

COMMUNAL HYGIENIC AND BACTERIOLOGICAL CONDITIONS OF THE RIVER-BANK BATHS AONG SURFACE WATERS IN CSONGRÁD COUNTY

MÁRIA HEGEDÜS, IBOLYA LÉVAI, ZSÓFIA FODRÉ and MARGIT ZSIGÓ

Public Health Station of Csongrád County, Szeged, Hungary.

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Abstract

In 1979—1980 the authors have dealt at a high priority with the problem whether the river-bank baths established in Csongrád county along surface waters are actually suitable for the purposes of bathing and water sports in the summer season of their utilisation. On the basis of a complex survey it was found that the fundamental hygienic conditions of the recreation areas are satisfactory. At the same time also the most important further tasks were listed. The results of the bacteriological investigations of waters carried out in the season of utilisation are given in a Table indicating the sampling sites. In the water samples the occurrence of Salmonella bacteria further the amounts of the coliform and faecal coliform bacteria and their relative proportions were determined. These results were compared with the amounts of the water output of the investigated period. On the basis of the results of hygienic bacteriological investigations carried out in the seasons of utilisation of the mentioned two-year period attention is called to the fact that in Csongrád county only the water of the Tisza backwater at Mártély is suitable for the purposes of recreation and water sports.

Introduction

In Csongrád county about 450 000 residents are requiring adequate conditions for recreation and sporting. In the county the natural scenery and the greater rivers further the backwaters of the Tisza river offer possibilities of recreation to the residents. These possibilities can be utilised and according to the requirements care must be taken to their further development. The group for hygiene and the laboratory of the Department for Settlement Hygiene of the Public Health Station of Csongrád County (KÖJÁL) have dealt in 1979—1980 at a high priority with the problem whether in the summer season of utilisation the communal hygiene of the river-bank baths and recreation areas, further the bacteriological quality of the waters are suitable for the purposes of recreation, bathing and water sports. The hygienic bacteriological investigation of the surface waters is carried out regularly since 1975. The results of these investigations have been reported also in papers (HEGEDÜS 1979, 1980).

The Salmonella contamination of the Szeged reach of the Tisza was described already of HERNÁDI and ROSZTOCZY (1935).

Hygienic bacteriological investigations were carried out for five years by VETRÓ, KISS and MINDSZENTY (1966) in the Tisza-reach of Szeged city. It was found that though the value of the coliform count is unfavourable in the Tisza water at the

sewage inflows, these inflows are not detrimental to the water quality of the sites licensed for bathing.

The hygienic microbiological investigation of the water of baths (beaches) established along the banks of the river Danube and of the Lake Balaton has been investigated by several authors. ULLRICH et al. (1977) investigated the water of beaches along the Ráckeve branch of the Danube and along the Danube-bend. They found that the quality of the water is unfavourable and detected regularly also pathogen bacteria. In order to establish the hygienic water quality of Lake Balaton a complex survey was carried out by SCHIEFNER et al. (1978). According to their report in this region of water "the deterioration of the hygienic bacteriological parameters expressible also by the classification of the water quality still did not take place".

In the period between 1975—1978 we found on the basis of the hygienic bacteriological investigations carried out by us (HEGEDÜS 1980) that the surface waters of the county were of a "contaminated" quality except for a few cases. Consequently it appeared to be of importance to examine whether our surface waters are suitable in the season of utilisation (about from May to end of August) for the purposes of bathing and water sports. The present study is a detailed report of this problem.

Materials and Methods

In Csongrád county the recreation areas, the beaches along surface waters have been developed in the flood-plain of the rivers Tisza, Hármas-Körös and Maros, further in the Tisza back-water at Mártély. From the aspect of the evaluation of the hygienic conditions priority was given to the investigation of the supply of drinking water, to the sewerage, to the collection of wastage and refuse, to the purity of the air, to the living plants and to the bacteriological quality of the surface waters. The hygienic bacteriological investigations were carried out according to the "Methodological Instructions" (1977) issued by the Department for Water Hygiene of the National Institute of Public Hygiene, and to the standard "Bacteriological Investigation of Drinking Water" (1971). The results were evaluated on taking into account the limit values of the Draft of Sectoral Standardization of the Ministry of Health and the National Office of Water Conservancy (1972).

