

# National database on RBC antibodies: why and how do we need it?

BeQuinT working group immunohaematology



Health  
Food Chain Safety  
Environment



BeQuinT  
*Belgian Quality in Transfusion*

Symposium 14/12/2023



Structural:  
legislative & financial

Data collection & analysis:

- National database RBC antibodies
- PBM survey
- PBM indicators
- Passerelle audit – PBM hip surgery

BeQuinT multi-annual plan

Education

Guidance & support

# Working group immunoohaematology

## Project 1 – national database RBC antibodies

### Co-chairs (clin. biologists)

- E. Lazarova (Fr)
- S. De Bruyne (NI)

### Clinical biologists

- V. Deneys (Fr)
- A. Devey (Fr)
- H. El Kenz (Fr)
- A. Hendrickx (NI)
- L. Moreno (Fr)
- R. Seghaye (Fr)
- K. Van Poucke (NI)
- A. Nijs (NI)

### Blood establishments:

- S. Van Landeghem (NI)
- A. Muylaert (NI)
- M.-P. Rodenbach (Fr)
- G. Bulliard (Fr)

### Business analyst:

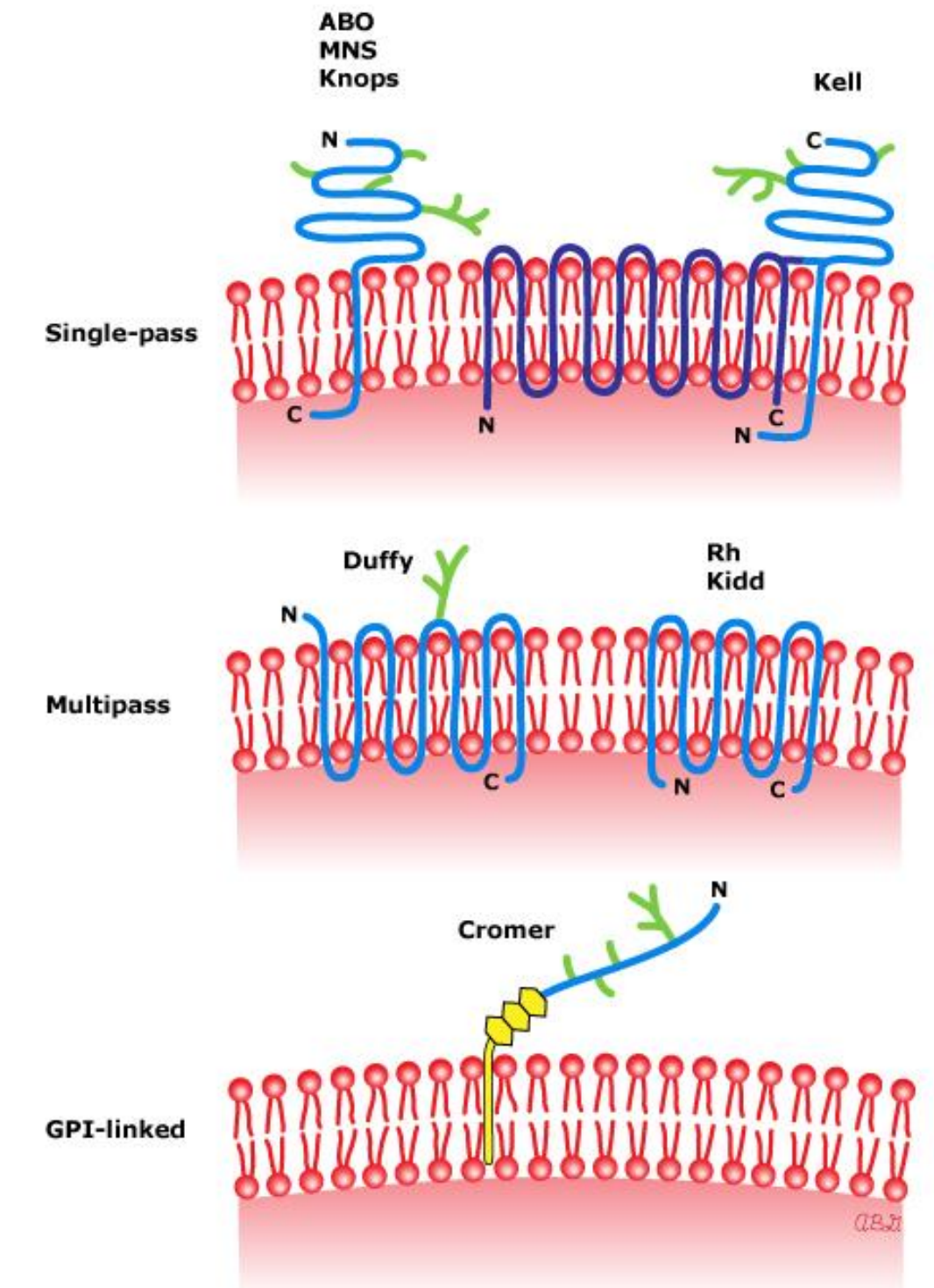
F. Dépelchin (Fr)

# INTRODUCTION

## RBC ANTIGENS AND ANTIBODIES

- **Blood group antigen** –a *sugar* or *protein* present on the surface of the RBC; *defined serologically* by reagent antisera that react with the antigen and cause *red cell agglutination*
- Every blood group antigen belongs to a **blood group system**
- A total of 343 red cell antigens are recognized by the International Society for Blood Transfusion

Major types of RBC blood group antigens and their relationship to the RBC membrane



The three major types of RBC blood group antigens are illustrated, showing their structure and interaction with the plasma membrane. Blue denotes protein; green, sugars; and yellow, GPI. The dark blue protein covalently linked to Kell is the XK protein, required for Kell expression. Refer to UpToDate content on RBC antigens for further information and clinical relevance.

N: protein amino terminus; C: protein carboxyl terminus; GPI: glycosylphosphatidylinositol; RBC: red blood cell.

