



Application Note AN-V-057

Thiomersal in eye drops

Voltammetric determination of preservative in vaccines and various pharmaceutical and cosmetic solutions

Thiomersal (also called thimerosal) is a mercury containing organic molecule that has been widely used as preservative for vaccines and eye drops. Other applications of this substance have been for ear drops, storage and cleaning solutions for contact lenses, and in tattoo inks. It is very effective, even in very low concentrations, against a wide range of microorganisms and viruses.

To reduce the risk for consumers the maximum concentration of mercury in the products is limited by

the authorities. Typical limit values in the European Union are 0.007% (as Hg) in eye products (EU Commission Regulation 1223/2009) or up to 25 µg thiomersal per vaccine injection dose if vaccines are distributed in multi-vaccine containers.

Polarography or voltammetry can be used to accurately determine the concentration of thiomersal in vaccines or other cosmetic and pharmaceutical solutions (such as eye drops). The method is simple to perform, specific, and free of interferences.

SAMPLE

Vaccine against diphtheria, tetanus, pertussis

EXPERIMENTAL

The sample and the supporting electrolyte are pipetted into the measuring vessel. The determination of thiomersal is carried out with an 884 Professional VA using the parameters specified in Table 1. The concentration is determined using external calibration with a calibration curve recorded from five standard concentrations.



Figure 1. 884 Professional VA.

Table 1. Parameters for voltammetric analysis of thiomersal in vaccine

Parameter	Setting
Working electrode	HMDE or DME
Mode	DP – Differential Pulse
Deposition	none
Start potential	-0.2 V
End potential	-0.6 V
Peak potential thiomersal	-0.45 V

ELECTRODES

- Working electrode: Multi-Mode Electrode pro with standard glass capillaries
- Reference electrode: Ag/AgCl/KCl (3 mol/L) reference electrode with electrolyte vessel.
Bridge electrolyte: KCl (3 mol/L)
 - Auxiliary electrode: Platinum rod electrode

RESULTS

The determination of thiomersal can be carried out in a simple and straightforward manner with voltammetry. The method is selective and free of interferences.

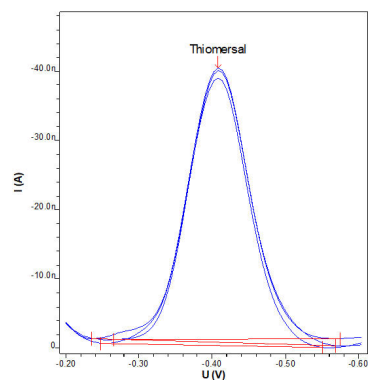


Figure 2. Determination of thiomersal in vaccine sample.

Table 2. Results of the thiomersal determination with the 884 Professional VA

Sample	Thiomersal [mg/L]
DTP vaccine	102

Internal reference: AW BR4-0002-072011

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CONFIGURATION



884 Professional VA manual for Multi-Mode Electrode (MME)

884 Professional VA manual for Multi-Mode Electrode (MME) is the entry-level instrument for high-end trace analysis with voltammetry and polarography with the Multi-Mode Electrode pro or the scTRACE Gold or the Bismuth drop electrode. The proven Metrohm electrode methods in combination with a high-performance potentiostat/galvanostat and the extremely flexible viva software open up new perspectives for the determination of heavy metals. The potentiostat with a certified calibrator readjusts itself automatically before each measurement, thus guaranteeing maximum precision.

Determinations with rotating disc electrodes can also be performed with the instrument, e.g. determinations of organic additives in electroplating baths with "Cyclic Voltammetric Stripping" (CVS), "Cyclic Pulse Voltammetric Stripping" (CPVS), and chronopotentiometry (CP). The replaceable measuring head enables rapid changes between the various applications with different electrodes.

The **viva** software is required for control, data collection, and evaluation.

The 884 Professional VA manual for MME is supplied with extensive accessories and a measuring head for the Multi-Mode Electrode pro. Electrode set and **viva** license need to be ordered separately.



VA electrode equipment with Multi-Mode Electrode pro for Professional VA instruments

Complete electrode set for polarographic and voltammetric determinations. Includes Multi-Mode Electrode pro, reference electrode, platinum auxiliary electrode, measuring vessel, stirrer, electrolyte solution and additional accessories for setting up and operating the Multi-Mode Electrode.