

# Case Study: Identification of Anti-Yt<sup>a</sup> in a Recently Transfused Patient with Multiple Alloantibodies

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**Background:** The Yt<sup>a</sup> antigen is a high prevalence antigen that is expressed in 99.8% of all populations. The Yt(a-) phenotype is slightly more common in people of Israeli descent, at approximately 2% of the population. Yt<sup>a</sup> was discovered in 1956 and its antithetical antigen Yt<sup>b</sup> in 1964, leading to Yt being classified as an official blood group system. The function of the Yt<sup>a</sup> and Yt<sup>b</sup> antigens on red cells is currently unknown, but both are present on acetylcholinesterase (AChE), an important enzyme in neurotransmission.

Anti-Yt<sup>a</sup> is typically an IgG antibody, and in some cases presents as IgG subclass 4 (IgG4). It is capable of binding complement and is most effectively identified at the anti-human globulin (AHG) phase. Yt<sup>a</sup> is sensitive to thiol reagents, such as dithiothreitol (DTT) and 2-aminoethylisothiuronium bromide (AET). Yt<sup>a</sup> is destroyed by  $\alpha$ -chymotrypsin and is resistant to trypsin and acid treatment. There has been reported variability with proteolytic enzymes, such as papain and ficin, which is believed to be dependent on the IgG subclass of the antibody.

Though not typically considered clinically significant, it has been reported to cause accelerated destruction of transfused Yt(a+) red cells and has been implicated in acute and delayed hemolytic transfusion reactions. Due to the rarity of Yt(a-) blood, performing a monocyte monolayer assay (MMA) to determine whether a demonstrating anti-Yt<sup>a</sup> is predicted to cause overt destruction of transfused Yt(a+) red cells is recommended.

**Case Report:** A case presented of a 41-year-old Caucasian male admitted to the ED with a positive COVID-19 test, and bleeding from an open wound, with a Hgb of 6.6g/dl. The patient had been transfused 2 units of RBCs within 3 weeks of admission. A post-transfusion specimen was submitted to the Immunohematology Reference Laboratory (IRL) for antibody identification. Testing of the patient's serum in the IRL demonstrated variable 2+ to 3+ reactivity with all reagent red cells and 1+ with the autologous control at AHG with polyethylene glycol (PEG) enhancement. The direct antiglobulin test (DAT) reacted 1+ with anti-IgG. Since the patient had been recently transfused, a reticulocyte separation was performed to isolate patient cells from the multiple donor red cell populations contained in the specimen. The DAT and autologous control were non-reactive with the patient's reticulocytes, suggesting that the positive DAT was due to antibody bound to donor cells only, indicating the probability of an antibody to a high prevalence antigen. After a serological phenotype was obtained using the reticulocytes, the patient's serum was tested against phenotypically similar reagent red cells, which reacted 1+ at AHG with PEG enhancement. Due to the variability in reaction strengths between the phenotypically similar reagent red cells and the random reagent red cells, additional specificities were suspected. A series of allogeneic adsorptions using papain treated donor cells of known phenotypes were performed, and the unknown antibody to a high prevalence antigen was removed from the serum. An underlying Anti-c and Anti-K were identified with the adsorbed serum, while antibodies to additional common red cell antigens were ruled out.

The patient's neat serum was tested against a ficin treated panel and 3+ to 4+ reactivity at AHG demonstrated with all cells. The patient's neat serum was then tested against a 0.2M DTT treated panel, and an Anti-c specificity demonstrated 2+ at AHG with PEG enhancement. All c- cells demonstrated no reactivity after DTT treatment. A selected cell panel of high prevalence antigen negative cells that are resistant to ficin and sensitive to DTT was tested against the patient's neat serum, and 3 of 3 Yt(a-) c- K- cells did not react. The patient's reticulocytes were tested against a plasma containing Anti-Yt<sup>a</sup>, confirming the lack of Yt<sup>a</sup> antigen on the patient's cells and the patient's ability to form an allo-Anti-Yt<sup>a</sup>.

A rapid acid eluate was performed on the posttransfusion specimen. A panel of selected cells demonstrated 2+ reactivity in all cells at the AHG phase with PEG enhancement. A series of allogeneic adsorptions were performed, removing all reactivity, ruling out underlying antibodies to common red cell antigens. Since antibodies to antigens of high incidence cannot be ruled out with this technique, Anti-Yt<sup>a</sup> could not be confirmed in the eluate. Further testing was unable to be performed on the eluate due to insufficient specimen volume.

**Conclusions:** Anti-Yt<sup>a</sup> was identified using standard tube techniques, proteolytic enzyme treatment, thiol reagent treatment, and allogeneic adsorptions. MMA testing was recommended but declined by the hospital. Due to the scarcity of Yt(a-) donor red cells, the uncertainty of the clinical significance of this case of Anti-Yt<sup>a</sup>, and the patient's clinical condition, the hospital declined to transfuse.

**References:**

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