Results

On the basis of the hygienic survey the supply with communal utilities is similar in all the recreational areas. The supply with drinking water is adequate, its quality has been controlled by the Public Health Station (KÖJÁL) of the county by regular samplings. The sewage disposal was at present everywhere inadequate. The sewer system is not established, the sewage lagoons located in the flood-plain do not operate adequately due to the high water level. Therefore during the floods the hazards of the contamination of the recreational areas are particularly existing. When the flood has passed, the arrangement, disinfection of the area and the renovation of the buildings are necessary in every case. The sewage disposal of the swimming boats on the Tisza river at Szeged is also objectionable since the formed sewage enters the Tisza directly below the boat, contaminating in this way the bathing area. The unreclaimed sewage of the city Szeged (about 70 000 m³/day) is now polluting the Tisza reach below the city. Owing to the contamination of the river the Public Health Station (KÖJÁL) refused the permission to establish a beach in this reach. The collection of refuse and its transport is organized and regular in the recreational

Table 1. Results of the bacteriological investigation of beaches established along surface waters

Sampling site	Year of investigation	Coliform counts/ml average	Faecal coliform counts/ml values	Percentage of <i>Salmonella</i> positivity	Water qualification
TISZA river					
Csongrád beach	1979	286.66	24.13	44.44	IIIrd class
	1980	82.16	24.06	49.95	IIIrd class
Szentes beach	1979	858.00	164.66	25.00	IIIrd class
	1980	60.60	16.76	50.00	IIIrd class
Mindszent beach	1979	594.66	79.66	50.00	IIIrd class
	1980	31.72	22.30	42.85	IIIrd class
Szeged-Tápé beach	1979	215.90	47.23	25.00	IIIrd class
	1980	48.00	17.30	57.14	IIIrd class
Szeged beach and boats for swimming	1979	65.66	58.55	87.50	IIIrd class
	1980	113.60	36.00	44.10	IIIrd class
MAROS river					
Apátfalva beach	1979	—	—	33.30	—
	1980	94.00	17.50	60.00	IIIrd class
Makó beach	1979	321.60	74.18	54.54	IIIrd class
	1980	199.30	31.30	62.50	IIIrd class
BACK WATERS					
Csongrád Serházzug backwater	1979	160.00	92.00	**	IIIrd class
Kayaking area	1980	167.00	95.00	**	IIIrd class
Mártély backwater beach	1979	7.60	1.35	**	Ist class
	1980	7.90	0.78	**	Ist class

** *Salmonella*-negative = no bacteria belonging to the genus *Salmonella* could be cultivated from 1000 ml of the water sample.

areas. In the relaxation areas there are no air-polluting sources, they have been established far from industrial zones and busy streets, the forests and green belts have been developed adequately.

The quality of the surface waters of the county is reflected by the results of the bacteriological investigations reported in the followings.

In the utilisation seasons of the last two years (from about May to end of August) on the beaches of the surface waters of the county *Salmonella* tests were carried out in 169 samples and complex bacteriological investigations were performed in 66 water samples. The average values of the results and the percentages of *Salmonella* positivity are summarized in Table 1, in groups according to sampling sites.

On comparing the average values of the results of investigations during the mentioned two years it is apparent that very great differences exist between the values. In 1980 the average values of the coliform and faecal coliform counts/ml were lower by one order of magnitude than those observed in 1979 both at the sampling sites along the Tisza and at those along the Maros, excepting the coliform counts observed on the Szeged beach.

When observing the changes in the percentage of *Salmonella* positivity it can be stated that the percentage of positivity increased at the sampling sites Szentes, Tápé and Apátfalva whereas it decreased to about the half value at the Szeged Partfürdő site. Since the water output of the river Tisza is very varying and fluctuating, the data of the water output during the examined two years are shown in Fig. 1 indicating the sites and dates of sampling. (The values of water output were supplied

