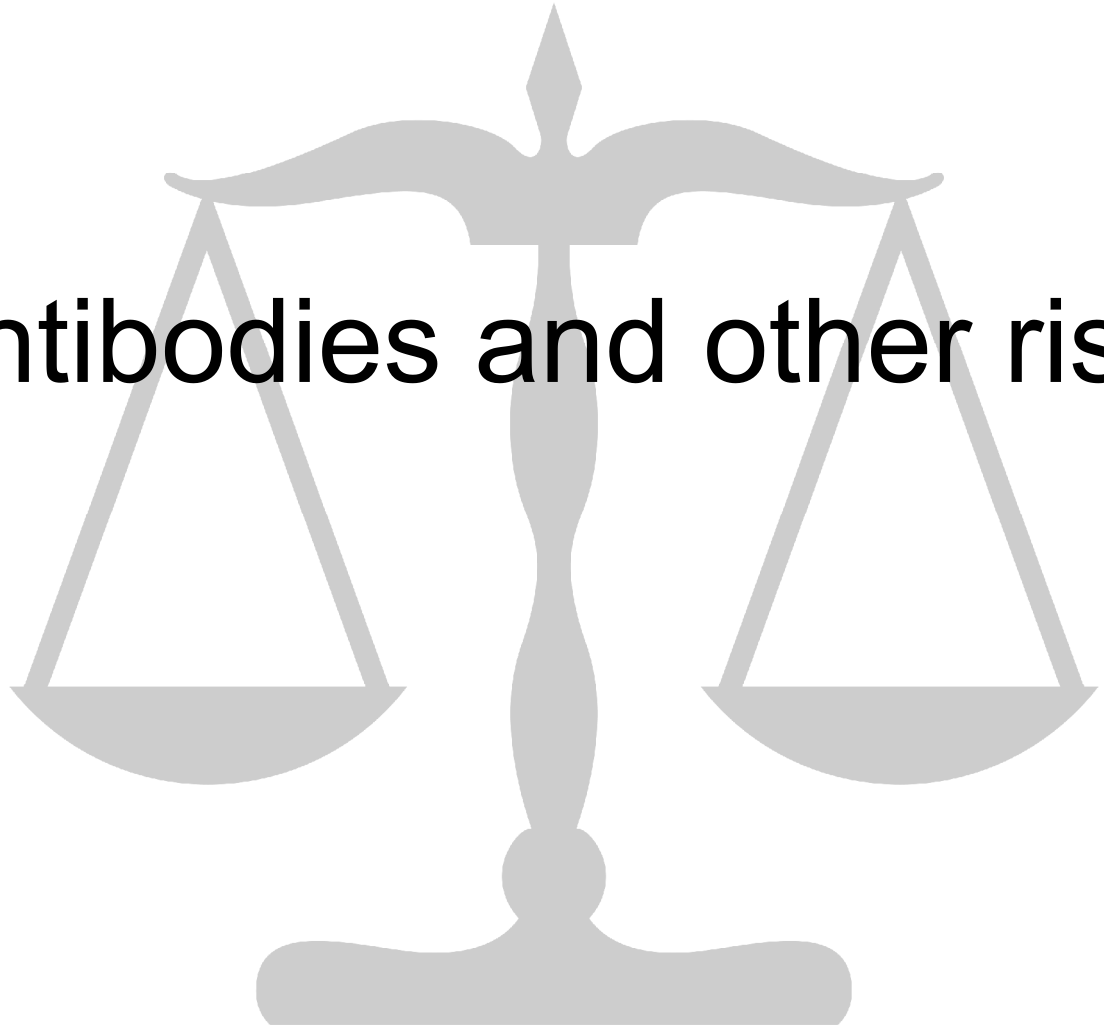
Antibodies and other risks

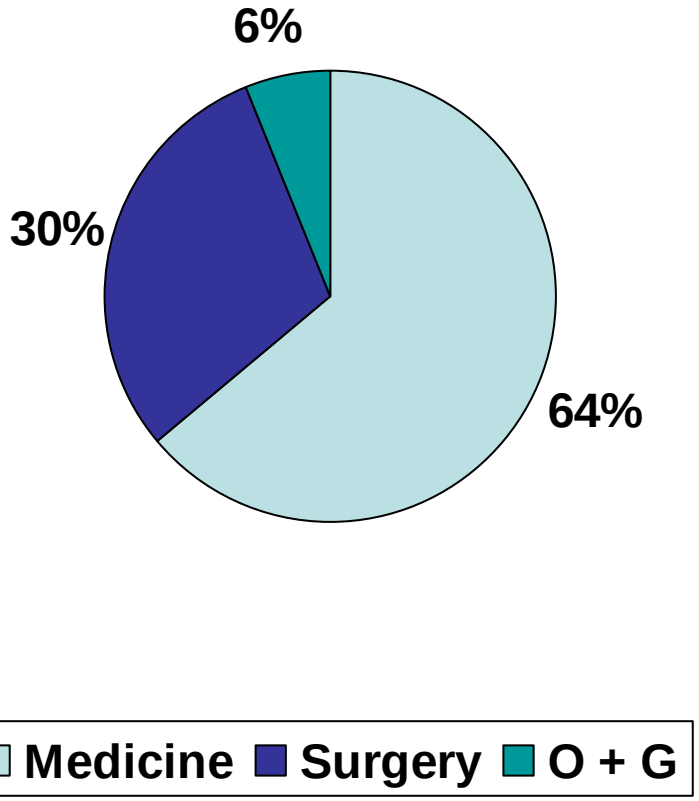


What this talk will cover

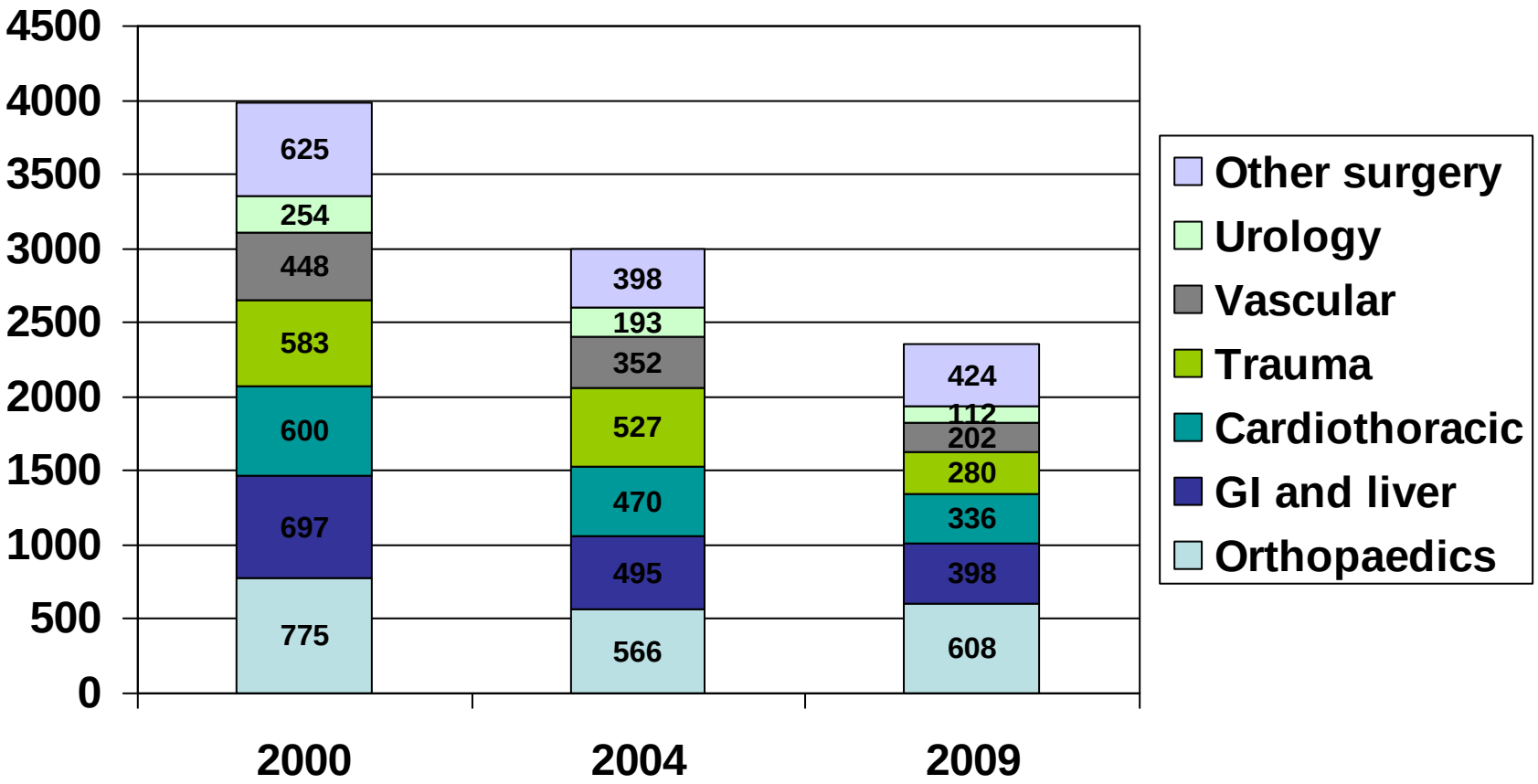
- How and why we perform group, antibody screen and crossmatch
