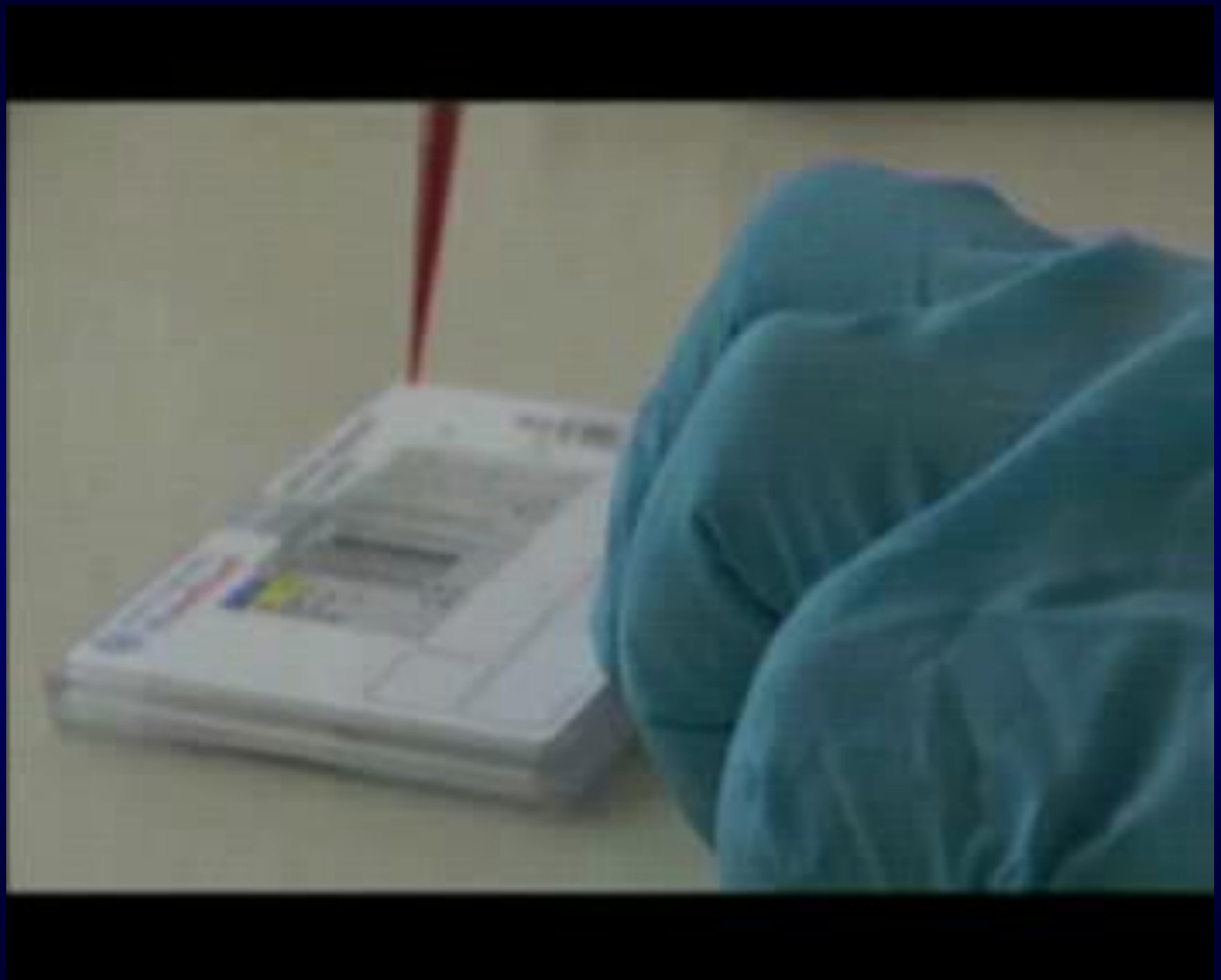


MD Multicard – Medion Diagnostics

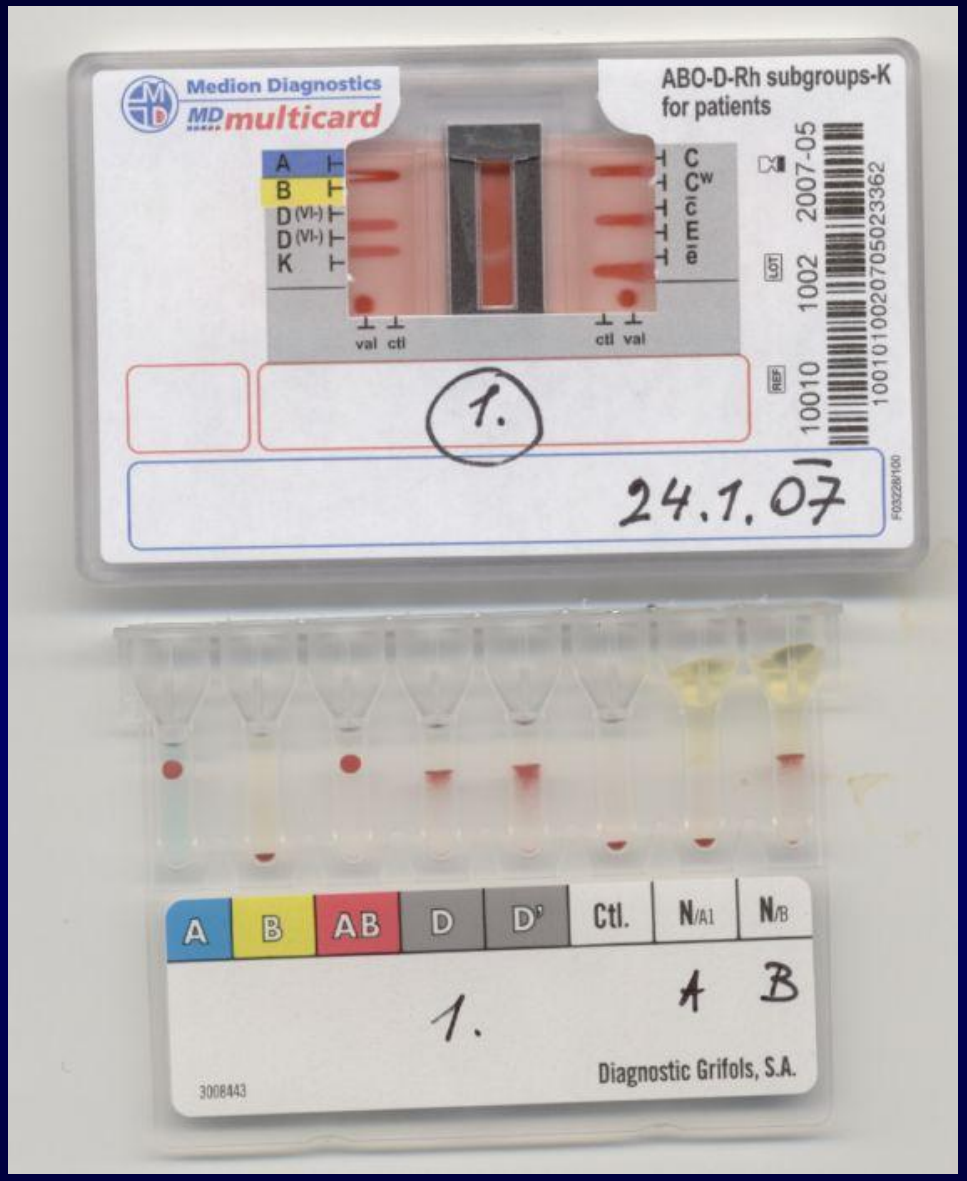
- This new test is highly sensitive and specific
- CE certified
- Thousands samples were processed in several evaluation studies including those in our laboratory
