

Optical detection of red blood cells captured on biochips for RH1 compatibility control at the patient's bedside

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Every year, several millions of red cell concentrates are transfused. For each of them, a pretransfusional compatibility test is performed. In France, an ABO compatibility test at the patient's bedside is performed, but rhesus compatibility is not yet checked. However, rhesus antigens are very immunogenic and could lead to Rh incompatibility or Rh disease. Rh incompatibility occurs when a woman with Rh-negative blood type is exposed to Rh-positive blood cells. This exposure leads to the sensitization of the women who develop anti-Rh IgG. This immunization is one cause of the hemolytic disease of newborns (HDN). HDN results from an incompatibility between mother's blood and fetus' blood. It happens when fetal red blood cells (RBCs) present antigens inherited from the father but missing from the mother. Consequence of this incompatibility is the fetal RBCs destruction by mother's antibodies. Antibodies could be natural, like IgM anti-A or anti-B from the ABO system, or from an immunization. Rh incompatibility results from 2 main mechanisms. The first one is when a pregnancy Rh-negative woman is exposed to fetal Rh-positive RBCs. Rh incompatibility leads to anemia (mild to severe) or ultimately to the *in utero* death. The second occurs when Rh incompatible blood is transfused. This is the subject of this communication.

We previously develop biochips and optical device to realize automatic ABO compatibility test at the patient's bedside (Charrière et al., 2015; Wacogne et al., 2011a, 2011b). Based on this project, we develop another biochip based on selective blood capture. The designed chip specifically captures RBCs according the presence of the RH1 antigen (also known as D antigen) at their surface. The device drives the different fluids and performs optical detection of captured red cells. Here, we recall the biochips fabrication, the control of their efficiency using SPRi methods and we present their integration in the device and the system efficiency in terms of biochips specificity and optical detection limits.

Charrière, K., Rouleau, A., Gaiffe, O., Fertey, J., Morel, P., Bourcier, V., Pieralli, C., Boireau, W., Pazart, L., Wacogne, B., 2015. Biochip technology applied to an automated ABO compatibility test at the patient bedside. *Sens. Actuators B Chem.* 208, 67–74. doi:10.1016/j.snb.2014.10.123

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