- The other major transfusion-related hazard
- Risks of not transfusing

Who gets red cells?

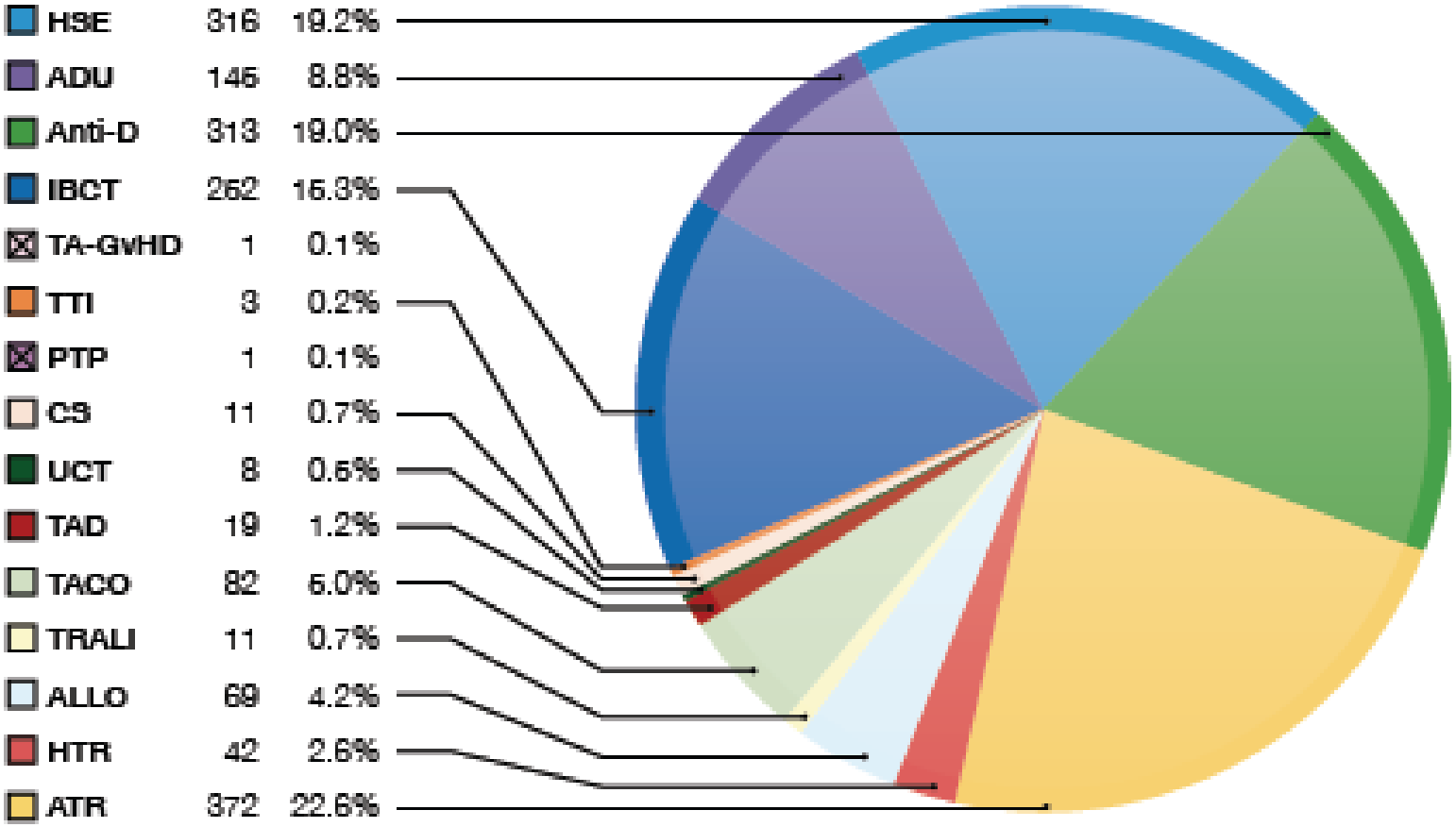
- Figures from the 2009 study of red cell transfusion in the North



