

**Caspian Environment Programme – Caspian Regional Thematic Centre
'Human Sustainable Development and Health'**

**Report on World Health Organisation Training Programme – recreational
water monitoring, held in Turkmenbashi April 31st-May 4th 2001**

**Course delivered by Dr. Stephen Pedley and Dr. Kathy Pond, Robens
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As part of the Caspian Environment Programme, an International workshop on recreational water and beach quality issues was held in the Turkmenbashi region of Turkmenistan. The primary aim of the workshop was to promote a new protocol for health-based monitoring of recreational waters which would lead to a classification system for bathing beaches. The course ran for five days and had a bias towards practical work to ensure that participants were comfortable with the use of the equipment provided for the pilot projects and with the methodology. Participants spent some time familiarising themselves with sampling methods and analytical techniques that will be applied during the pilot project.

Objectives

- To provide background information on health-based monitoring for recreational waters.
- To provide basic field and laboratory training to analyse water quality.
- To set up a pilot project in Turkmenistan, Azerbaijan and Iran to monitoring recreational waters according to the protocol established by the World Health Organisation.

Background

Recreational waters generally contain a mixture of pathogenic and non-pathogenic microbes. These microbes may be derived from sewage effluents,

the recreational population using the water (from defaecation and / or shedding), livestock, industrial processes, farming activities and wildlife. In addition, recreational waters may also contain truly indigenous pathogenic micro-organisms. This mixture can present a hazard to the bather where an infective dose of a pathogen colonises a suitable growth site in the body and leads to disease.

Regulatory schemes for microbiological quality of bathing waters have been largely based on percentage compliance with faecal indicator counts. However, there are a number of constraints to these approaches, such as:

- Management actions can only be retrospective and instigated after human exposure to the hazard
- In many situations, the risk to health is mainly from human excreta, but the traditional indicators of faecal of faecal pollution are also derived from other sources.
- There is poor interlaboratory and international comparability of microbiological analytical data.
- While beaches are classified as either safe or unsafe, there is in fact a gradient of increasing variety and frequency of health effects with increasing faecal pollution of human and animal origin.
- Regulation tends to focus on sewage treatment and outfall management as the main, or only, effective interventions. However, costs to implement such strategies may be prohibitively high and detract resources away from greater public health priorities such as securing safe access to drinking water supplies.

The World Health Organisation (WHO) recognises these limitations and has developed a monitoring scheme or Protocol that combines microbiological testing with broader data collection concerning sources and transmission of pollution (sanitary survey). This scheme leads to a recreational water environment

classification based on long-term analysis of data, and immediate actions to reduce exposure.

The analysis uses the membrane filtration technique to filter water samples, which is not widely used in the Caspian Region at present. This technique is however commonplace throughout Western Europe, the United States and other parts of the World.

The proposed WHO Protocol is currently being trialed in a number of regions world-wide. Concurrently with the development of this Protocol the European Commission (EC) are revising the EC bathing water Directive (76/160/EEC) and it is expected that this will follow the same approach that World Health Organisation has developed, i.e. a risk-benefit approach to management of bathing waters. It is also expected that the EC standards will be modified to include a standard for faecal streptococci, as recommended by World Health Organisation (currently there is no mandatory standard for faecal streptococci set by the EC). The WHO and the European Commission recognise that it is important to standardise techniques if water quality results are to be comparable globally. Participants attending the training course in Turkmenbashi have been given training in standard techniques that are employed throughout Western Europe to monitor bathing waters.

Participants

Byashim A Ovezov – Chief Sanitary Epidemiological Inspection of Turkmenbashi
BD Chagylova, Turkmenistan

Fanya Galyamova, Turkmenistan

Jamshit Temirbekov, Kazakhstan

Andrey Skovronskiy, Russia

Konstantin Karamzin, Russia

Mahyar Sakari, Iran

Nasser Mehrdadi Ehsanollah, Iran

Rauf Gadjyev, Azerbaijan
Fekret Aslanov, Azerbaijan

Final timetable

Monday April 31st

9.00 am – 9.30 Introduction to course, participants and aims
9.30-12.45 WHO guidelines for safe recreational water environments
12.45-2.00 Lunch
2.00-3.30 Indicator Species – background and rationale for choosing the most appropriate indicator
3.30-4.00 Coffee
4.00-5.00 Techniques for sampling water quality

