

Influence of Magnetic Beads on StripAssays®

The influence of residual magnetic beads after DNA extraction from whole blood has already been demonstrated, and Fe³⁺ ions derived from magnetic microspheres may be present in the solution.¹ Depending on the coating of the beads, a potential interference with PCR might be the consequence. Commercial magnetic beads for nucleic acid separation can be coated with a multitude of matrices based on silica, porous glass, cellulose, agarose, polystyrene and silane.²

We investigated two types of magnetic beads, which are frequently used by customers of ViennaLab Diagnostics. Experiments included testing of the FMF-SAA1 StripAssay® (standard complexity) and the α-Globin StripAssay® (high complexity) with a dilution series from 0.001 to 3 µg/µl of magnetic beads in the reaction mix.

In summary, the performance of StripAssays® was unaffected within a concentration range of 0.001 to 0.1 µg/µl for both types of magnetic beads, but may be inhibited above 0.1 µg/µl. For safety, the lowest concentration observed for each of the magnetic beads tolerated by one of the StripAssays® was used to define the overall **critical concentration** for all other assays and **was determined to be 0.1 µg/µl**.

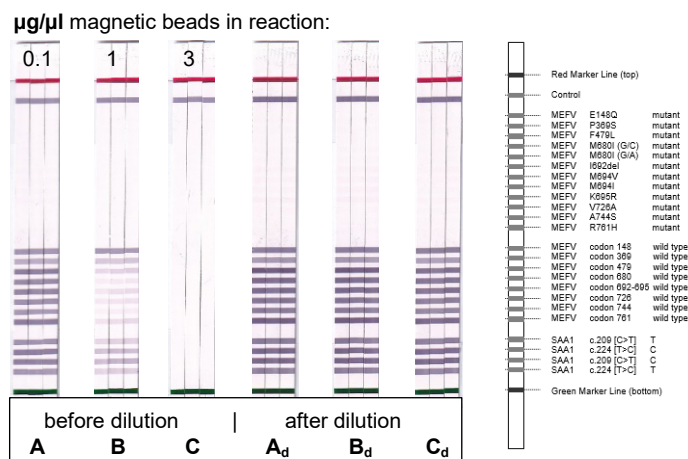


Figure 1: FMF-SAA1 StripAssay® results for a DNA sample containing magnetic beads at a concentration of 0.1 to 3 µg/µl (A, B, C). Shown are triplicates. Low signal intensity or complete drop-out of bands are visible at 1 and 3 µg/µl, respectively. A subsequent 1:5 dilution of the extracted DNA (5 ng/µl) leads to a successful amplification of targets (A_d, B_d, C_d) for these dilution steps.

To overcome potential problems with the interpretation of StripAssay® results under conditions, where a high concentration of residual magnetic beads is present, **extracted DNA should be diluted to 2 ng/µl** using PCR grade water (Figure 1). Subsequently, the **sample should be centrifuged for 5 min at 12,000 rpm** and the **supernatant should be used for PCR**.

Due to the multitude of different types of magnetic beads and extraction protocols, care should be taken when extrapolating our results to all products available on the market. However, the investigated products from two manufacturers showed a similar behaviour, which indicates that **at least certain types of magnetic beads can have an inhibiting effect on the performance of the StripAssays® at high or excessive concentrations**.

References:

[1] Spanová A, Horák D, Soudková E, Rittich B. Magnetic hydrophilic methacrylate-based polymer microspheres designed for polymerase chain reactions applications. J Chromatogr B Analyt Technol Biomed Life Sci. 2004 Feb 5;800(1-2):27-32. doi: 10.1016/j.jchromb.2003.09.010. PMID: 14698232.

[2] Berensmeier S. Magnetic particles for the separation and purification of nucleic acids. Appl Microbiol Biotechnol. 2006 Dec;73(3):495-504. doi: 10.1007/s00253-006-0675-0. Epub 2006 Oct 25. PMID: 17063328; PMCID: PMC7080036.