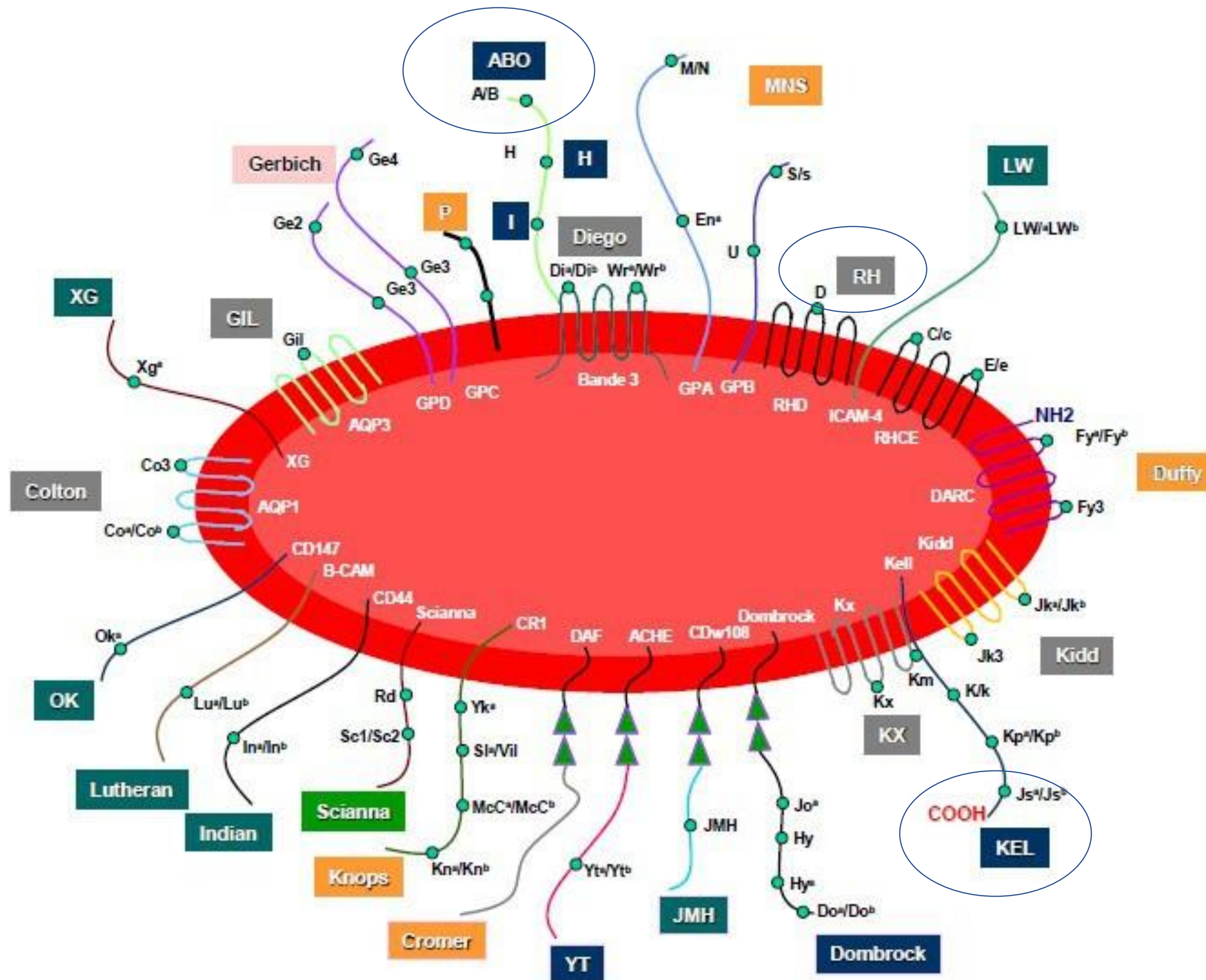
Modified from: *The Blood Group Antigen FactsBook*. Reid ME, Lomas-Francis C (Eds), Academic Press Harcourt Brace & Co, 1997.

UpToDate®



# INTRODUCTION

## RBC ANTIGENS AND ANTIBODIES



- ABO system is the most important in transfusion, followed by **RH** system and **Kell** system
- Other blood group systems are also important but less frequently

## INTRODUCTION

### SETTINGS IN WHICH BLOOD GROUPS PLAY A ROLE

- Transfusion
  - Organ/tissue transplantation
  - Evaluation of transfusion reaction (esp. hemolytic TR)
  - Determining the risk of hemolytic disease of the fetus and newborn
- 
- Transfusion-associated hemolytic anemias

