VOLUME - 15, ISSUE - 04, APRIL - 2026 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper | Transfusion Medicine

CLINICAL AND SEROLOGICAL SIGNIFICANCE OF ANTI-M ANTIBODY DETECTED DURING COMPATIBILITY TESTING: A CASE REPORT

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ABSTRACT

Background- Anti-M is an antibody of the MNS blood group system, most often naturally occurring and predominantly of the IgM class. It usually reacts at temperatures below 37°C and is generally considered clinically insignificant. However, when it demonstrates reactivity at 37°C and/or in the antiglobulin phase, it may become clinically relevant and complicate transfusion support. **Case Presentation-** A 41-year-old female patient scheduled for surgery underwent routine pre-transfusion testing. Her blood group was identified as B Rh(D)-positive. Antibody screening was positive, and crossmatching revealed incompatibility with multiple donor units. Further immunohematological workup, including antibody identification using reagent red cell panels, demonstrated a reaction pattern consistent with anti-M. The direct antiglobulin test and autocontrol were negative, supporting the presence of an alloantibody. **Results-** The antibody showed stronger reactivity at colder temperatures and weaker reactivity in the antiglobulin phase, suggesting anti-M with extended thermal amplitude. Based on serological findings, M antigen-negative red cell units were advised for transfusion support. **Conclusion-** This case emphasizes the importance of routine antibody screening and detailed serological evaluation in pre-transfusion testing. Although anti-M is frequently clinically insignificant, its detection remains important because it may interfere with compatibility testing and occasionally carry clinical significance.

KEYWORDS : Anti-M; MNS Blood Group System; Alloantibody; Antibody Screening; Compatibility Testing; Transfusion Medicine

INTRODUCTION

The MNS blood group system is among the most complex blood group systems and includes more than 40 recognized antigens. Of these, the M and N antigens are among the most frequently encountered in routine immunohematology. These antigens are carried on glycophorin A, a sialo glycoprotein located on the red blood cell membrane. Antibodies directed against these antigens, particularly anti-M, are occasionally identified during pre-transfusion testing and may present diagnostic and compatibility challenges.[1–3]

Anti-M is usually a naturally occurring antibody, often arising without prior red cell sensitization through transfusion or pregnancy. It is predominantly an IgM antibody and typically reacts best at room temperature or lower temperatures, particularly at 4°C. For this reason, it is usually considered clinically insignificant. However, anti-M may occasionally possess an IgG component or demonstrate reactivity at 37°C and/or in the antiglobulin phase, in which case it may become clinically important.[1–4]

Although most anti-M antibodies do not result in clinically significant hemolysis, they may interfere with compatibility testing and have been implicated in hemolytic transfusion reactions and, rarely, hemolytic disease of the fetus and newborn (HDFN).[4–6] Therefore, careful serological characterization is necessary to determine their relevance in transfusion practice.

We report a case of anti-M antibody identified during routine pre-transfusion compatibility testing in a female patient undergoing surgical evaluation, highlighting its serological features and transfusion implications.

Case Presentation

A 41-year-old female patient was admitted for planned surgical intervention and was referred to the blood bank for pre-transfusion evaluation in anticipation of possible intraoperative blood loss. There was no documented history of previous blood transfusion. No significant obstetric history suggestive of alloimmunization was elicited.

Clinical and Laboratory Details-

- Age/Sex: 41-year-old female
- Hemoglobin: 11.2 g/dL
- Indication for transfusion request: Anticipated intra-operative blood requirement
- ABO and Rh group: B Rh(D)-positive

During routine pre-transfusion testing, antibody screening was found to be positive, and cross match testing revealed incompatibility with multiple donor red cell units. This prompted further immunohematological evaluation.

Immunohematological Workup

ABO and Rh typing was performed by the conventional tube technique. Extended Rh and Kell phenotyping was carried out by column agglutination technology (CAT). The direct antiglobulin test (DAT) was performed using polyspecific and monospecific antihuman globulin reagents. Antibody screening was done using reagent screening cells by CAT, followed by antibody identification using a commercial red cell panel. Autocontrol was also performed.

RESULTS

ABO and Rh Typing

Forward grouping demonstrated strong agglutination with anti-B and anti-D. Reverse grouping initially showed discrepancy at room temperature, which resolved on incubation at 37°C. Final interpretation confirmed the blood group as B Rh(D)-positive.

Table 1. ABO and Rh Typing by Conventional Tube Technique

Test Phase	Auto Control	Anti-A	Anti-B	Anti-AB	Anti-D	A1 Cells	B Cells	O Cells	Interpretation
Room Temperature	0	0	4+	4+	4+	4+	2+	2+	Initial discrepancy
37°C	0	0	4+	4+	4+	4+	0	0	B Positive

Final Blood Group: B Rh(D)-positive

Table 2. Rh and Kell Phenotyping by Column Agglutination Technique

Antigen	C	E	c	e	K	Control
Result	4+	0	4+	4+	0	0

Table 3. Direct Antiglobulin Test

Test Type	Polyspecific AHG	Anti-IgG	Anti-C3d	Interpretation
DAT	Negative	Negative	Negative	No in vivo sensitization

Table 4. Indirect Antiglobulin Test

Method	Reagent Cells	AHG Phase Result	Interpretation
CAT	Pooled O Cells	2+ Positive	Unexpected antibody present

Antibody Screening

Antibody screening with commercial reagent red cells showed positive reactions with all screening cells.