- Challenging samples were also tested /neonatal, weak antigen expressions, double-population samples after transfusions or BMT/ - correct results were obtained

MD Multicard – Medion Diagnostics

Conclusion:

- Simple and rapid method
- No need of instrumentation /centrifugation/
- No need of electric power
- Reliable and stable results in few minutes

- Suitable for emergency diagnostics
- Applicable in situations with limited electric power and instrumentation supply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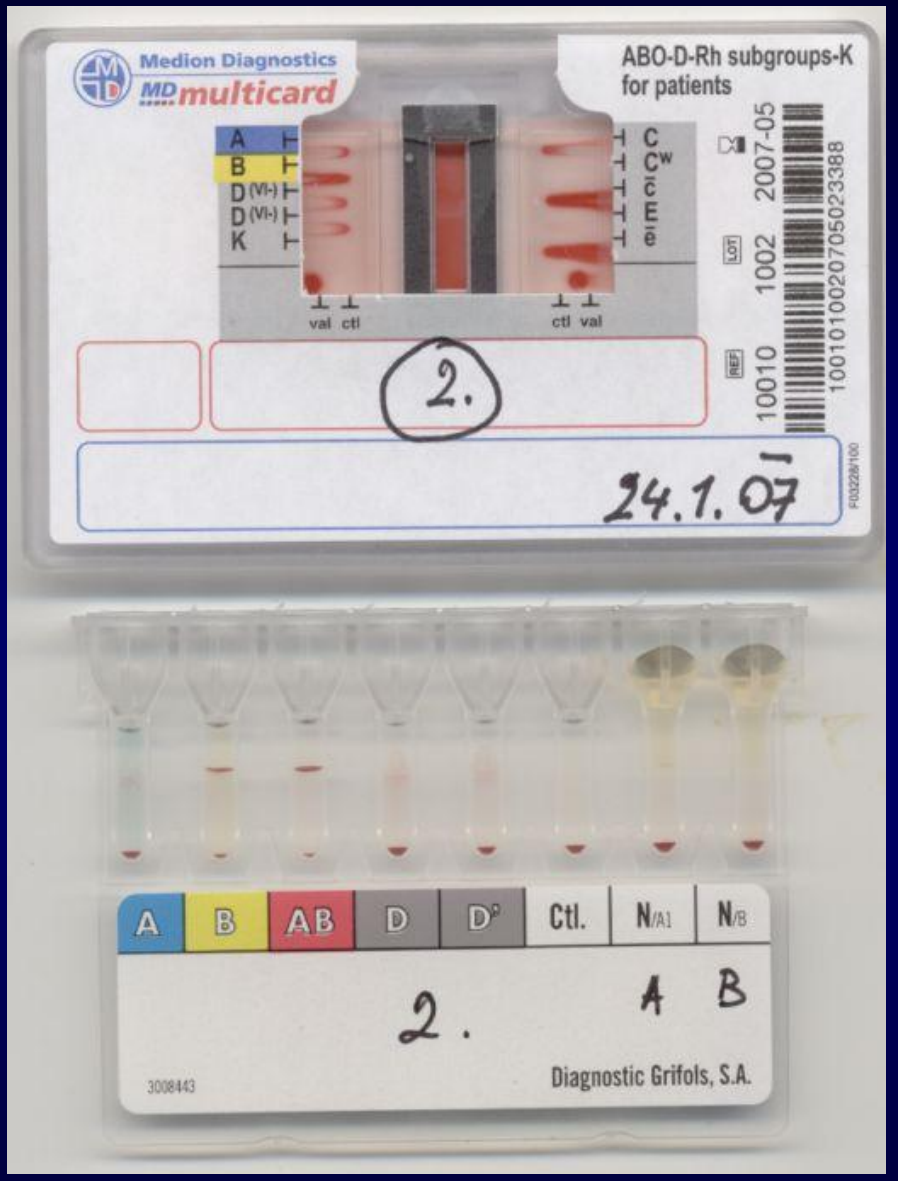
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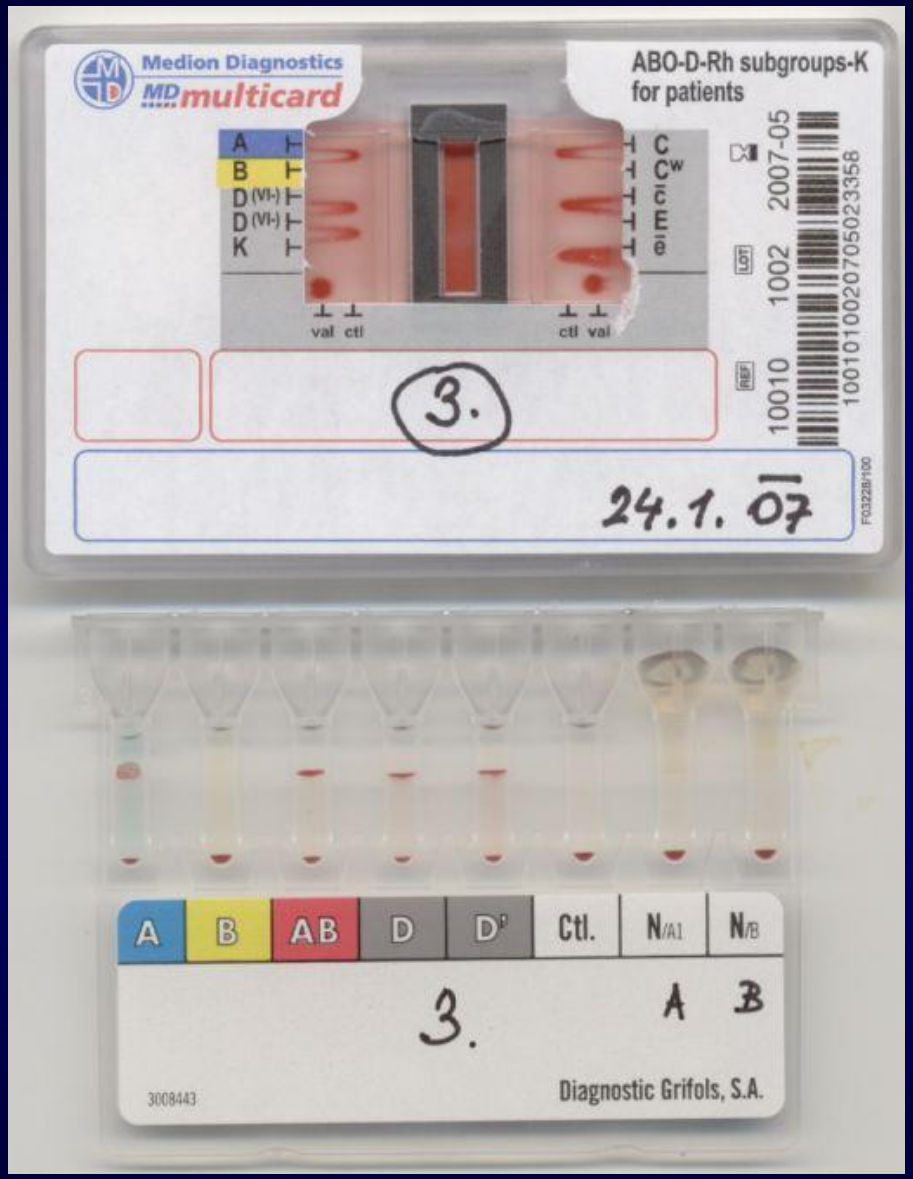
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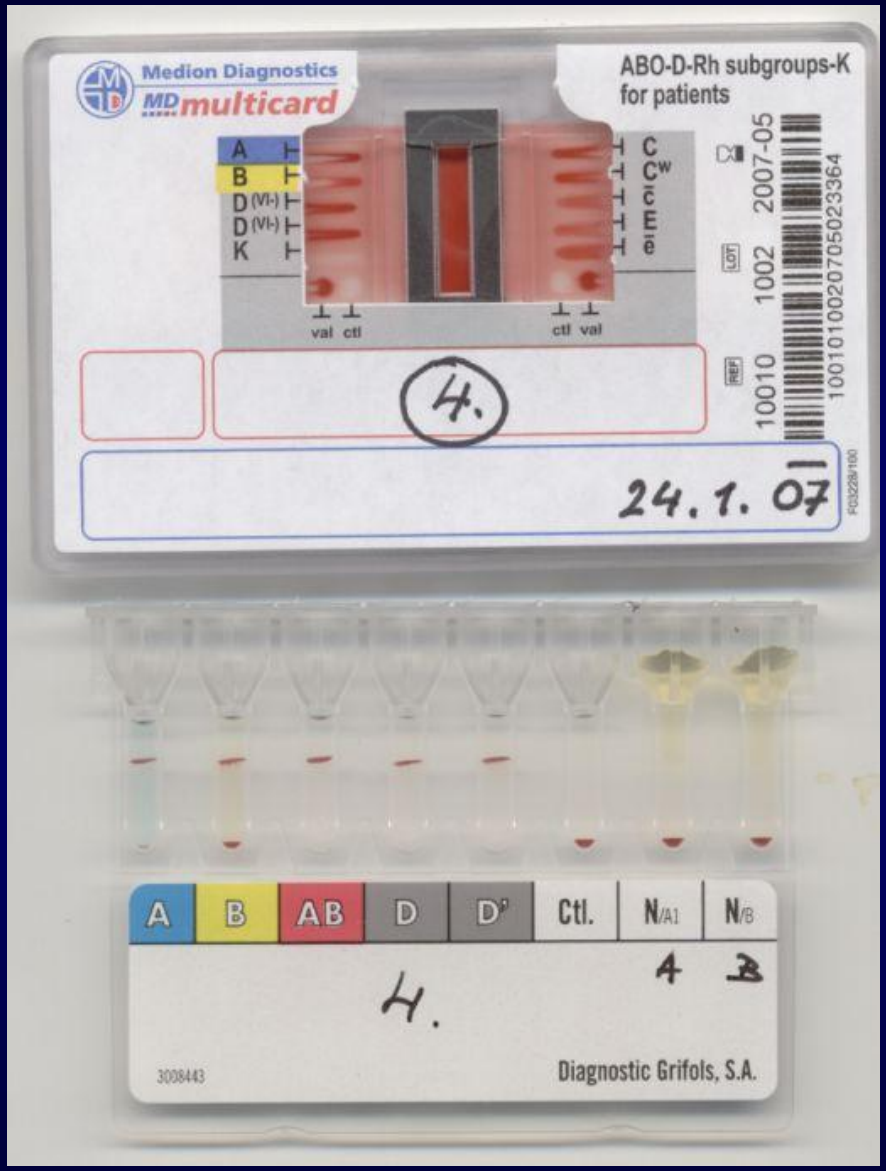