## INTRODUCTION

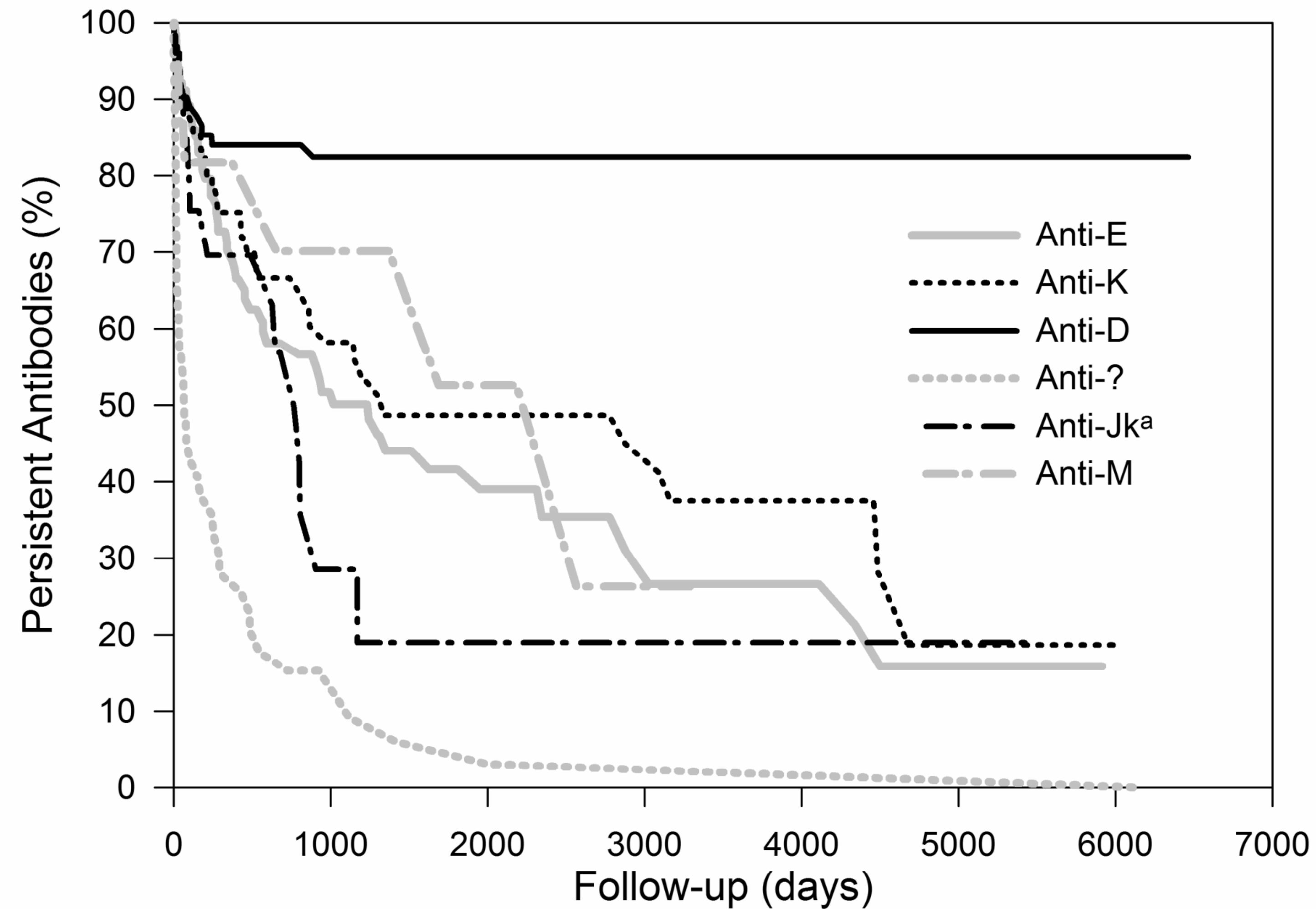
### RBC ANTIGENS AND ANTIBODIES IN BLOOD COMPONENT TRANSFUSION

- Safe transfusion of RBCs : donor RBC are selected for their **compatibility** with the recipient's blood type
- Transfused RBC units do not need to be phenotypically **identical** to the recipient's RBCs, but they do need **to lack antigens** that could provoke clinically significant **hemolysis** in the recipient (eg, a blood group A donor unit cannot be transfused to a blood group O recipient, **natural Ab**)
- If **alloantibody** is developed to an RBC antigen (immune antibody), it is important *to avoid transfusing RBCs with that specific antigen, indefinitely* (importance of **historical Ab**)
- How an alloantibody is developed:
  - Previous transfusions
  - Pregnancy
  - Transplantation
- 20% to 80% of RBC antibodies disappear over time and can escape from detection
  - antibody specificity
  - sensitivity of laboratory techniques
  - time period after immunization



