Capillary Zone Electrophoresis method for the determination of Adenovirus particles in vaccine

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A wide variety of analytical and biological methods are required to characterize the quantity and quality of virus throughout the production process to ensure the safety, efficacy and quality of the virus vaccines. Typical characteristics of Capillary Electrophoresis (CE) are fast separations, low sample volumes, qualitative analysis with good precision and accuracy and a wide range of applications. Additionally, CE has the advantage to be able to analyse under native conditions and the potential to directly inject a wide range of sample matrices.

An analytical quality by design (AQbD) approach was embraced for the development of a CZE method for the quantification of intact virus particles. With CE, the intact adenovirus particles were separated from sample matrix components such as cell debris, residual cell DNA, proteins, and/or salts. The background electrolyte (BGE) composition, analysis time, and sample pretreatment were optimized using a full factorial design of experiments. BGE additives, capillary temperature, the use of a coated capillary and capillary conditioning were investigated and proved vital to reduce virus adsorption, particulate matter and carry-over, and to allow long series of measurements.
The method was validated for the quantification of intact adenovirus particles for samples from downstream and upstream processing. The intact adenovirus particle concentrations obtained by CE were overall equivalent to those obtained by quantitative polymerase chain reaction (qPCR), although the CE method showed better precision (RSD < 6%) than anion-exchange HPLC and qPCR (10 – 25% RSD). Additionally, analysis times were much shorter with CE than with qPCR, allowing analysis of 30 samples in less than 4 h. CE proved highly useful for process development support and is implemented for in-process control testing for adenovirus vaccine manufacturing.

Biography:
Assoc Prof Dr Cari Sänger – van de Griend is owner and director of Kantisto BV, an analytical pharmaceutical chemistry consultancy that she started after more than 20 years working in the pharmaceutical industry (Astra Pain Control, AstraZeneca, Solvay Pharmaceuticals, Abbott). Cari received her MSc form Leiden University and her PhD and Habilitation from Uppsala University.
In her spare time, Cari is Associate Professor Analytical Pharmaceutical Chemistry at Uppsala University and supervises industrial and academic PhD-students. She is visiting professor at the Jagiellonian University of Krakow spring 2021. Cari's volunteer roles also comprise Director and Board member of CASSS and President of the Section Analytical Chemistry of the Dutch Royal Society of Chemistry. Currently, she chairs the European Pharmacopoeia CE working party.

Cari has trained and supervised many students, and has organized, chaired and lectured at international symposia, trainings and short-courses for over 25 years. Cari's focus is primarily on implementation, knowledge transfer and good working practices. Although employed in industry, Dr Sänger – van de Griend published 41 papers and book chapters (h-index 20, i10-index 27) and several online columns and webinars. Her "CE Solutions" series at www.kantisto.nl are well read. Cari received the *CASSS CEPharm Award 2015* for sustained and significant contribution to the practical application of Capillary Electrophoresis to the analysis of biotechnology and pharmaceutical products. Quotes from the award committee: "Cari advocates tirelessly for scientifically sound CE method development and for the use of CE to ensure the quality of pharmaceutical products. She enabled acceptance of CE in the pharmaceutical industry and provides essential input to the community by teaching and otherwise sharing knowledge."