Changing surgical indications



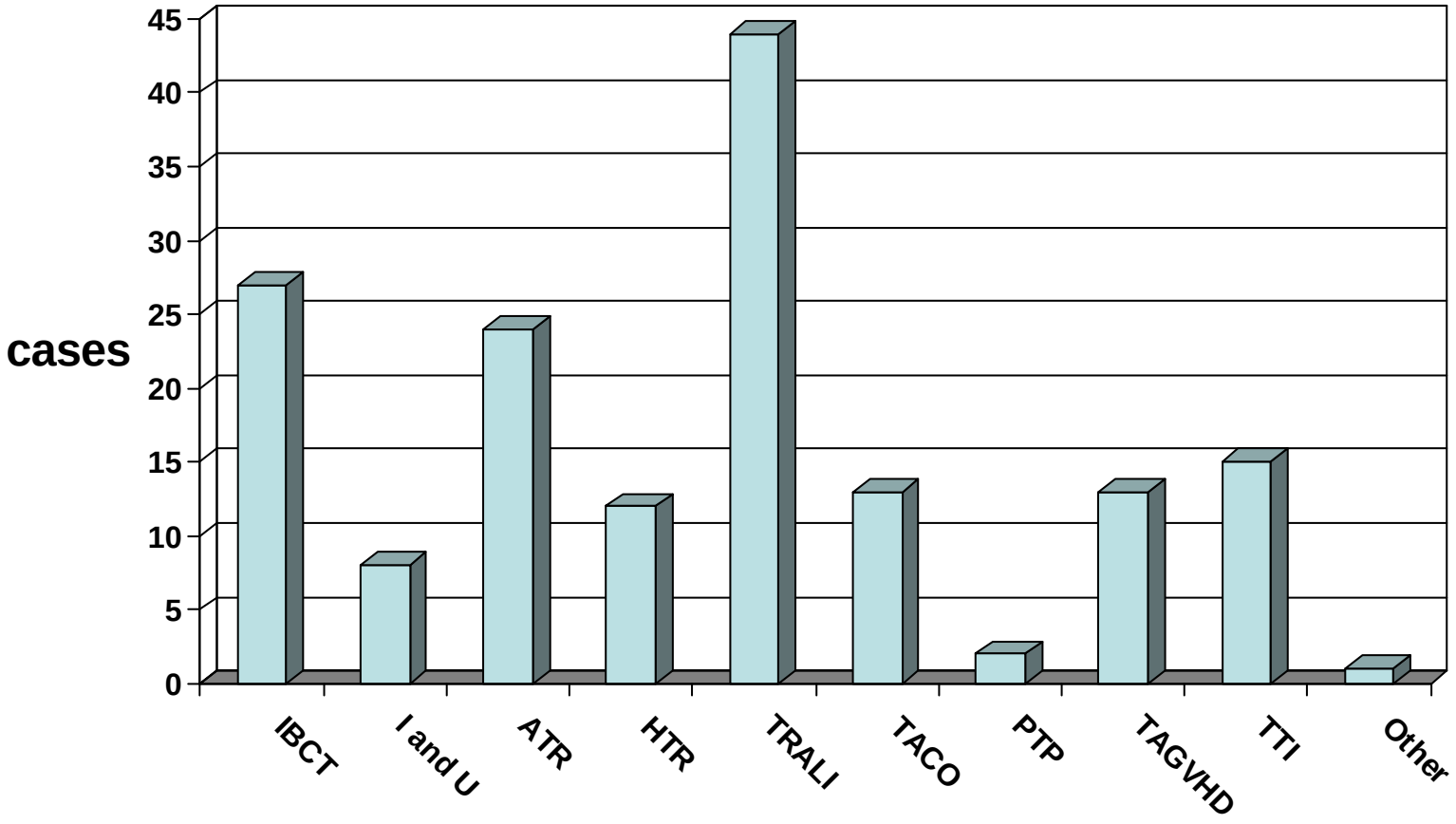
SHOT data from 2012



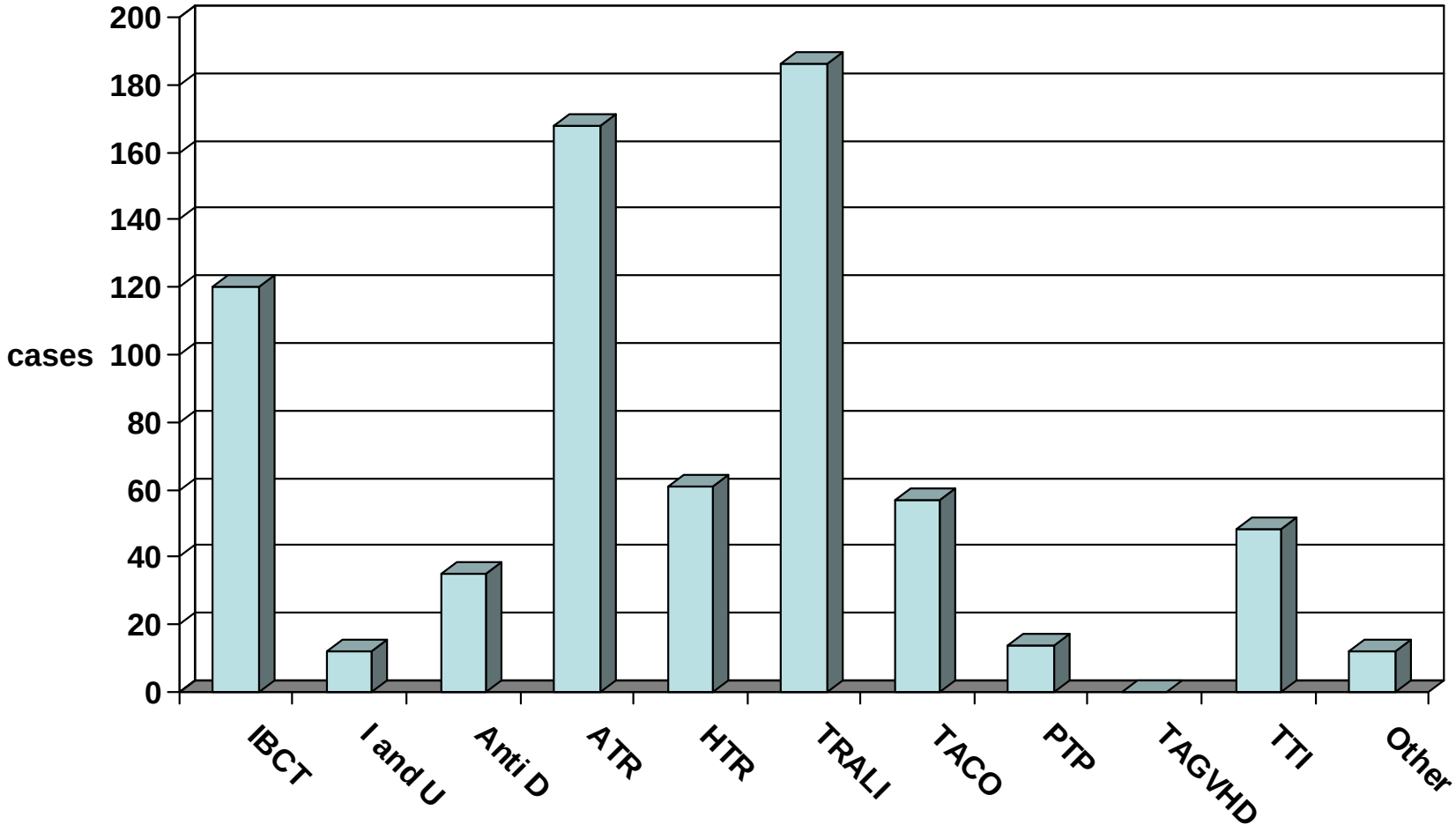
HSE	316	19.2%
ADU	146	8.8%
Anti-D	313	19.0%
IBCT	262	16.3%
TA-GvHD	1	0.1%
TTI	3	0.2%
PTP	1	0.1%
CS	11	0.7%
UCT	8	0.6%
TAD	19	1.2%
TACO	82	6.0%
TRALI	11	0.7%
ALLO	69	4.2%
HTR	42	2.6%
ATR	372	22.6%
TOTAL	**1645**	**100.0%**