## INTRODUCTION

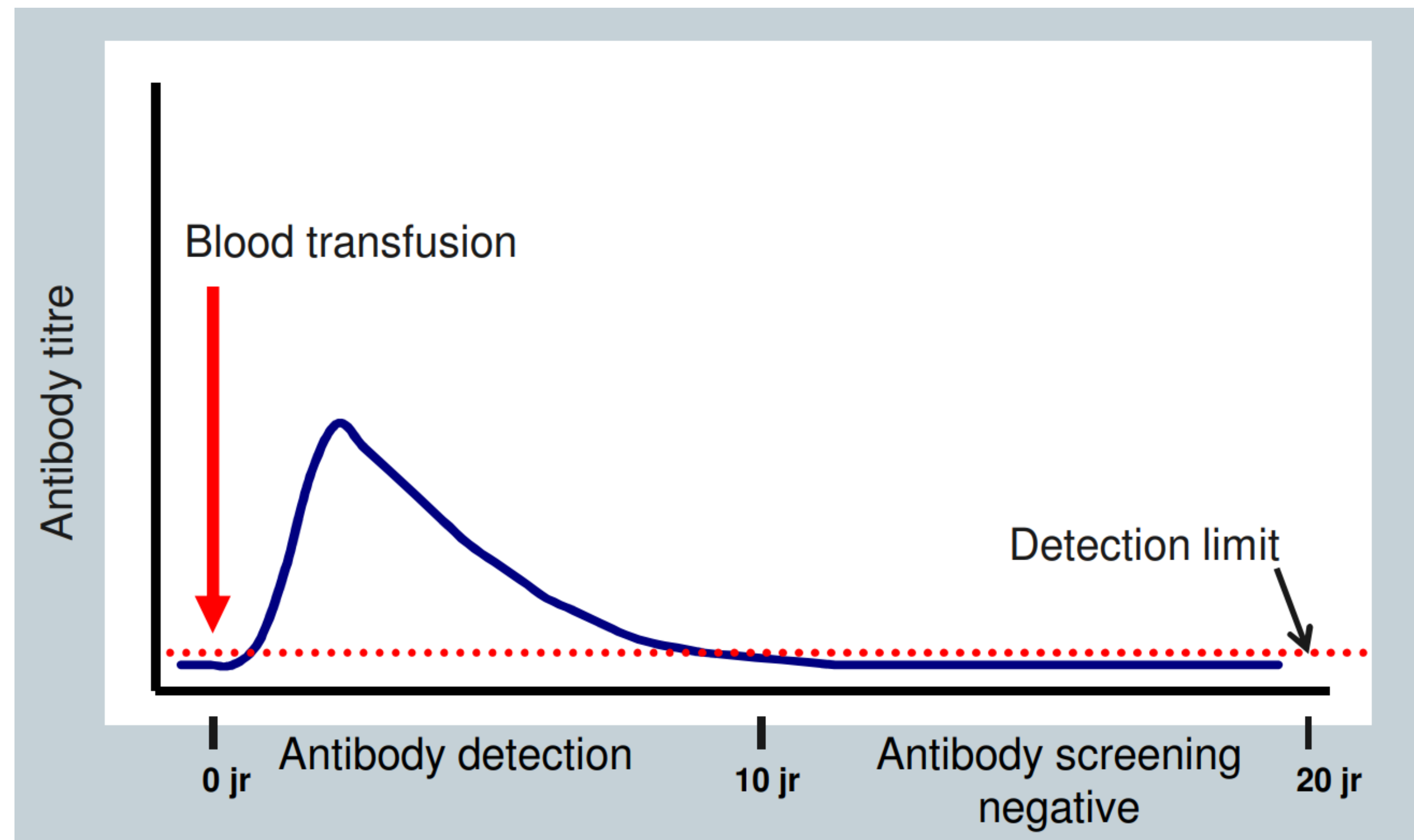
### ANTIBODY DISAPPEARANCE





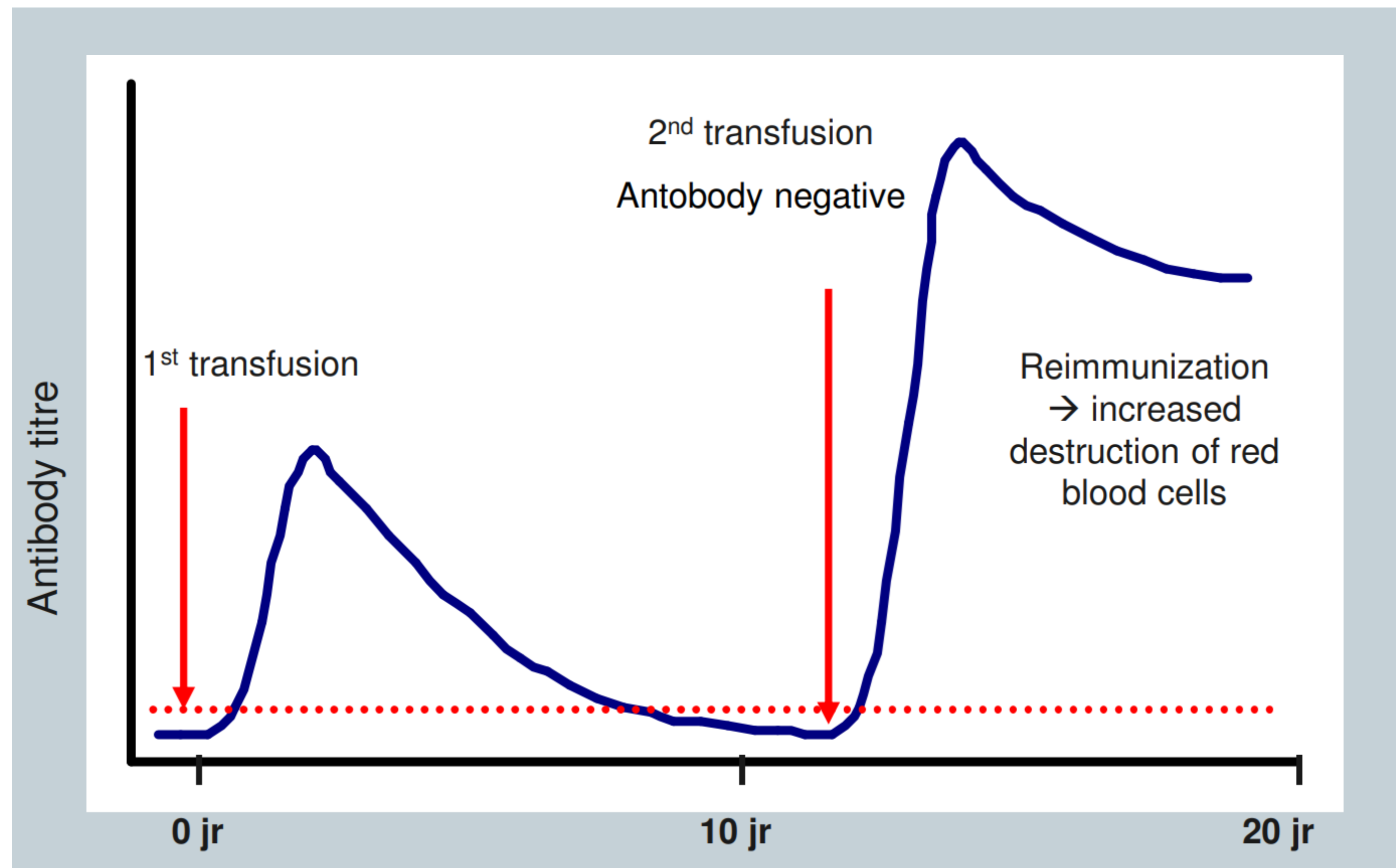
## NATIONAL REGISTER

### WHY WE NEED IT?



## NATIONAL REGISTER

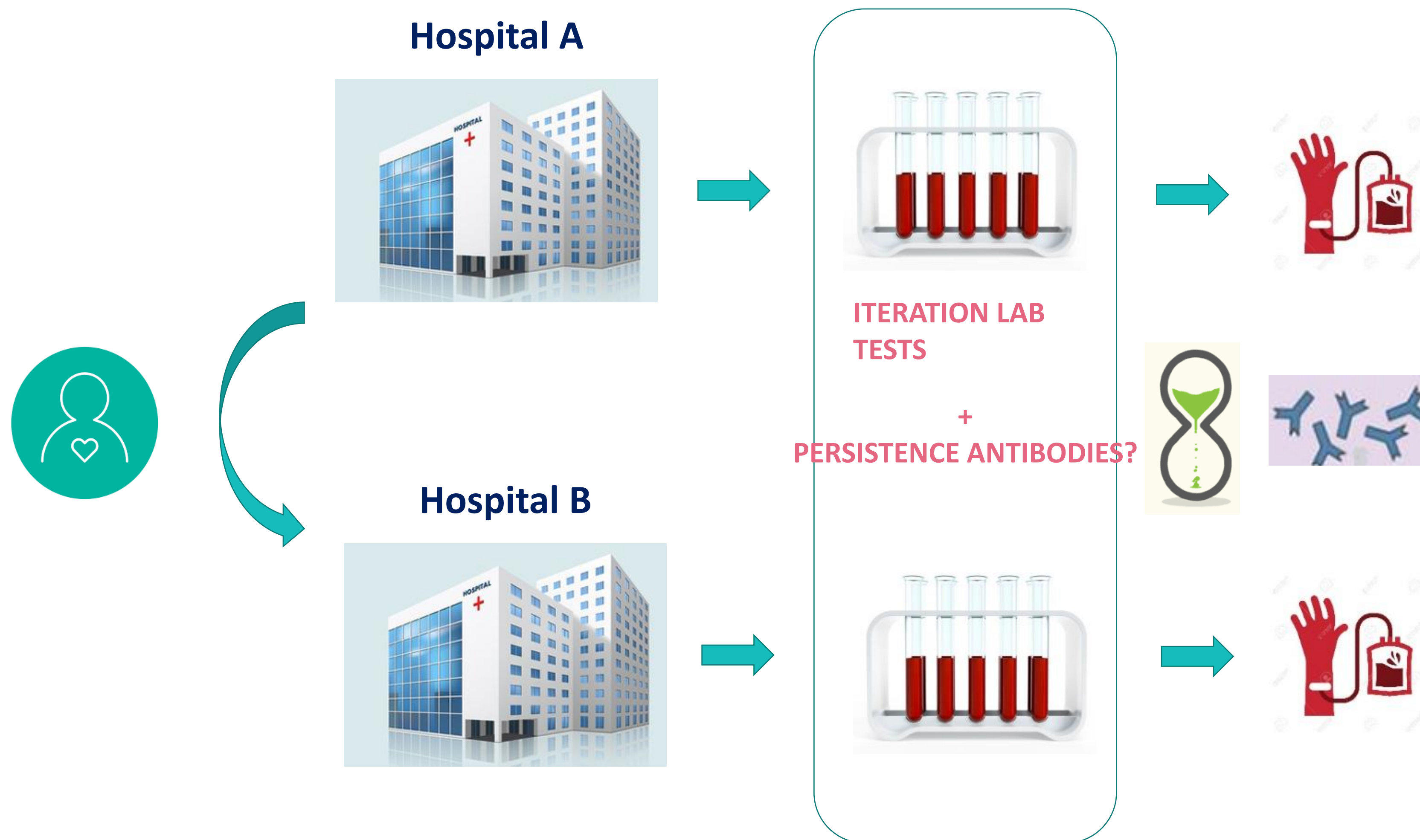
### WHY WE NEED IT?





# INTRODUCTION

## SITUATION “AS IS”



## NATIONAL REGISTER

### WHY WE NEED IT?



**Antibody  
evanescence**



**Transfusion  
record  
fragmentation**



**Additional safety benefits**  
e.g. extra blood group  
confirmation



