Process validation for removal of therapeutic antibodies from stainless steel surfaces

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Introduction

Cleaning efficiency has often been investigated for selected antineoplastic drugs such as antimetabolites, mitotic inhibitors, alkylating agents, antitumour antibiotics and platinum cytostatic drugs [1,2]. These studies did not investigate the removal of monoclonal antibodies (mAb). Since then, the number of mAb-based preparations has increased. Therefore, we analysed the cleaning efficiency using established cleaning procedures, including alcoholic and alkaline cleaning solutions.

Material and Method

Stainless steel planar surfaces (200 cm^2) were contaminated with a mixture of selected antibody-containing drugs (bevazizumab, rituximab, trastuzumab, daratumumab, cetuximab and omalizumab). Process cleaning validation (n = 4) was performed using Schülke & Mayr perform® sterile 70% isopropanol (IPA), 0.05 M sodium hydroxide (NaOH), 0.1 M NaOH and perform® sterile 2% Mucasol solution in single-step or combined cleaning procedures. Schülke & Mayr perform® sterile mix dry wipes soaked with 300% (w/w) cleaning solution were utilized. After cleaning, wipe sampling and liquid chromatography-mass spectrometry (LC-MS/MS) were performed to analyse the residual surface contamination as described by Reinders et al. [3].

Results and discussion

A regularly performed single cleaning step with 70 % IPA results in an average cleaning efficiency of 67%. Alkaline solutions used in the single cleaning step give mean cleaning efficiencies of >95% (0.05 M NaOH) and >97% (Mucasol 2%, 0.1 M NaOH). A combined two-step cleaning procedure using an alkaline solution (Mucasol 2% or 0.1 M NaOH) and 70% IPA gives slightly better results with an overall cleaning efficiency of over 98%. The widely used method of cleaning three times with an alkaline and an alcoholic solution, which is recommended for the decontamination of cytostatic drugs, is also very suitable for the decontamination of monoclonal antibodies with an efficiency of over 99%.

Conclusion

The successful process validation shows unexpectedly that 70% IPA is not efficient and the use of alkaline cleaning agents is also necessary for monoclonal antibodies. Provided that no unintentional release of substances has taken place, we recommend for cytostatic drugs as well as monoclonal antibodies the same cleaning procedures. Daily cleaning should be performed with 70% IPA once or twice and a basic cleaning procedure should be carried out once with an alkaline solution and at least once with 70% IPA weekly. Decontamination after spillage has to be performed with at least three cleaning steps with an alkaline cleaner followed by three cleaning steps with 70% IPA.

References

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