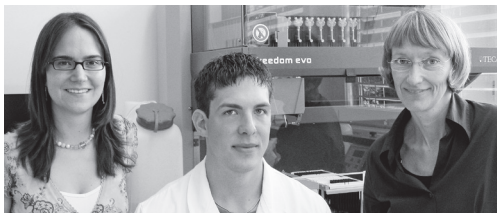
Liquid Handling with Robots



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Liquid handling robots are finding widespread use in the *in vitro* diagnostics field (IVD) and in the pharmaceutical and biotechnology industries. However, only in a few areas has the use of reusable pipetting needles became established, as carry over between samples must be strictly limited. Previously, no established procedure with a standardised method existed for determining the carry over from pipetting needles.

Development of Carry Over Analysis

The first goal of the project was to develop robust methods for accurate and reproducible quantification of carry over from standard pipetting needles in buffer and serum. As analyte, fluorescein was chosen and immunoglobulin G (IgG) and hepatitis B surface antigen (HBsAg) were selected as diagnostically relevant molecules. The standard test procedures for the quantification of carry over were established at the ZHAW and have been successfully implemented in the liquid handling systems of Hamilton Bonaduz AG, Sias AG and Tecan Schweiz AG.

Coated pipetting needles (at rear) and disposable tips (at front) integrated into a robot arm.

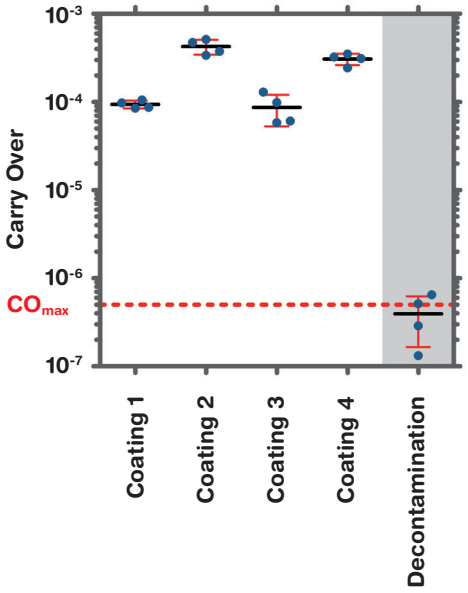
Minimising Carry Over

An additional goal was to minimise carry over from pipetting needles, so that the costly disposable tips can be replaced by reusable needles. Maximum allowable carry over values were defined for the analytes IgG and HBsAg, so that carry over causing false-positive samples could be excluded.

The pipetting needles and washing routines previously used had shown excessive analyte carry over. For this reason, ten new coatings were developed to minimise carry over (Surface Contacts GmbH, ZHAW). It was found that the carry over values required could not be achieved solely by varying the coating. Decontamination steps were then developed and optimised both in terms of the time required and the type of solution. By integrating the final decontamination routine, carry over could be reduced 10000-fold and the measured carry over was below the maximum allowable values.

Conclusions

Standard test procedures for measuring carry over were successfully established. This made it possible to test new coatings for pipetting needles and decontamination steps that brought the carry over below the required target values. The determination of IgG and HBsAg in serum is thus feasible with reusable pipetting needles. No significant carry over is involved, and the routines are high throughput compatible. In addition, the methods developed for measuring and minimising carry over can be readily transferred to customer-specific substances.



Reduction of carry over through decontamination: Coatings 1–4 resulted in carry over above the maximum value allowed (CO_{max}). Through decontamination carry over below CO_{max} was achieved (grey shaded).

Research project

Development of a Coated Pipetting Needle with Minimal Carry Over Behaviour

Leadership ZHAW:	Prof. Dr. Christiane Zaborosch
Project duration:	2 years
Partners:	Hamilton Bonaduz AG, Sias AG, Tecan Schweiz AG, Surface Contacts GmbH, NTB
Sponsorship:	Commission for Technology and Innovation CTI, Bern
Project volume:	CHF 878000.–