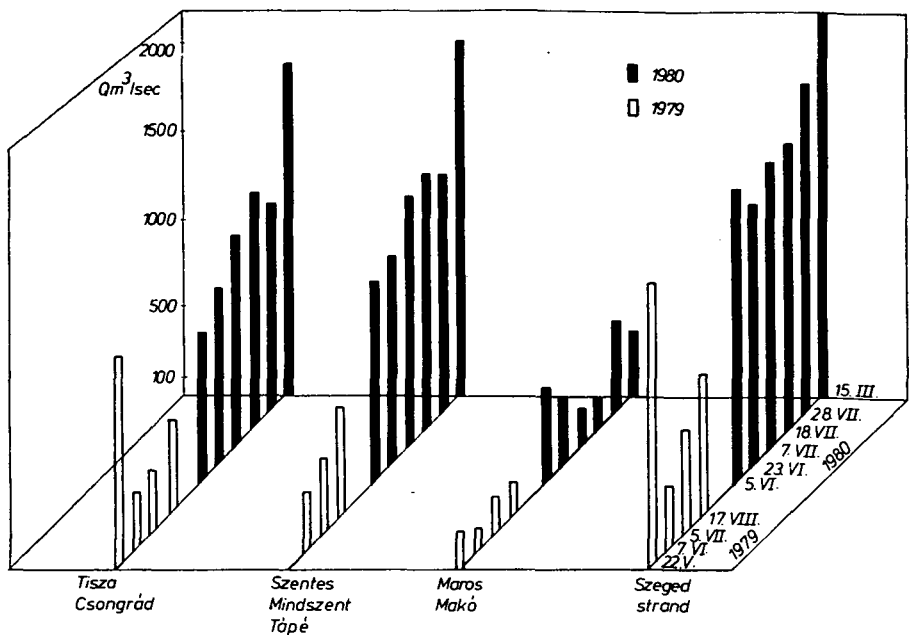


Fig. 1. Changes in the amount of the water output in 1979—1980.

by the workers of the firm ATIVIZIG and the authors express here their gratitude for this). It can be seen in Fig. 1 that the water outputs of the summer season of the mentioned two years differed significantly from each other both in case of the Tisza river and in that of the Maros river. The summer of 1979 was a "low-water" period in comparison to that in 1980 whereas in the latter year a high water output predominated. It is likely that the occurrence of the coliform and faecal coliform bacteria in a relatively smaller number may be attributed to the water output of the year 1980 which exceeded the average values. In 1979 in turn, at a lower output the average values of the coliform bacteria were higher by an order of magnitude and also the local polluting effects could be measured better (e.g. HEGEDŰS et al. (1980) at Mindszent). Furthermore it is known that in 1979 a significant sewage wave arriving from over the frontier passed through the river Tisza. It is likely that the effect of this wave has been recorded by us at some sampling sites (e.g. at Szentes and Tápé).

On surveying the hygienic bacteriological conditions of the beaches established along the river Maros it can be stated that the water was during the summer season of utilisation of a "contaminated" quality at both sampling sites. The values of the coliform and faecal coliform counts/ml were significantly affected also in this river by the differences between the water outputs of the two years discussed.

In Csongrád county two backwaters of the Tisza river are used for purposes of recreation and bathing. The waters of these backwaters can be considered as nearly stagnant waters, and this appears also in the high stability of the observed values. The Mártély backwater, quite in contrast to the Serházzug backwater, is directly connected with the river Tisza through a southern connecting channel. In the high-water periods of the Tisza, the water level rises also in the backwater, the floodplain is inundated and the recreational area as well. This process occurred end of

July 1980, as indicated by the coliform count 1600/ml and the faecal coliform count of 160/ml. Since at this time the water has not been utilised for purposes of recreation and bathing in the backwater, this value has been omitted on calculating the average value since it was not considered to be typical. When however this fact is considered from a hygienical aspect, it must be regarded as an important condition because during the rinsing of the sewage lagoons located in the recreational area the water of the backwater became contaminated to an extraordinary extent.

Since great differences appeared between the results of the summer seasons of the investigated two years, it seemed advisable to investigate whether differences of similar magnitude are occurring also in the ratio of the coliform and faecal coliform bacteria. According to our calculations this ratio was 4.6 in 1979 and 3.8 in 1980. Thus, though in 1980 the values of the coliform counts and faecal coliform counts were lower, their ratio proved to be less favourable. Data based on this ratio concerning the entire Hungarian longitudinal section of river Tisza have been published by DEÁK and SCHIEFNER (1972), investigating also the ratios of these bacteria in the *Salmonella*-positive and *Salmonella*-negative samples.

We have carried out this calculation as well and our results are given in Table 2. In this relation it can be stated that no essential differences exist in case of the *Salmonella*-negative samples whereas in case of the positive samples a difference appeared

Table 2. Proportion of counts of coliform bacteria to counts of faecal coliform bacteria

Year of investigation	In <i>Salmonella</i> -positive	In <i>Salmonella</i> -negative
	s a m p l e s	
1979	5.80	3.56
1980	3.81	3.58

between the annual values. On the basis of our results it can be stated that in the surface waters of Csongrád county the number of coliform bacteria was in the examined period 4-6-times higher than the faecal coliform counts.

In the years 1979—1980 in the utilisation season investigations concerning the detection of bacteria belonging to the genus *Salmonella* were carried out in 169 water samples. Our results are summarized in Table 3. At the serotypization of *Salmonella* bacteria also several *Salmonella* colonies were investigated in the same water sample. When the water sample contained only identical serotypes, this was considered as solely one strain. This is the cause why differences appear between the values given in the Table 3 and those mentioned in the text.

