4. Influence of Sterilization and Temperature Changes
on the in vitro Characteristics of the pH Electrode

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Summary. 1. When chemical sterilization (with Korsolin or Cidex) is performed, a minimal duration of sterilization of 3 h is required for asepsis.

2. Duration of Korsolin sterilization up to 3 h does not influence the in vitro characteristics of the pH-electrode.

3. Sterilization with formaldehyde (24 h, 40°C) is save, but needs another 24 h restabilization time of the electrode.

4. The temperature dependence of the pH-electrode is minimal. With increasing temperature a slight decrease of pH measurement can be found (−0.02 pH units from 20–40°C).

Key words: Sterilization of pH-electrode – Temperature dependence of pH-electrode.
When using the tissue pH electrode from ROCHE, an adequate freedom from germs in the material employed must be ensured. This is especially important since the method is invasive and there is special danger to the fetus sub partu because of its topography. Problems associated with sterilization are storage of the sterilized electrode and restabilization of electrodes after sterilization.

Methods

The following methods of sterilization are suggested in the ROCHE manual:

Chemical Methods with Citex and Korsolin: These have the advantage that the electrodes can be used immediately after the procedure. This form of sterilization can be applied to electrodes filled with reference solution.

Gas Sterilization: (1) using formaldehyde and (2) using ethylene oxide gas. In this method, the electrode dries out and must be restabilized for 24 h before it can be used again. Electrodes cannot be autoclaved without destroying them.

We tested the effect of Korsolin and formaldehyde vapor sterilization on electrodes with a defined bacterial contamination.

A total of three electrodes were contaminated with beta-streptococci and Escherichia coli bacteria and placed in 4% Korsolin solution for 15, 30, 45, 60, 120, and 180 min. The results of the test are shown in Table 1. No effect on the test strain is found after 15 min. After 1 h one of the three electrodes still showed contamination with E. coli, the beta-streptococci can no longer be demonstrated already after 30 min what may be a suppression effect of E. coli. Only after 180 min can bacterial growth no longer be detected on all three electrodes tested. On sterilization with formalin at 40° C for 24 h, no beta-streptococci and no E. coli bacteria were demonstrable.

It was shown that the electrode must be sterilized for at least 3 h in Korsolin in order to obtain freedom from bacteria. The electrode can be used immediately afterwards.

In formalin sterilization, however, which is very certain from a bacterial point of view, the electrode must be restabilized for 24 h before it can be used again.

The next question was whether the Korsolin bath can affect the quality of measurement on electrodes. We examined the accuracy of the electrodes at pH 7.00 and pH 7.40 after various times of exposure to Korsolin.

Results

The results are shown in Figure 1. An effect on the accuracy of measurement due to Korsolin cannot be detected after sterilization time up to 3 h. Even after formaldehyde sterilization, the electrode measures accurately after subsequent restabilization.

In addition to these sterilization procedures, we tested the accuracy of measurement of the electrode at various temperatures. For this, we used the buffer 7.00 and 7.40 of the firm Hoffmann-LA ROCHE measured at 21° C and two phosphate buffer solutions which we prepared ourselves according to the method of McGilvaine pH 7.15 at 37° C and pH 7.24 at 37° C.

The results of this test series are shown in Figure 2. As expected, increasing temperature leads to a falling pH. According to the ROCHE manual, a pH alteration of 0.036 pH units is to be taken into consideration when the temperature is raised from 22—37° C. In our measurement, we found an average deviation of —0.02