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MICROBIOLOGICAL METHODS FOR MARINE POLLUTION MONITORING (WHO/UNEP JOINT PROJECT, MED POL PHASE II)

Summary Report on the Sixth WHO Training Course and Intercalibration Exercise

Tunis, 20–25 September 1993

ABSTRACT

The course was organized in collaboration with the Institut Pasteur de Tunis and attended by 19 microbiologists from 6 Mediterranean countries. Participants determined concentrations of the main bacterial indicators, as well as *Salmonella* and *Staphylococcus* in seawater samples. Results showed variations both between methods used and individual readings. Recommendations were made for further studies on methods.

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TARGET 20
WATER QUALITY

By the year 2000, all people should have access to adequate supplies of safe drinking-water, and the pollution of groundwater sources, rivers, lakes and seas should no longer pose a threat to health.

Keywords

ENVIRONMENTAL HEALTH
ENVIRONMENTAL MONITORING
WATER POLLUTION
SEAWATER
ENVIRONMENTAL MICROBIOLOGY
MICROBIOLOGICAL TECHNIQUES

Introduction

Under the terms of the 1976 Convention for the Protection of the Mediterranean Sea against Pollution, and the 1980 Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources, the contracting parties have undertaken to establish a marine pollution monitoring system for the Mediterranean Sea area, and systematically to assess, as far as possible, the levels of pollution along their coasts.

To facilitate the achievement of these objectives, the Long-term Programme of Pollution Monitoring and Research in the Mediterranean Sea (MED POL Phase II) has assisted in the development of national pollution monitoring programmes in Mediterranean countries, which include the determination of bacterial concentrations in coastal recreational areas and, where applicable, shellfish-growing areas. As a result, several existing microbiological laboratories have been upgraded and new ones established. This has resulted in the need for more trained personnel as well as for harmonization of methodologies between the different institutions in the various countries to ensure comparable results and to enable regular Region-wide assessments to be performed.

Five training courses have been held since the start of the series in 1988. This course and exercise, the sixth in the series, was convened jointly by WHO and the United Nations Environment Programme (UNEP) in collaboration with the Institut Pasteur de Tunis, Tunisia. Nineteen participants from six Mediterranean countries attended this course and intercalibration exercise. Most of them were microbiologists engaged in monitoring the microbiological quality of coastal marine recreational and shellfish waters. The Institut Pasteur de Tunis organized the technical aspects of the course and provided the laboratory facilities and supervision. The course was in French, and its objectives were:

- to further train microbiological laboratory personnel from Mediterranean institutions participating in the MED POL Phase II programme, by instructing them in jointly agreed methodologies for determining the main bacterial parameters in seawater and shellfish;
- to contribute to the building-up of a nucleus of trained personnel in Mediterranean countries capable of organizing microbiological courses at national or local level;
- to promote contacts between scientists from different laboratories, through discussion on mutual problems in the application of the relevant microbiological techniques;

- to improve comparability of results obtained in the microbiological component of the MED POL programme, through the intercalibration of data;
- to make recommendations for future training courses.

During the opening session, prior to the commencement of the laboratory work, a lecture on the control of microbiological pollution of coastal recreational waters was given by Professor L. Villa of the High Institute of Public Health, Rome, Italy.

Results

The participants determined the concentrations of three major bacterial indicator organisms (total coliforms, faecal coliforms and faecal streptococci) in prepared samples of natural seawater, in the case of the latter two using both the membrane filtration culture (MF) method and the most probable number (MPN) method. In the case of total coliforms, only the MPN method was used. They also determined concentrations of *Staphylococcus aureus* in seawater samples, using both the MF and MPN methods, and isolated *Salmonella*, also from seawater samples.

The results obtained during the laboratory exercise varied, both between individual participants and between the two methods (MF and MPN) used for the same bacterial parameter by each participant. Counts obtained by the MPN method were generally higher than those obtained by the MF method. The results obtained by two of the participants could have been considered apart, owing to their relative inexperience with a number of the techniques used. However, the results obtained by the other participants, most of whom had extensive experience in the microbiological analysis of seawater, also varied. This outcome was similar to that of previous courses, although the range of variation was below the general average, probably through efforts made by the organizers to reduce sample heterogeneity to the minimum possible.

Analysis of the overall results for indicator bacteria showed that in the case of moderately polluted samples, results for the MF and MPN methods were comparable. This, however, was not the case with faecal coliform counts of highly polluted samples. For faecal streptococci, the MF method was considered to be more precise. In the case of *Staphylococcus aureus*, the two techniques (MF and MPN) were not comparable.

Recommendations

The participants did not make any formal recommendations. During informal group discussions, however, most of them proposed that such courses should be held as frequently as possible and that individual participants should have the opportunity to attend more than one course. The general feeling was that, apart from providing updated knowledge of laboratory techniques, the courses served another important function, as they brought people from different institutions and countries into personal contact.

A number of participants had problems with the determination of gas production in Durham

tubes, and felt this should be better explained in updated versions of the recommended methods. There was also a problem with the Litsky medium. In the case of *Salmonella*, it was observed that a 24-hour enrichment on the Rappaport medium gave better results than the 48-hour one, and participants suggested that comparative studies should be carried out. For *Staphylococcus aureus*, it was suggested that, as the recommended MF method used the Baird Parker medium, which was non-selective, a study on the possible introduction of a confirmatory test (such as the coagulase test) should be carried out. Similarly, the M-*Staphylococcus* medium used in the MPN method should be studied further.