During the two-year period, of the 65 *Salmonella*-positive water samples of 9 sampling sites, 165 *Salmonella* strains were serotypized which belonged to 23 serotypes. On evaluating the results separately for each sampling site it can be stated that the greatest number and the most diversified serotypes of *Salmonella* have been isolated from the Szeged reach of the Tisza and from the Makó reach of the Maros river. Bacteria belonging to the *Salmonella* genus could never be isolated from any of 1000 ml water samples of the backwaters Mártély and Serházzug withdrawn during the two-year period.

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Table 3. Serotypes and numbers of *Salmonella* strains isolated in the years 1979 and 1980 at the recorded sampling sites

<i>Salmonella</i> serotypes	Sampling sites									
	TISZA					MAROS				TOTAL
	Csongrád	Szentes	Mindszent	Tápé	Szeged*	Makó	Apátfalva	Serházzug backwater	Mártély backwater	
1. <i>S. derby</i>	3	2	3	—	2	2	—	—	—	12
2. <i>S. give</i>	3	—	1	1	5	1	—	—	—	11
3. <i>S. panama</i>	3	2	1	4	1	—	—	—	—	11
4. <i>S. typhimurium</i>	1	—	—	—	2	4	1	—	—	8
5. <i>S. agona</i>	—	1	1	1	2	—	2	—	—	7
6. <i>S. heidelberg</i>	—	—	—	—	3	2	1	—	—	6
7. <i>S. newport</i>	—	—	—	—	3	2	—	—	—	5
8. <i>S. bovismorbificans</i>	—	—	1	—	2	1	—	—	—	4
9. <i>S. abortusbovis</i>	—	—	—	1	2	—	—	—	—	3
10. <i>S. london</i>	1	—	—	1	1	—	—	—	—	3
11. <i>S. senftenberg</i> var. <i>newcastle</i>	—	—	—	1	—	1	1	—	—	3
12. <i>S. anatum</i>	—	—	1	—	1	—	—	—	—	2
13. <i>S. aba</i>	—	—	—	—	—	—	1	—	—	1
14. <i>S. bredeney</i>	—	—	—	—	—	1	—	—	—	1
15. <i>S. enteritidis</i>	—	—	—	—	1	—	—	—	—	1
16. <i>S. essen</i>	—	—	—	—	—	1	—	—	—	1
17. <i>S. indiana</i>	—	1	—	—	—	—	—	—	—	1
18. <i>S. infantis</i>	—	—	—	—	1	—	—	—	—	1
19. <i>S. java</i>	1	—	—	—	—	—	—	—	—	1
20. <i>S. mbandaka</i>	—	—	—	—	—	1	—	—	—	1
21. <i>S. reading</i>	—	—	—	1	—	—	—	—	—	1
22. <i>S. saintpaul</i>	1	—	—	—	—	—	—	—	—	1
23. <i>S. thompson</i>	—	—	—	1	—	—	—	—	—	1
Total:	13	6	8	11	26	16	6	0	0	86

TISZA, Szeged (+) values refer to sampling sites: Riverbank beach, four boathouses for swimming and "free beach".

Underlined serotypes indicate serotypes isolated in Csongrád county for the first time.

The Department for Settlement Hygiene of the Public Health Station (KÖJÁL) of Csongrád county surveyed the health resorts and beaches with increased attention in 1979—1980. On the basis of the control tests it was found that:

1. the fundamental hygienic condition of the recreation areas and beaches is acceptable;
2. the development of the supply with communal utilities, with particular respect to sewage treatment and disposal, is very important in order to protect the surface waters from further contaminations;
3. the development of the correct human forms of attitude during recreation and bathing must be promoted;
4. in order to achieve the more cultured development of the investigated areas a more efficient coordination of the activity of the keepers, the operators, the social and mass organizations and of the authorities concerned is needed.

On the basis of the results of the bacteriological investigations the followings could be stated:

1. The water of the riverside beaches established along the Tisza and Maros rivers, furthermore the water of the Tisza backwater at Serházzug are according to the hygienic bacteriological investigations IIIrd class water of "contaminated" iquality. According to the limit values being valid at present they are not suitable for recreational, bathing and water-sporting purposes.

2. A favourable water quality appeared only on the beach established along the Tisza backwater at Mártély, with the exception of the period when the recreational area has been flooded by the Tisza river.

3. On comparing the results of investigations carried out during the mentioned two years with the amount of the water outputs of the investigated period great differences were observed in the values of the coliform counts and faecal coliform counts but at the same time hardly any differences appeared in the proportion of both bacterium groups to each other.

