Arh Hig Rada Toksikol 2001;52:169–175

COUNTRY REPORT

FOOD CONTAMINATION MONITORING IN CROATIA

KRUNOSLAV CAPAK, MARIJAN KATALENIĆ, AND ANDREJA BARIŠIN

Croatian National Institute of Public Health, Zagreb, Croatia

Received December 2000

The Croatian National Institute of Public Health implements the statistical food safety monitoring programme for foods marketed in Croatia in accordance with effective laws and regulations. Laboratories for food safety control, certified by the Ministry of Health, report their findings in quarterly notifications, using the standard forms and issue statements of compliance or non-compliance with current regulations, specifying the cause in case of the latter. This paper brings the results for the period 1993–99 as an illustration of the monitoring programme.

Key words:
laboratory analysis, legislation, monitoring, food safety

Microbiological and chemical food contamination as the common cause of consumer infections and poisonings is currently one of the world's leading public health problems. Due to changes in human lifestyle, dietary habits, and the globalisation of food supply it has become an increasing problem in the developed Western countries. One of the country's top priorities is to secure a sufficient food supply and prevent human health hazards related to food through a program of monitoring and control measures. To be effective, the Croatian sanitary surveillance system requires an efficient food production and a proper food control legislation, a well-organised, efficient and modern inspectorate, and a well-equipped laboratory service.

FOOD CONTROL METHODS

Food production and of the marketing system are regulated by the Infectious Diseases Act (1), Food and Object of Common Use Safety and Sanitary Surveillance Act (2), and a number of bylaws.

Presented at the ICS-UNIDO Workshop on Contamination of Food and Agroproducts, 28 September – 1 October 2000, Varaždin, Croatia

The Croatian Ministry of Health has appointed an interministerial commission to prepare new food legislation (Food Safety bill) with the main aim to harmonise the Croatian legislation with the EU's and to resolve overlapping responsibilities in the control and monitoring system between ministries. Medical surveillance of food handlers, laboratory control of raw food materials and final food products prior to marketing, and the inspection of manufacturing, marketing conditions, and of food safety at all stages follow the above regulations.

Today there are 23 licensed laboratories all over Croatia. Seven laboratories are licensed for special assays (these encompass special microbiological assays for the identification of species, some special physicochemical analyses, such as pesticide, metal, metalloid, biogenic amine, additive, vitamin, mineral and mycotoxin determinations; special estimations of bioresidue levels in animal samples, etc.) and the other fourteen for basic food analyses. The basic analysis covers sensory tests, basic microbiological assays, purity appraisals of food and of objects of common use, basic physicochemical analyses, freshwater quality assays according to the purpose of the water, physicochemical and microbiological water analyses, and so on (3). In their reports to the Croatian National Institute of Public Health (CNIPH), all certified laboratories have to specify the number and the type of analyses.

Subject to the above regulations, food samples are examined for a whole range of health safety, sensory, microbiological, and chemical parameters. Under the 1993 Health Act (4), CNIPH in Zagreb coordinates the activity of all certified laboratories with regional institutions. Furthermore, major, better equipped, and more experienced food control and environmental protection laboratories are located in Zagreb (Zagreb Public Health Institute) and in Osijek, Rijeka, Split, and Pula (regional public health institutes).

The surveillance of food production and distribution is carried out by the Sanitary Inspectorate which consists of the County Sanitary Inspection Service, Border Sanitary Inspection, and State Sanitary Inspection. While most food control laboratories are located in public health institutes, some are in other certified institutions such as at the Faculty of Nutrition and Biotechnology, Faculty of Veterinary Medicine, and the Veterinary Institute. The safety of foods of animal origin is also monitored by the Veterinary Inspectorate and enforced by the Market Inspectorate through the national food legislation.

In the inspection system, five food samples per 1,000 inhabitants are assayed under the »Minimum Annual Food and Object of Common Use Sampling Schedule« prepared annually in accordance with legal stipulations. As local county budgets often fail to provide sufficient money for the implementation of the plan, the means necessary for the effective sanitary food monitoring should be secured through the national budget. Certified laboratories are required to submit food-test reports showing the number of analysed food samples and their findings.

INFECTIOUS DISEASES, MICROBIOLOGICAL AND CHEMICAL CONTAMINATION

In 1999, the CNIPH Epidemiological Service (5), acting within the surveillance system for infectious diseases, was notified of 8,244 cases of food poisoning (bacterial infections or intoxications with bacterial toxins through food) from across the country. The

corresponding 1997 and 1988 figures were 8,241 and 8,320, respectively. In the past few years, notified outbreaks varied between 47 and 66 (average 56) a year, affecting 581 to 1,492 people in each outbreak (average 1,036) (Table 1). A 5-year case-trend analysis for the period 1973–97 showed these diseases to be on the continuous rise (Table 2, Figure 1).