## NATIONAL REGISTER

### IMPORTANT FEATURES

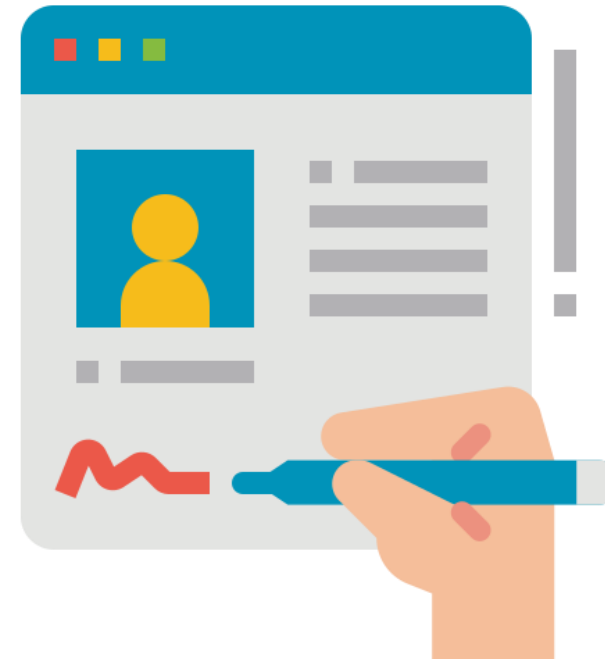
- ✓ a simple **database** where our data are stored, can be accessed and uploaded
- ✓ an **application** for the integration in the lab/blood bank information system of Belgian hospitals
  - “Write once, read many”; growing history
  - Limited number of “readers”; professionals who can upload data
  - Continuous availability 24/7
  - Privacy issues due to GDPR

# NATIONAL REGISTER

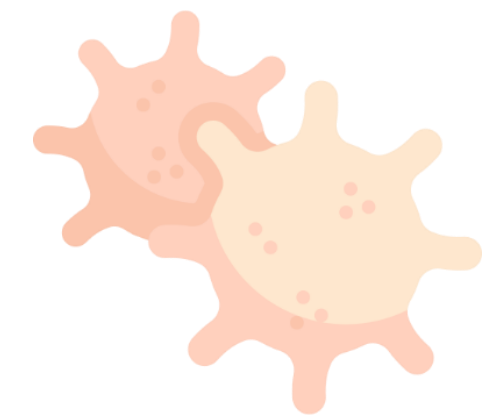
## WHAT SHOULD BE REGISTERED?