☒ – *The number of cases for TA-GvHD and PTP are too small to be represented on this Figure 4.1.*

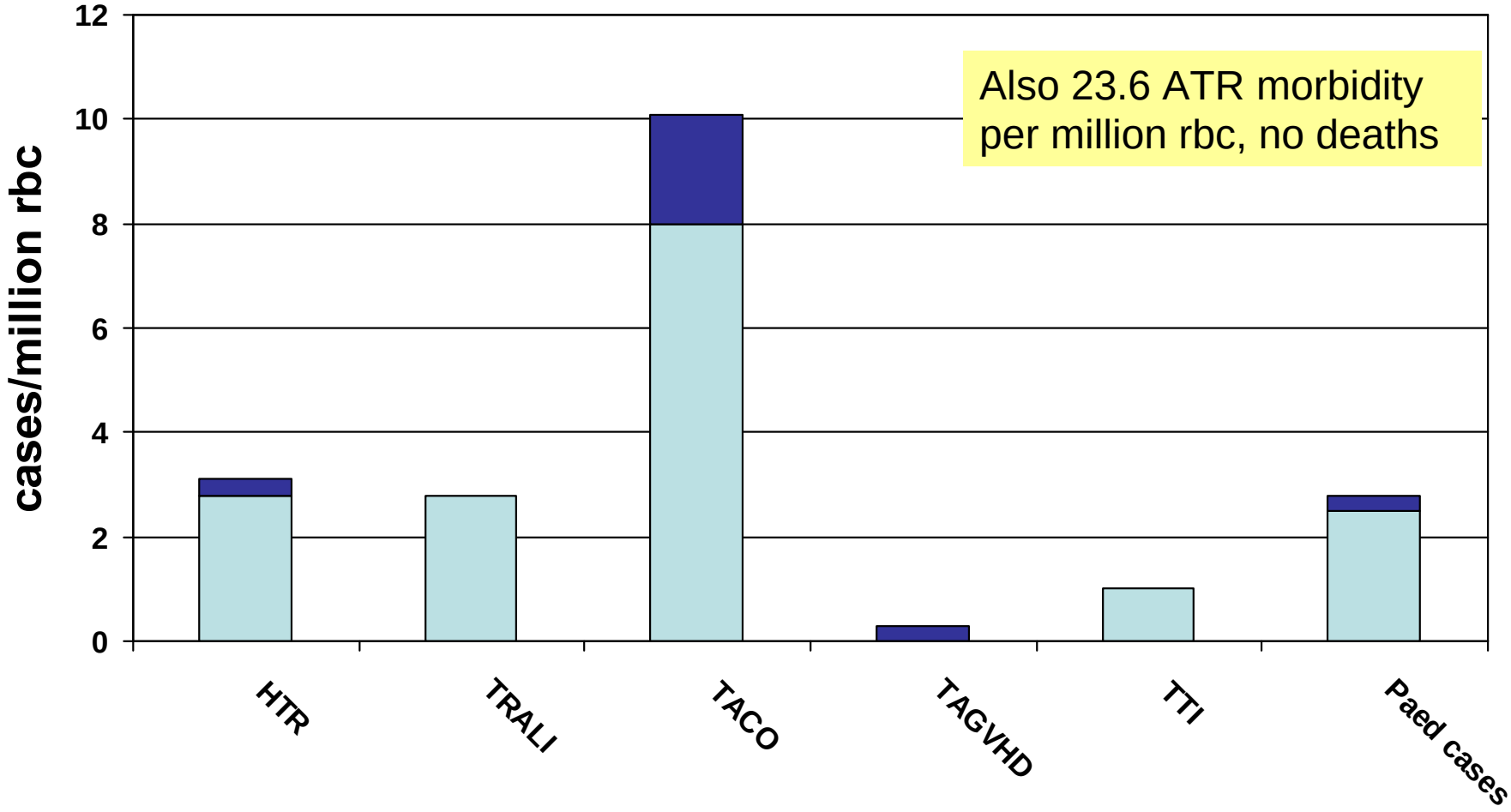
Cumulative mortality 1996-2011



Cumulative morbidity 1996-2011



Morbidity and mortality 2012

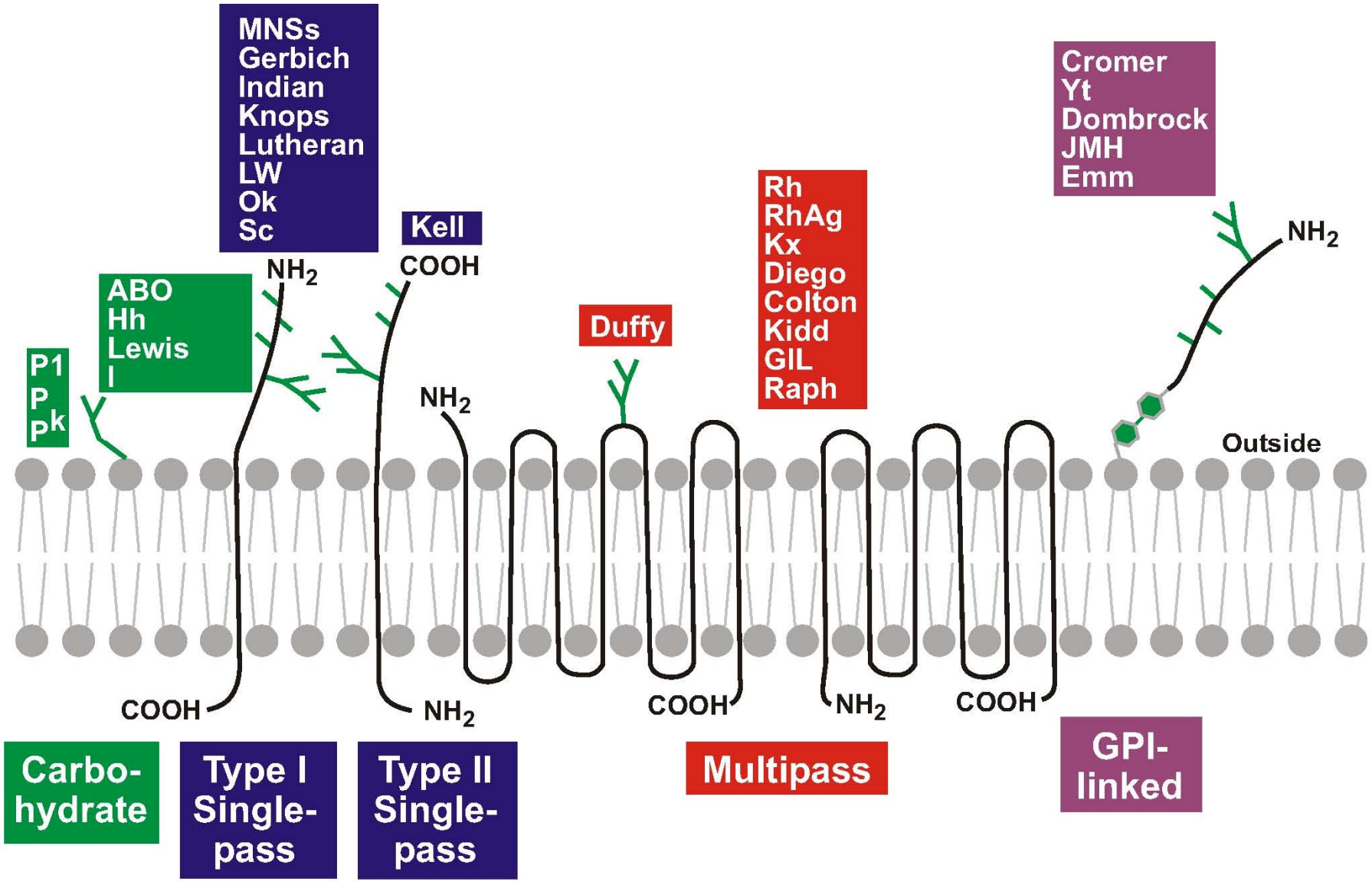


Red cell antibodies and antigens

Their role in transfusion mortality/morbidity

Antibodies and antigens

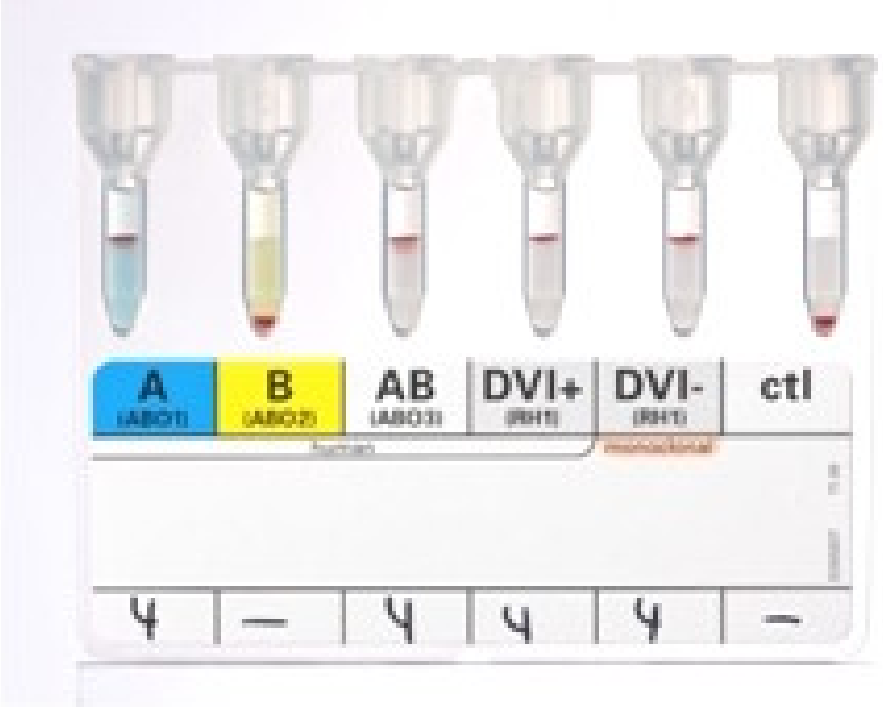
- An antigen is a biological substance capable of causing an immune response
- An antibody is a protein produced by B cells in the immune system to recognise and destroy foreign antigens such as bacteria or viruses-but can be stimulated by any antigen.
  - Some are naturally occurring-e.g. anti A and anti B
  - Some develop when the immune system encounters an antigen


MNSs
Gerbich
Indian
Knops
Lutheran
LW
Ok
Sc
Kell
ABO
Hh
Lewis
I
P1
P
Pk
Duffy
Rh
RhAg
Kx
Diego
Colton
Kidd
GIL
Raph
Cromer
Yt
Dombrock
JMH
Emm
NH2
COOH
Outside
Carbo-hydrate
Type I Single-pass
Type II Single-pass
Multipass
GPI-linked