Table 1 *Foodborne disease outbreaks and cases, Croatia 1993–99 (4–11)*

Year	No. of outbreaks	Cases per outbreak	Single cases	Total number of cases	Cases of salmonellosis
1993	56	2,028	8,954	10,982	7,087
1994	67	1,811	7,237	9,048	4,931
1995	47	1,433	6,294	7,727	3,642
1996	47	928	5,553	6,481	2,899
1997	56	581	7,660	8,241	4,204
1998	65	1,492	6,828	8,320	4,288
1999	66	1,223	7,021	8,244	4,120

Table 2 *Cases of food intoxication in 5-year periods (3, 9)*

Period	Cases
1973–1977	17,035
1978–1982	20,844
1983–1987	39,959
1988–1992	41,111
1993–1997	42,479

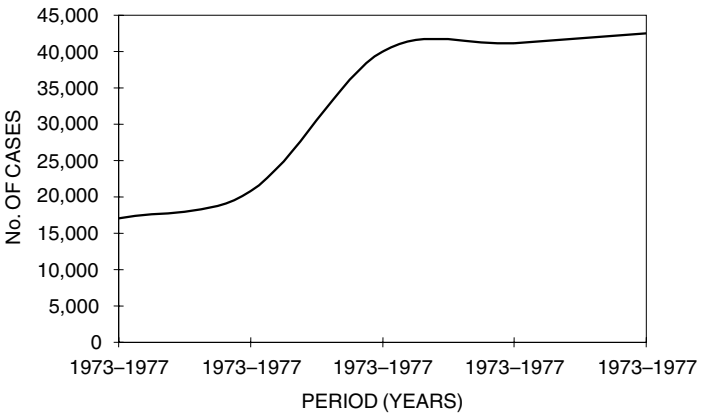

Figure 1 *Trends in the number of food intoxication cases in 5-year periods (3, 9)*

Microbiological food contamination is a frequent cause of epidemics. While salmonella and staphylococcal toxin were the most common bacterial causes, trichina took the lead among parasites. Conditions leading to these epidemics differed from one causative agent to another. The absence of veterinary monitoring of swine slaughters in households or small manufacturing facilities accounted for the outbreaks of trichina. Thermally underprocessed and originally contaminated foodstuffs were usually associated with salmonella outbreaks. Particularly noted was the outbreak of *Campylobacter jejuni* in a Zadar kindergarten in 1998 which affected 388 persons (Table 3).

According to the CNIPH Health Ecology Service (data from all certified laboratories), of 35,092–46,823 samples analysed annually for microbiological parameters

Table 3 *Foodborne disease-associated cases in outbreaks by causative agent, Croatia 1993–99 (4–11)*

Causative agent	Year						
	1993	1994	1995	1996	1997	1998	1999
	No. of cases						
Salmonella	1,374	1,240	900	403	378	723	614
Trichinella spiralis	25	63	115	156	49	298	291
Staphylococcus aureus	73	14	7	0	84	0	30
Shigella	192	7	0	0	0	4	4
Clostridium perfringens	0	0	50	65	0	16	57
Clostridium botulinum	0	3	0	5	3	9	12
Bacillus cereus	0	10	0	0	0	0	0
Mycetismus	35	0	0	0	6	0	0
Campylobacter jejuni	0	0	14	0	0	388	0
Escherichia coli	0	0	0	19	15	0	0
HAV	0	0	0	0	0	0	7
Histamine	0	17	0	0	0	0	0
Total known	1,699	1,354	1,086	648	535	1,438	1,015
Unknown	329	457	347	280	46	54	208
Total	2,028	1,811	1,433	928	581	1,492	1,223

Table 4 *Food samples found to be unsafe by microbiological assay (6–11)*

Year	Domestic			Imported			Total		
	Samples analysed	Unsafe		Samples analysed	Unsafe		Samples analysed	Unsafe	
		No.	%		No.	%		No.	%
1994	29,199	2,583	8.80	5,893	151	2.60	35,092	2,734	7.80
1995	32,902	3,520	10.70	7,509	174	2.30	40,411	3,694	9.10
1996	34,556	3,944	11.40	8,889	233	2.60	43,455	4,177	9.60
1997	33,624	3,113	9.26	12,402	314	2.53	46,026	3,427	7.44
1998	34,389	3,669	10.67	11,136	296	2.66	45,525	3,965	8.71
1999	35,405	2,830	7.99	11,417	186	1.63	46,823	3,260	6.96

2,734–4,177, or 6.96–9.60% are found unsafe (Table 4). As for chemical parameters, of 22,037–28,588 analysed food samples, 1,013–2,223 or 3.90–10.0% are found unsafe (Table 5).