- RBC antigens
- Antibodies against RBC antigens (incl auto-Ab)



anti-HPA, anti –  
HLA and anti-IgA  
antibodies



- Transfusions (date, product)
- Tfn reactions
- Intra-uterine tfn



- Allo SC/BM-transplantations
- SCD

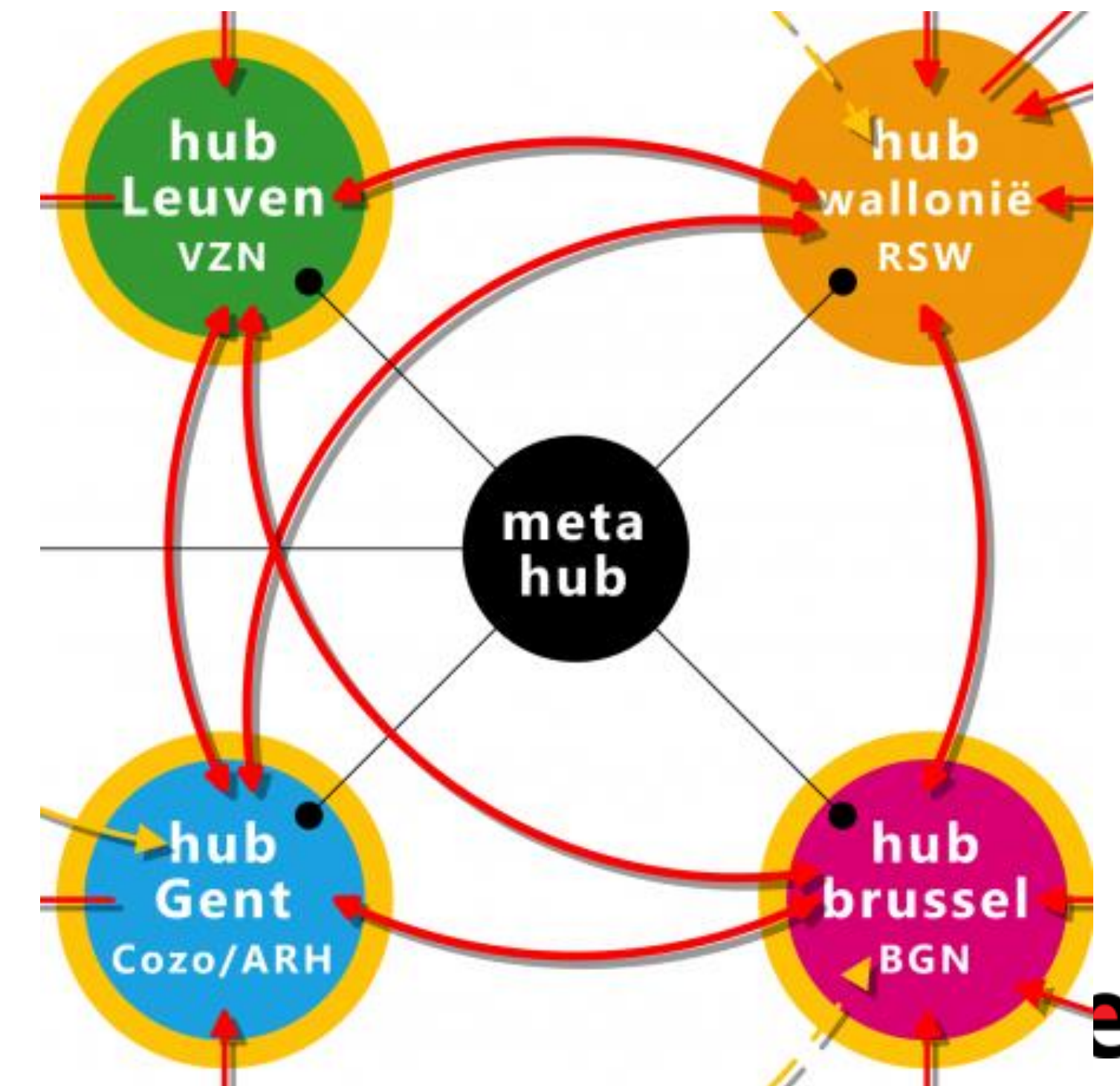
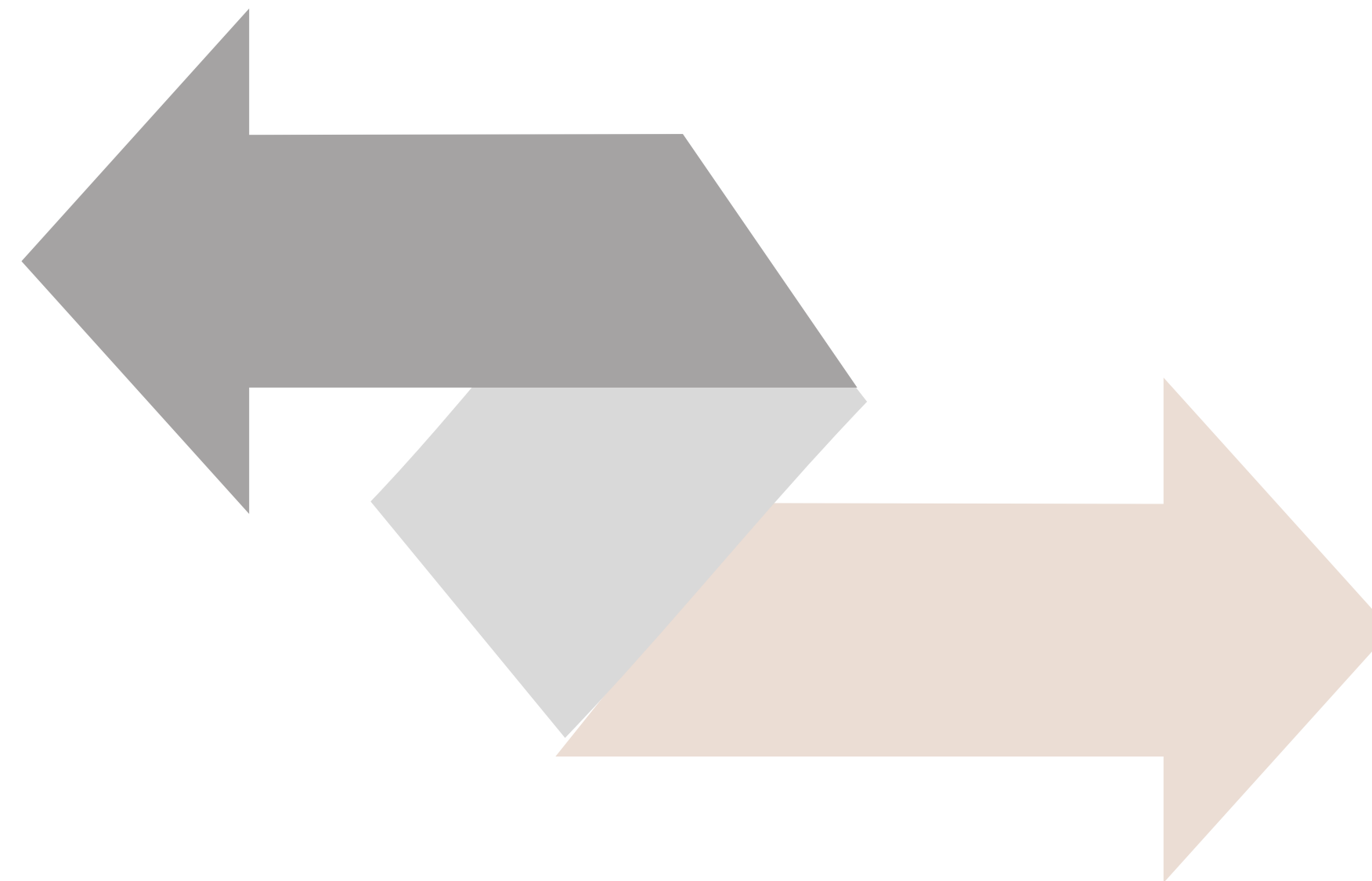