Tuesday May 1st

9.00-10.30 Techniques for analysing water quality
10.30-11.00 Coffee break
11.00-12.30 Techniques for analysing water quality
12.30-2.00 Lunch
2.00-5.00 Introduction to the laboratory equipment

Wednesday May 2nd

9.00-12.30 Field Sampling
12.30-2.00 Lunch
2.00-3.30 Laboratory analysis of water samples
3.30-4.00 Coffee break
4.00-5.30 Laboratory analysis of water samples

Thursday May 3rd

9.00-10.00 Conducting sanitary surveys
10.00-11.00 Setting up the pilot project
11.00-11.30 Coffee

11.30-12.30 Bacteriological results – *E. coli*

12.30-2.00 Lunch

2.00-5.30 Field work – conducting a sanitary survey

Friday May 4th

9.00-10.00 Bacteriological results – Faecal streptococci

10.00-12.30 Discussion of results and setting up the pilot projects.

1.00 pm Close of workshop

The theory and discussion sessions were held in the conference room of the Hotel Awaza. Practical work was conducted in the chemical laboratory of the fish factory of Turkmenbashi.

Results of water quality sampling

Four recreational waters were sampled during the training course. The participants were split into five groups, each group was responsible for taking a water sample at each site and undertaking the analysis under the supervision of the consultants. Table 1 shows the results of the bacteriological analysis. Due to time constraints and some problems with water supply not all the samples were analysed.

Table 1. Bacteriology Results – samples taken Wednesday 2nd May, Turkmenbashi

| Country undertaking the analysis | Site | Thermotolerant coliforms (cfu) | | | Faecal streptococci (cfu) / 100 ml |
|----------------------------------|----------------------|--------------------------------|-----------------|------------|------------------------------------|
| | | 10 ml dilution | 100 ml dilution | cfu/100 ml | |
| Iran | 1. Hotel Awaza beach | 0 | 0 | 0 | No analysis |
| | 2. Sandy beach | 0 | 1 | 1 | No analysis |
| | 3. Port | 2 | 14 | 14 | No analysis |
| Russia | 2. Sandy beach | 0 | 0 | 0 | 1 |
| | 3. Port | 0 | 13 | 13 | 13 |
| | 4. Florida Disco | 0 | 4 | 4 | 4 |
| Turkmenistan | 1. Hotel Awaza beach | 0 | 0 | 0 | 0 |
| | 2. Sandy beach | 0 | 0 | 0 | 1 |
| | 3. Port | 0 | 17 | 17 | 65 |
| Azerbaijan | 1. Hotel Awaza beach | 0 | 0 | 0 | 0 |
| | 2. Sandy beach | 0 | 1 | 1 | 0 |
| | 3. Port | 0 | 6 | 6 | 2 |
| | 4. Florida Disco | 0 | 7 | 7 | 4 |
| Kazakhstan | 1. Hotel Awaza beach | 0 | 0 | 0 | 0 |
| | 2. Sandy beach | 0 | 0 | 0 | 2 |

The results were remarkably consistent between countries and based on this one sample all waters were well within the current EC bathing water quality standards and the WHO Guideline values. However, it is stressed that one sample cannot give a true indication of the bathing water quality. Sanitary surveys were undertaken on sites 2 and 4 and both indicated low risk from human faecal contamination.

Issues of concern raised during the training week.

Turkmenbashi experiences problems with irregular water supply which the consultants were not made aware of prior to the course despite having discussed this issue the day before the practical work was undertaken. We were assured that there would be no problem with a continuous water supply. Alternative arrangements therefore had to be made on the day of the practical work. Participants from Azerbaijan expressed similar potential problem in Azerbaijan. It would therefore be appropriate to supply an electric pump to the countries undertaking pilot projects in order to filter the water and overcome the problem encountered during the training course when using the vacuum pump. The approximate cost would be 370 pounds sterling per country (approximately \$520).

Participants raised the issue of contracts to undertake the sampling and analysis. Participants from Turkmenbashi had concerns over availability of transport to the sampling sites and to the laboratory. Draft terms of reference for local consultants are attached.

Standards – Participants from Turkmenistan in particular were concerned that the standards currently used to measure recreational water quality in Turkmenistan were not compatible with those of World Health Organisation or the European Commission. They were concerned that recreational water users may be exposed to poor water quality as identified by western European standards and World Health Organisation guidelines but which may not be considered poor under existing standards followed by Turkmenistan.