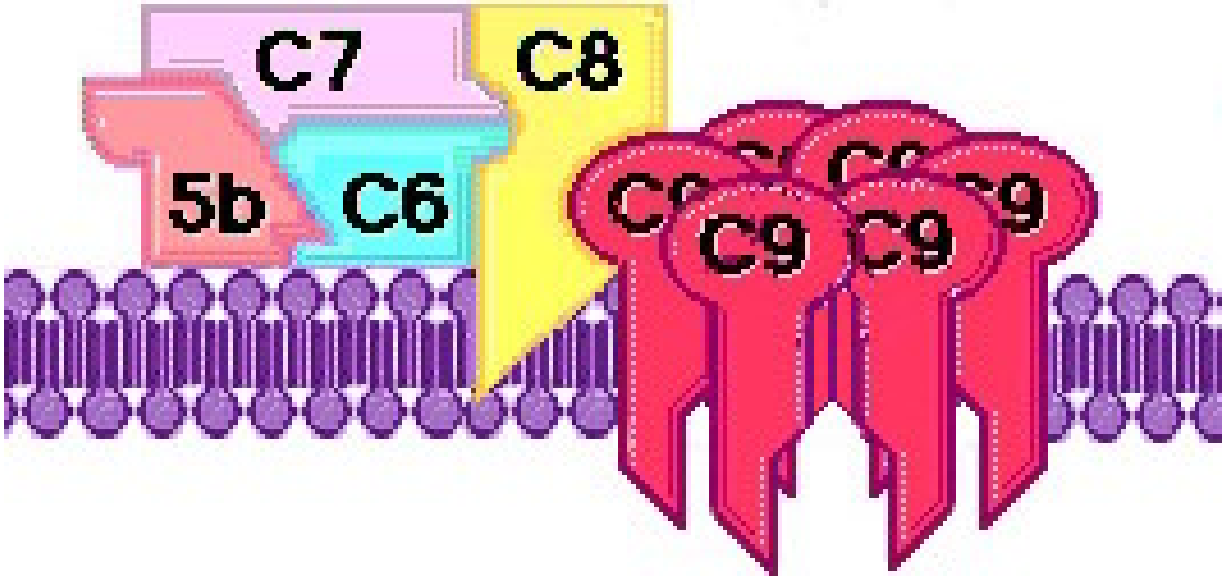
ABO antibodies

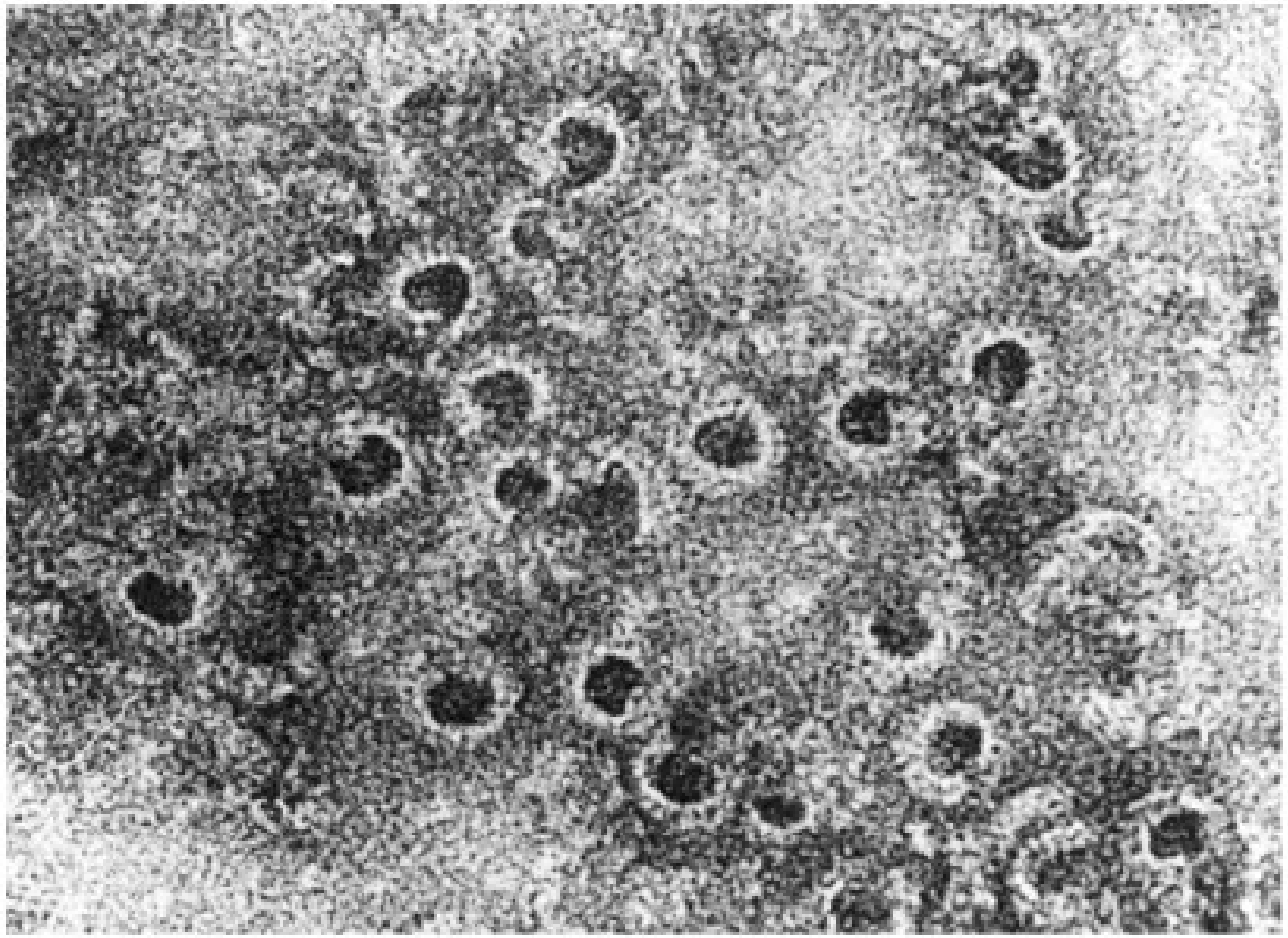
- Present without transfusion
- Large molecules
- Form complexes with complement
- Cause rapid intravascular haemolysis

ABO group	Antibodies
O	Anti-A and B
A	Anti-B
B	Anti-A
AB	None


A
(ABO1)
B
(ABO2)
AB
(ABO3)
DVI+
(RH1)
DVI-
(RH1)
ctl
human
monoclonal
+
—
+
+
+
—

The Membrane Attack Complex





Membrane attack complexes in
a red blood cell

ABO grouping

- ABO grouping is the most important test performed on pre-transfusion samples
  - Should be tested by forward grouping
    - Cells tested by anti A and B
  - And reverse grouping
    - Patients plasma against test red cells
- Rh typing
  - In most patients, anti D typing only is performed

Case history

- A patient due for MVR and CABG had transfusion sample taken in the pre-op clinic
  - Allegedly
- Grouped as A RhD pos
- Given 2 units in theatre, 2 in CCU
  - Hb fell
  - Bilirubin 241 micromol/L
- Extended stay in ITU

Continued

- Patient was actually O Rh Neg
- Sample transposition
- Wrong Blood in Tube
- North East study suggests approx 1 in 2000 samples is a WBIT
- Solutions?