## NATIONAL REGISTER

WHAT ARE THE OPTIONS?

# TR!X



## NATIONAL REGISTER

### WHAT ARE THE OPTIONS?

# TRIX

**~1000 evanescences reported over 10 years**

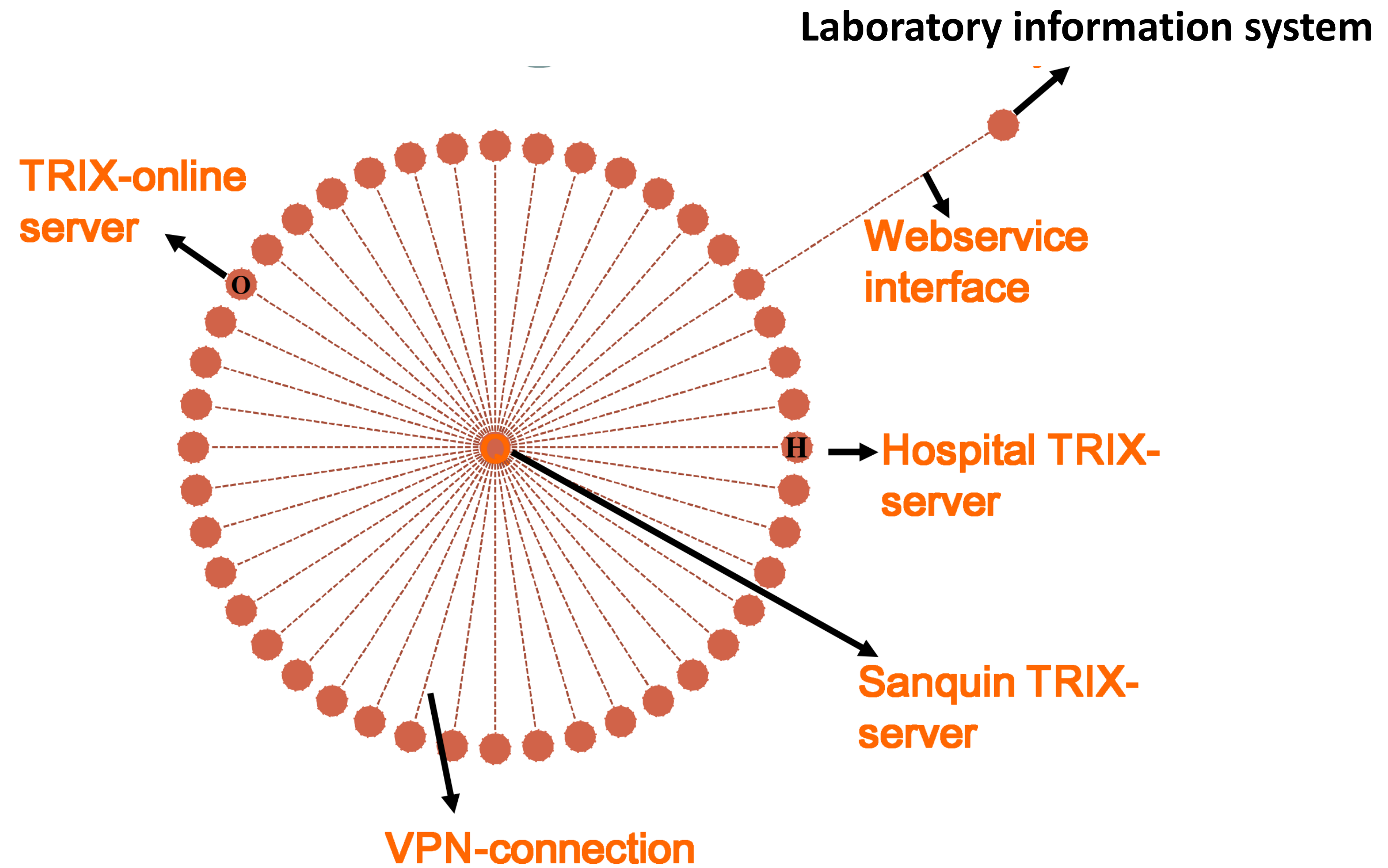
**=**

**~ 1000 potential transfusion reactions prevented over 10 years**



## T R I X

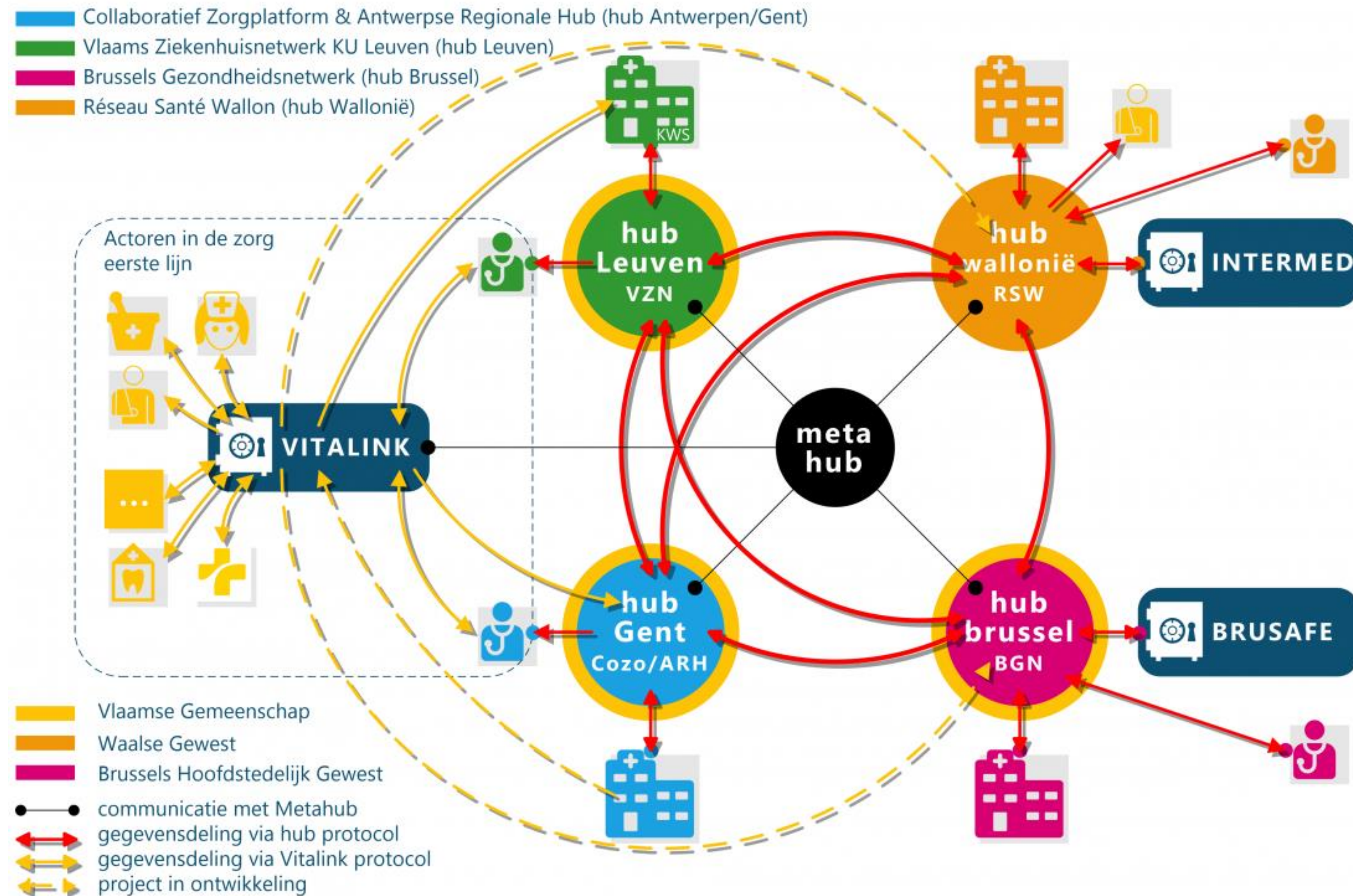
## I N F R A S T R U C T U R E





# NATIONAL REGISTER

## WHAT ARE THE OPTIONS?





## NATIONAL REGISTER

### HOW TO BUILD IT?

1. Government approval and support: **September 2022**
2. Realising « business analysis » : **February 2023-November 2023**
  - a) High level design solution
  - b) Project “work breakdown structure”
  - c) Estimated costs
3. Software development: **to be started**
4. Data exports and analyses: **to be started**
5. Implementation in Belgian hospitals: **to be started**

## NATIONAL REGISTER

### REQUIREMENTS

- Data to be exchanged: **Q1 2023**
  - usefulness /needs /standardization
- Expectations and requirements regarding the interface: **Q3 2023**
  - performances
  - visual representation
  - functionalities
- Degree of integration with the lab information system (LIS) and blood bank information system (BIS) : **ongoing**
  - + data of blood donors from the blood establishments ?



## NATIONAL REGISTER

## BUSINESS ANALYSIS

- LIS in Belgian hospitals **Q3 2023**
  - methods to encode and electronically communicate data
- eHealth standards to be met
  - healthcare provider and the patient
  - security of data