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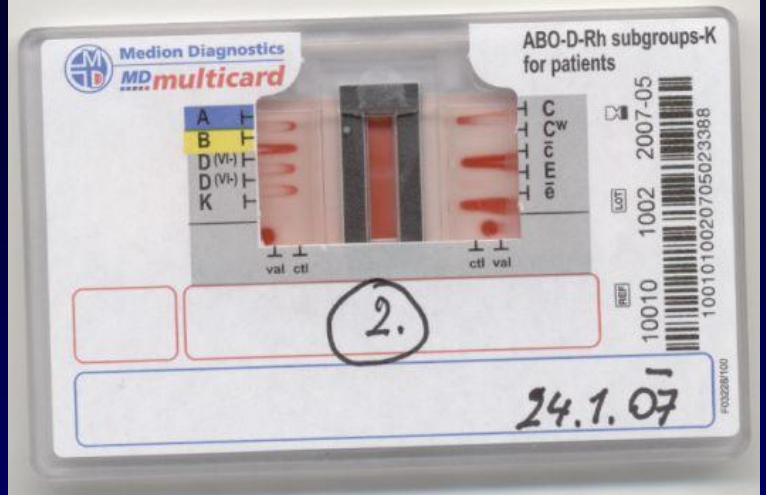
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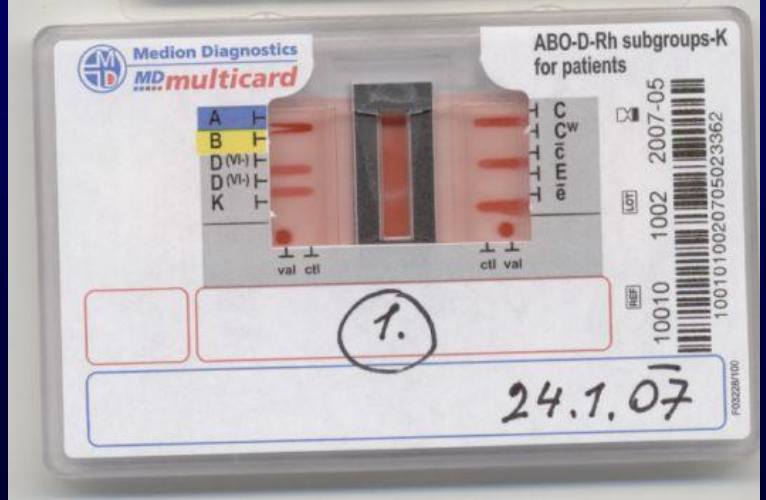
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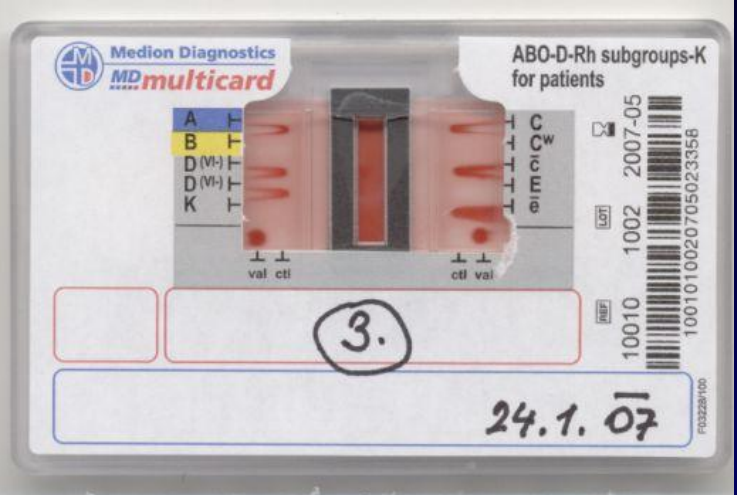
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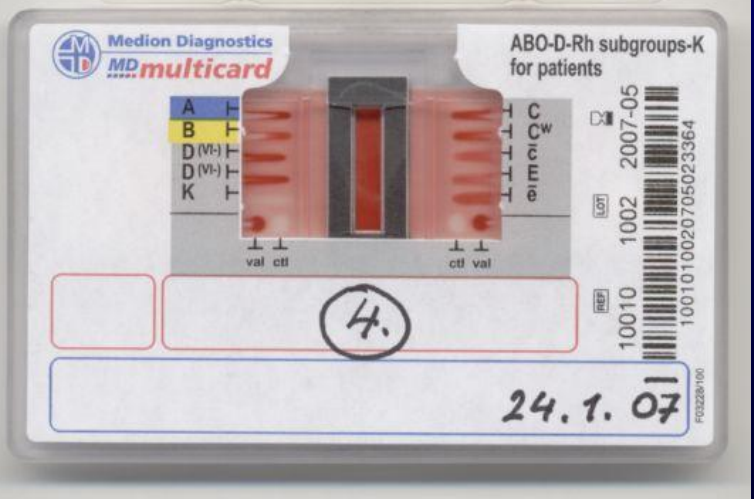
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Thank you for your attention.

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