Stand by me!

Two sample rule: BCSH guidelines 2013

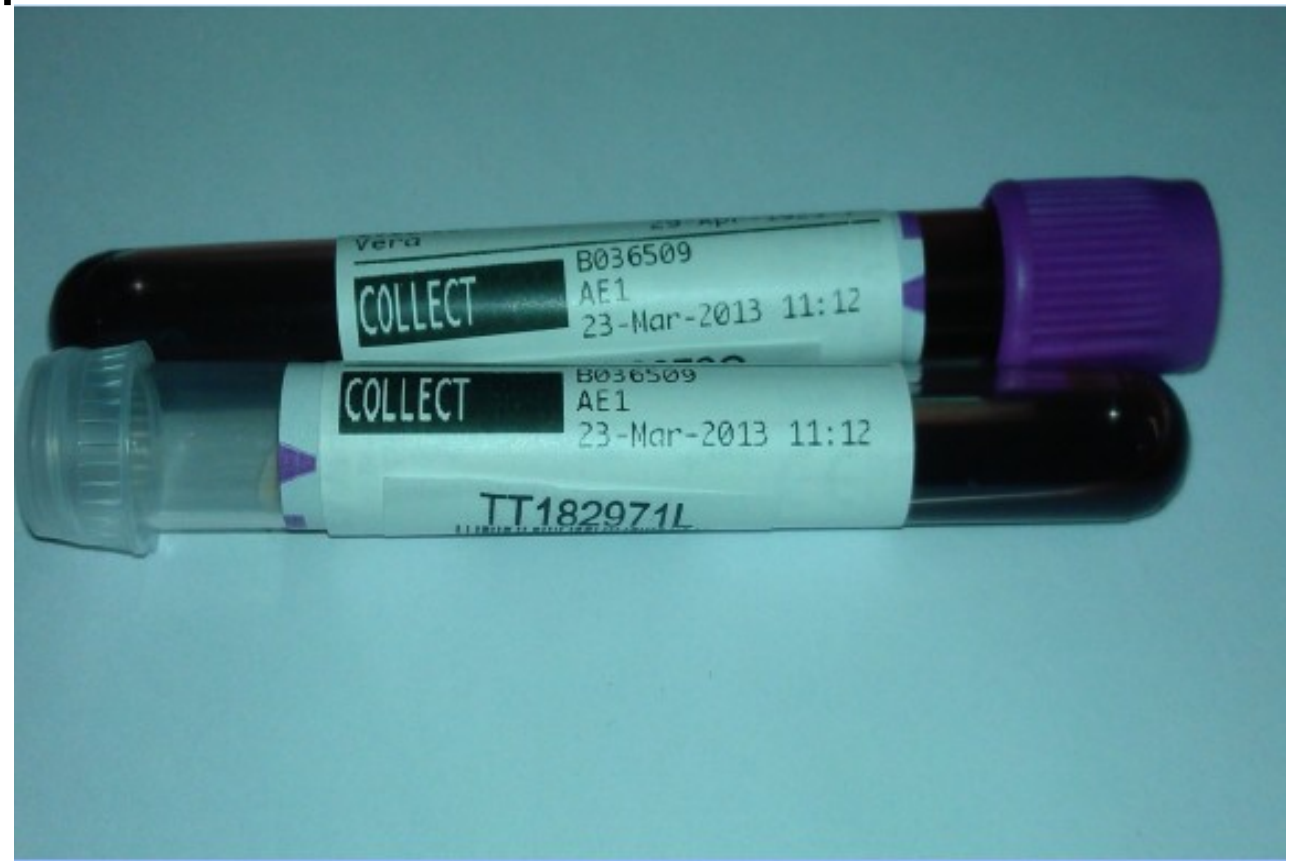
APPENDIX 7 REQUIREMENT FOR TWO SAMPLES FOR ABO/D GROUPING PRIOR TO ISSUE OF RED CELLS

This recommendation is based on the evidence from the BEST studies as referenced in 7.2, and on data from the IBCT and the Near Miss chapters in recent SHOT reports (SHOT, 1996–2010) – 386 cases of 'wrong blood in tube' (WBIT) were reported as near misses in 2010.

Whenever possible a second sample should be obtained. The urgency of the situation should always be considered, as delays in provision of blood could compromise patient outcome.

The “two sample rule”

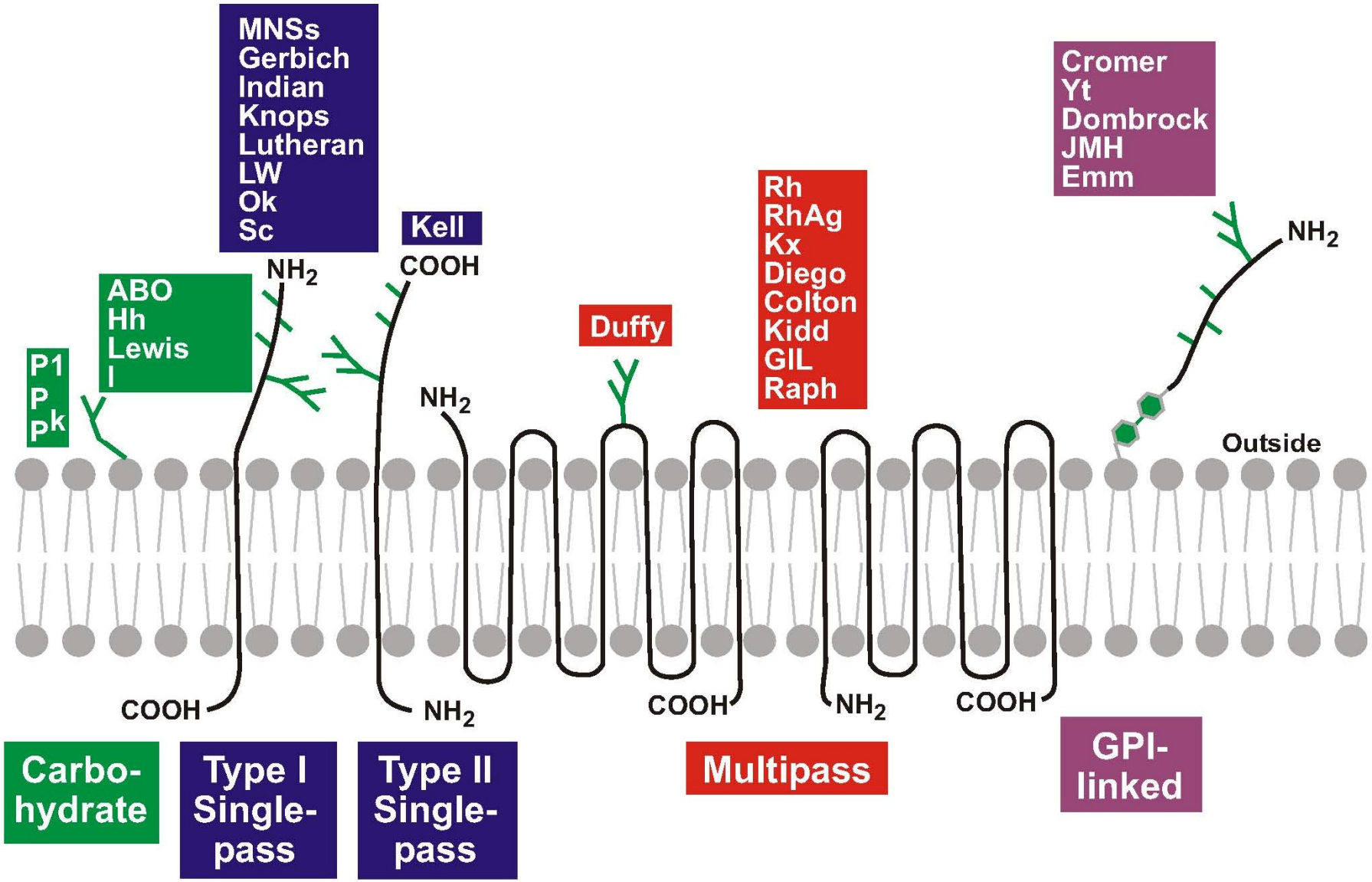
- What is wrong with this picture?