  - application of LOINC, HL7 (CDA, FHIR), SNOMED CT
- Alternatives for the target solution
  - Stand alone application

## NATIONAL REGISTER

### AREAS OF CONCERN

**Q1: Resources** for LIS development/implementation

- Hospital directory boards need to invest resources

**Q2: Accessibility of data (restriction based on therapeutic relationship)?** (legal cell, FPS of Public Health)

- laboratory testing as care/therapeutic relationship;
- **responsibility** for sharing a results/report

**Q3: Data flows** to be used? (duplication of information, other uses)

**Q4: Target solution:** consistent with all eHealth projects; timing and implementation challenge

## NATIONAL REGISTER

### OPTIONS

#### **Option 1 : Dedicated BeQuinT database and interface**

- ⇒ in parallel with the main lab report publication flow?
- ⇒ procedures relevant for transfusions (but not only)

#### **Option 2 : Dedicated BeQuinT application using data directly from structured lab reports**

- ⇒ Parameter: not limited to blood test (e.g. procedures)
- ⇒ Patient information without publishing a report (e.g. add a risk or a procedure directly in the health record)

#### **Option 3: Interface with consolidated parameters of the health record in shared data vaults**

- ⇒ Avoid duplication of data in vault and in reports



## NATIONAL REGISTER

### TAKE HOME MESSAGES

- National register: we definitely need it !
- Work has started
- Functional target solution
- Information standardization and share
- Governmental support