It is considered inappropriate for Turkmenistan to change their standards 'overnight'. Shokhrat Orazov (Public Participation Advisor) informed the participants of the forthcoming proposal by the Caspian Environment Programme to review standards in the Caspian Sea region and it was agreed that the results

from the pilot project could be used to feed into this work and identify whether it was feasible for the regional standards to be changed.

Actions

The following actions were identified to be fulfilled by the countries undertaking the pilot projects:

- Selection of monitoring points

The criteria for choosing a suitable monitoring site were identified as high bather density, easy access to the laboratory and where possible it was suggested that sites of expected differing quality should be chosen.

- Initial sampling

Two samplings should be undertaken in 2 weeks to assess the spatial variation in quality along the beaches chosen.

- Finalise sampling sites

Based on the results of the initial sampling the final monitoring sites should be selected. It is suggested that fewer sites should be chosen which could be regularly monitored in preference to selecting a lot of sites which can only be monitored irregularly.

- Gather historical water quality data (if available)
- Undertake a sanitary survey on each beach to be sampled
- Begin intensive sampling period:

Ideally one sample per week for a period of one year

Sample at the start of each week to complete analysis by the weekend.

- Review the programme mid/End July
- Forward results to the Caspian Environment Programme via Svetlana Sakhatova on a monthly basis. Results will then be forwarded to Kathy Pond/Steve Pedley (Robens Centre/World Health Organisation consultants).
- Following completion of the project results could be published in a scientific journal or presented at a conference such as the MEDCOAST conference with all participants acknowledged.

Recommendations

It is recommended that an early follow up visit is made by the consultants to the countries undertaking the pilot projects. It is suggested that this should be end June/mid July. This will allow the consultants to solve any problems arising early on in the monitoring. Following this visit a third visit is recommended mid way through the project and a final visit at the end of the pilot (Spring 2002).

Supply of electric pumps to pilot countries (see above).

A case study has been developed by World Health Organisation to aid participants in the implementation of the Protocol. Participants requested this and it is therefore suggested that it be translated into Russian and distributed as soon as possible.

Acknowledgements

We wish to acknowledge Svetlana Sakhatova and Nabat Mamedova Co-directors of the CRTC HSD&H, Turkmenistan and Shokhrat Orazov, Public Participation Advisor for their invaluable assistance throughout the recreational water course. Thanks also to the laboratory staff in Turkmenbashi for their hospitality at short notice.

Terms of reference for local consultants in Turkmenistan, Azerbaijan and Iran undertaking the pilot project

It is suggested that two consultants are involved per country to undertake the sampling and analysis. Transport to and from the sampling sites and laboratory should also be available once a week.

1. To select a variety of suitable monitoring sites based on bather density, easy access to the laboratories and varying quality.
2. Undertake initial sampling of the water quality on 2 occasions over 2 weeks to assess the spatial variation of quality. Samples should be analysed for *E. coli* and faecal streptococci using the membrane filtration method as agreed during the training programme.
3. Finalise the sampling sites. This should be a minimum of 4 sites. Provide a map of each location to show the sampling site.
4. Gather historical water data (if available, back to 5 years). For each microbiological parameter produce a bar chart to show the variation in micro-organism concentrations (\log_{10}) with time. Time should be plotted on the x axis and micro-organism concentration on the y axis.
5. Undertake a sanitary survey (using the proformas provided during the training course) on each sampling site at the start of the sampling programme.
6. Undertake an intensive period of monitoring. Samples should be taken and analysed on a weekly basis until 50 samples per site are collected. All methods to be carried out according to the description given during the workshop.
7. Forward results (expressed as colony forming units per 100 ml) to the Caspian Environment Programme through the Directors of the CRTC. Results will then be forwarded to the WHO international consultants.
8. Attend 3 review meetings with the international consultants to evaluate the programme and results.
9. Assist with the production of the final report.

Deliverables

1. Monthly results of analysis for *E. coli* and faecal streptococci
2. A brief report on the sanitary survey undertaken
3. Analysis of historical water quality data (if available)
4. Final classification of the sampling beaches based on the WHO Protocol.

The above tasks should be undertaken between May 2001 and May 2002.