Other antibodies

Clinically important antibodies

- RH D, C, c, E. e
- Fy a and b (Duffy)
- Jk a and b (Kidd)
- Kk (Kell)
- And others


MNSs
Gerbich
Indian
Knops
Lutheran
LW
Ok
Sc
Kell
ABO
Hh
Lewis
I
P1
P
Pk
Duffy
Rh
RhAg
Kx
Diego
Colton
Kidd
GIL
Raph
Cromer
Yt
Dombrock
JMH
Emm
NH2
COOH
Outside
Carbo-hydrate
Type I Single-pass
Type II Single-pass
Multipass
GPI-linked

Rh and other antibodies

- Usually produced by exposure to foreign antigen: transfusion or maternal sensitisation by fetus
- May cause haemolysis, usually not as dramatic as ABO-induced
- But can be fatal
- Delayed haemolysis is a particular problem

How do we test for antibodies?

- The aim is to determine non-ABO antibodies likely to be of clinical significance
- Initially perform a screen
  - If positive, need further testing
- This enables the lab to select suitable units
- A positive initial screen means that there is a small risk that procedures may need to be delayed

A panel

	ABO	Rh	M	N	S	s	P_1	Lu^a	Lu^b	K	k	Kp^a	Kp^b	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b		Sal RT	IAT 37	
1	O	$R_1^wR_1$	+	+	-	+	+	-	+	+	+	-	+	+	-	+	+	+	+		0	5	
2	O	R_1R_1	+	-	+	+	+	+	+	-	+	-	+	-	+	-	+	-	+		0	5	
3	O	R_2R_2	+	-	-	+	+	-	+	-	+	-	+	-	+	+	-	+	-		0	5	
4	O	R_or	-	+	+	-	+	-	+	-	+	-	+	-	-	-	-	+	-		0	5	
5	O	r'r	-	+	+	-	-	-	+	-	+	-	+	+	-	+	-	+	+		0	5	
6	O	r''r	+	-	-	+	-	+	+	+	+	-	+	+	-	-	+	-	+		0	5	
7	O	rr	-	+	+	-	-	-	+	-	+	+	+	-	+	+	-	+	-		0	5	
8	O	rr	+	-	+	+	+	-	+	-	+	+	+	+	-	-	+	+	-		0	5	
9	O	rr	-	+	-	+	+	+	+	-	+	-	+	+	-	+	-	-	+		0	5	
10	O	rr	-	+	+	-	-	-	+	+	-	-	+	-	+	+	+	-	+		0	5	
		Auto																			0	5	

Case History

- A patient with bowel cancer and chronic anaemia presented with HB 67 g/L
- Transfused 5 units over 3 days, discharged with Hb 103g/L
- 11 days later presented with Hb 35 g/L
- Evidence of haemolysis: positive DAT, raised bilirubin and haemoglobinuria
- Patient had developed anti K

Delayed haemolysis

- Often presents 3-11 days (mean 9 days)
- Haemolysis may be less dramatic but the reaction can be fatal
- Patient forms a new antibody to an antigen on transfused red cells
- Destroys transfused cells
- Occasionally, can destroy patient's own cells
  - Hyperhaemolysis)
- Testing for the new antibody can be a problem and labs may need to send to reference centre for an eluate test

How to reduce this risk

- Appropriate transfusions always
  - Would this patient have been better managed with iron?
- Regular testing in multi-transfused patients

Sampling to reduce the risk of DHTRs

- Patients who require regular transfusions should have an extended phenotype performed
  - Full Rh DcCeE and K
- The sample should represent the patient's current immune status
  - If not transfused in last 3 months, sample "lasts" 3 months
  - If transfused in last 3 months, valid for 3 days only
    - Except in specific circumstances

Patients with antibodies

- Blood may be delayed
  - Reference lab work
  - In rare cases, difficulty finding compatible blood
- What is the likelihood you will need to transfuse?
- Cell salvage?

Minimise the risk of blood not being available

- Correctly timed samples
- Correctly labelled with form and tube having 4 key identifiers
- Look at “gold taps”
  - Do you need that blood to be CMV negative?
  - No! (usually)
- Communication with transfusion lab

How would you manage this case?

- 82 year old woman had chronic iron deficiency
- Hb 45g/L

How would you manage this case?

- 82 year old woman had chronic iron deficiency
- Hb 45g/L
- Transfused 4 units
  - Each over 2.5 hours
- Became hypoxic, dyspnoeic, tachycardia, rise in BP (200/99)
- Needed to be intubated, 2 days on ITU
- What is this likely to be?

Choose one

- TRALI
- Infection
- Haemolytic transfusion reaction
- TACO
- Unrelated to transfusion

Transfusion Associated Circulatory Overload

- Risk factors
  - ? Age
  - Co-morbidity
  - Size
- Do you think she could have been managed by iron treatment alone?

How can you help?

- Identify patients at risk
  - Co-morbidity
  - Short stature
- Optimise Hb if possible

Thanks

Any questions?