Table 5. Antibody Screening

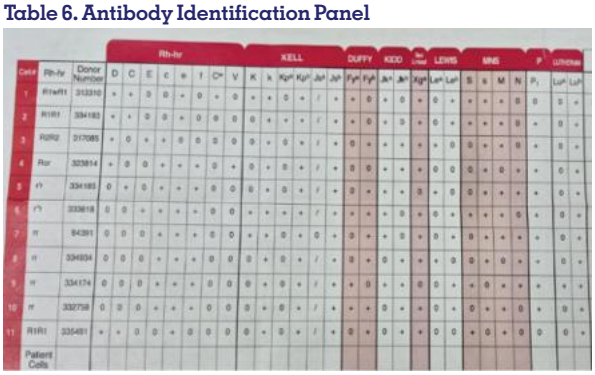
Screening Cell	AHG Phase	Interpretation
O I	2+	Positive
O II	2+	Positive
O III	1+	Positive

This screening pattern warranted further antibody identification.

Antibody Identification

Antibody identification using a commercial red cell panel revealed a reaction pattern compatible with anti-M. The antibody showed stronger reactivity at 4°C and selective reactivity at the AHG/37°C phase. The autocontrol was negative.

Table 6. Antibody Identification Panel



Cell No.	IS Phase	AHG/37°C Phase	4°C Phase
1	-	2+	4+
2	-	2+	4+
3	-	2+	4+
4	-	0	0
5	-	0	3+
6	-	2+	4+
7	-	0	4+
8	-	0	0
9	-	0	3+
10	-	2+	4+
11	-	2+	4+
Auto Control	-	0	-

Interpretation of Panel Findings-

The reaction pattern strongly supported the presence of anti-M antibody:

- Strong reactions (4+) with several cells at 4°C suggested reactivity with homozygous M-positive cells (M+M+)
- Moderate reactions (3+) with selected cells suggested heterozygous expression (M+N+)
- Non-reactive cells likely corresponded to M-negative (N+N+) cells

The overall pattern was consistent with dosage-dependent anti-M reactivity. Because of partial overlap in panel reactivity, coexistence of other low-frequency or clinically significant alloantibodies could not be excluded with absolute certainty; however, the predominant serological specificity was anti-M.

Management and Outcome-

In view of the serological findings, the patient was advised to receive M antigen-negative, AHG crossmatch-compatible red cell units if transfusion became necessary. Ultimately, transfusion was not required during the current admission. Nevertheless, the antibody identification was documented for future transfusion support.

DISCUSSION

Anti-M is an antibody directed against the M antigen of the MNS blood group system and is commonly encountered as a naturally occurring alloantibody. It is usually of the IgM class and often reacts optimally at room temperature or lower temperatures. In most instances, it is considered clinically insignificant because it does not react at 37°C or in the antiglobulin phase.[1–3]

However, anti-M is not always benign. In some patients, it may show a broader thermal amplitude, react at 37°C, or possess an IgG component. Under such circumstances, it may become clinically significant and complicate transfusion support. Several reports have described anti-M associated with hemolytic transfusion reactions and, less commonly, HDFN.[4,6,7]

In the present case, the antibody was detected during routine compatibility testing because multiple donor units were found to be incompatible despite ABO and Rh compatibility. The negative DAT and autocontrol helped exclude an autoantibody, while the antibody identification panel demonstrated a characteristic pattern of reactivity with M-positive cells and non-reactivity with M-negative cells. The stronger reactions observed at 4°C, along with weaker but definite reactivity at AHG/37°C, suggested anti-M with extended thermal amplitude.

An important serological feature of anti-M is its tendency to show dosage, reacting more strongly with cells homozygous for the M antigen than with heterozygous cells. This pattern was also evident in the present case and provided an additional clue toward antibody specificity.

From a transfusion medicine perspective, the clinical significance of anti-M depends not merely on its identification but also on its thermal characteristics and phase of reactivity. When anti-M reacts only at colder temperatures and is not demonstrable at 37°C or AHG phase, provision of routine crossmatch-compatible blood may often be sufficient. In contrast, when the antibody reacts at 37°C or in the antiglobulin phase, transfusion with M antigen-negative red cell units is generally preferred to ensure safety.[2,5,6]

This case reinforces the value of a systematic immunohematological workup in patients with unexpected antibody positivity. Even antibodies often considered clinically insignificant can interfere with compatibility testing and may become relevant in surgical, obstetric, or transfusion settings.

CONCLUSION

This case illustrates the importance of routine antibody screening and detailed antibody identification during pre-transfusion testing. Although anti-M is usually a cold-reactive and clinically insignificant antibody, it may present with broader thermal amplitude and create significant compatibility challenges.

Recognition of its serological pattern, exclusion of other alloantibodies, and provision of M antigen-negative, crossmatch-compatible red cell units are important to ensure transfusion safety. Careful documentation of such antibodies is also essential for future transfusion planning.

Conflict of Interest
The authors declare no conflict of interest.
Funding
Nil

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