4. No significant differences were found between the proportions of the two groups of bacteria in the case of *Salmonella*-negative samples, either, whereas in case of the *Salmonella*-positive samples this proportion disclosed a more favourable value.

On the basis of the hygienic bacteriological investigations carried out during the utilisation season of a two-year period attention is called to the fact that in Csongrád county solely the water of the Tisza backwater at Mártély proved suitable for purposes of recreation and water sports.

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Csongrád megye felszíni vizein létesített strandok bakteriológiai és kommunálhigiénés helyzete

HEGEDÜS MÁRIA, LÉVAI IBOLYA, FODRÉ ZSÓFIA és ZSIGÓ MARGIT

Csongrád megyei Közegészségügyi-Járványügyi Állomás,
Szeged, Hungary

Kivonat

A szerzők 1979—1980-ban kiemelten foglalkoztak azzal a problémával, hogy a nyári hasznosítási ideyben, Csongrád megye felszíni vizein létesített strandok az üdülés, fürdőzés vízisport céljára alkalmasak-e. A komplex felmérés alapján megállapították, hogy az üdülőterületek alapvető higiénés helyzete kielégítő és ugyanakkor megjelölték a legfontosabb feladatokat is. A hasznosítási ideyben végzett vízbakteriológiai vizsgálatok eredményeit táblázatban tüntették fel a mintavételi helyek megjelölésével. A vízmintákban vizsgálták a Salmonella baktériumok előfordulását, valamint a coliform és a faecalis coliform baktériumok mennyiségét és egymáshoz viszonyított arányukat. Az eredményeket összehasonlították a vizsgált időszak vízhozam mennyiségével. A két év hasznosítási ideyben végzett higiénés bakteriológiai vizsgálatok eredménye alapján felhívják a figyelmet arra, hogy Csongrád megyében csak Mártélyi holt Tisza-ág vize felel meg üdülés és vízisport céljára.

Bakteriolosko i komunalno-higijensko stanje podignutih strandova na otvorenim vodama županije Csongrád

HEGEDÜS MÁRIA, LÉVAI IBOLYA, FODRÉ ZSÓFIA, i ZSIGÓ MARGIT

Zdravstveno-epidemiološka stanica županije Csongrád, Szeged, Hungaria

Abstrakt

Autori su se u toku 1979—1980 godine posebno zanimali problemom podobnosti štrandova, podignutih na otvorenim vodama županije Csongrád, za rekreaciju, kupanje i vodene sportove u toku letnje sezone korišćenja. Na osnovu kompleksnih istraživanja utvrđeno je da rekreaciona područja zadovoljavaju osnovnim higijenskim zahtevima, i istovremeno su određeni i najvažniji izdaci.

Rezultati bakterioloških analiza u sezoni korišćenja rekreacionih centara, sa naznakom loketa uzimanja proba, prikazani su tabelarno. Utvrđivano je prisustvo Salmonella bakterija, količina Coliform i faecal-Coliform bakterija i njihove međusobne vrednosti. Rezultati su upoređivani sa količinom protoka vode u sezoni ispitivanja.

Na osnovu rezultata dvogodišnjeg bakteriološkog ispitivanja ukazuje se na činjenicu da na području županije Csongrád samo mrtva Tisa Mártély odgovara za rekreaciju i upražnjavanje vodenih sportova.

БАКТЕРИОЛОГИЧЕСКОЕ И КОММУНАЛГИГИЕНИЧЕСКОЕ СОСТОЯНИЕ ПОВЕРХНОСТНЫХ ВОД ПЛЯЖЕЙ В ОБЛАСТИ ЧОНГРАД

М. Хегедюш, И. Леваи, Ж. Фодре и М. Жиго

Санитарно-эпидемиологическая обл. Чонград, Сегед, Венгрия

Резюме

Авторы в 1979—1980-годах занимались вопросами, что в летнем сезоне поверхностные воды Чонградской области, являются ли подходящими с целью отдыха, купания и водного спорта.

На основании комплексного изучения было установлено, что в сущности гигиеническое состояние курортных мест является удовлетворительным к назначенным целям. В то же время к этому наметили самые близки задачи. Результаты проведенных водно-бактериологических исследований в приведенном сезоне в таблицах были представлены с указанием в них

изученных образцов. В водных образцах уточнили наличие бактерий салмионелла, а также количественные отношения бактерий колиформ и фекалис колиформ — в соотношениях друг к другу.

В сезонном периоде полученные результаты изложили в сравнительных отношениях воднымобъемом. На основании выполненных гигиеническо-бактеорологических исследований казалось, что в области Чонград для отдыха и водного спорта — только Мартейская старика реки Тисы является вполне подходящим.