Table 5 *Food samples found to be unsafe by chemical assay (6–11)*

Year	Domestic			Imported			Total		
	Samples analysed	Unsafe		Samples analysed	Unsafe		Samples analysed	Unsafe	
		No.	%		No.	%		No.	%
1994	9,320	874	9.40	12,717	697	5.34	22,037	1,553	10
1995	16,485	1,503	9.10	12,968	720	5.60	29,453	2,223	7.00
1996	12,958	827	6.38	13,048	603	4.62	26,006	1,430	5.50
1997	12,382	755	6.10	16,206	645	4.00	28,588	1,400	4.90
1998	13,763	651	4.73	14,667	525	3.58	28,430	1,176	4.14
1999	11,636	512	4.40	14,351	501	3.49	25,987	1,013	3.90

Increased counts of microorganisms and enterobacteria, coagulase-positive staphylococci, E. coli, and salmonella were the leading reasons for the unfitness of food for human consumption. As regards chemical parameters, the leading nonconformities were the inappropriate food composition, sensory properties, and the use of additives not allowed for particular types of food. There were some individual cases of excessive food additive levels.

PESTICIDES AND HEAVY METALS

A comparison of results (Table 6) from the 1989 food pesticide monitoring with the 1999 figures shows a significant decrease in the number of samples with excessive pesticide residue levels, confirming thus that proper practice was followed in the treatment of crops and the use of land.

Table 6 *Pesticide residues in food (3, 11)*

	Year	HCB	HCH	Lindane	DDT and metabolites	Organophosphorous
% with residues:	1989	27.8	32.7	71.0	76.7	33.0
	1999	19.5	51.7	68.5	83.6	13.8
N above MRL*:	1989	10	5	52	79	5
	1999	0	0	0	1	0

* MRL - Maximum residue limit
Number of analysed samples: 1989=2922; 1999=474

The fact that increased pesticide, heavy metal, cadmium, lead, and arsenic levels (Table 7) in food, which may indicate greater contamination of agricultural soil, were extremely rare suggests that such soils have been preserved from these types of contamination.

Table 7 *The number of food samples assayed for mercury, arsenic, lead, cadmium, and the number and percentage of samples exceeding the maximum allowances (7–9)*

Year	Mercury			Arsenic			Lead			Cadmium		
	Total assays	Unsafe		Total assays	Unsafe		Total assays	Unsafe		Total assays	Unsafe	
		No.	%		No.	%		No.	%		No.	%
1995	4,795	5	0.1	6,995	2	0.03	7,445	8	0.11	5,684	9	0.16
1996	4,777	11	0.23	6,513	0	0	7,288	7	0.1	5,110	2	0.04
1997	5,415	3	0.06	7,459	18	0.24	8,189	12	0.15	6,171	3	0.03

REFERENCES

1. Zakon o zaštiti pučanstva od zaraznih bolesti [Infectious Diseases Act, in Croatian]. Narodne novine 1992;60:1338–49.
2. Zakon o zdravstvenoj ispravnosti i zdravstvenom nadzoru nad namirnicama i predmetima opće uporabe [Food and Object of Common Use Safety Act, in Croatian]. Narodne novine 1997;1:39–46.
3. Capak K, Petrović I. Country Report Croatia. Proceedings of the ILSI/FAO Workshop on Food Safety and Quality Control Systems; 2–6 Dec 1996; Budapest, Hungary. Brussels: International Life Science Institute; 1996 p. 122–6.
4. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1993. Zagreb: CNIPH; 1994.
5. Croatian National Institute of Public Health. Nadzor nad zaraznim bolestima [Infectious Disease Surveillance, in Croatian]. Epidemiološki vjesnik 1999;(1-12).
6. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1994. Zagreb: CNIPH; 1995.
7. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1995. Zagreb: CNIPH; 1996.
8. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1996. Zagreb: CNIPH; 1997.
9. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1997. Zagreb: CNIPH; 1998.
10. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1998. Zagreb: CNIPH; 1999.
11. Croatian National Institute of Public Health (CNIPH). Croatian Health Service Yearbook 1999. Zagreb: CNIPH; 2000.

Sažetak

PRAĆENJE ISPRAVNOSTI NAMIRNICA U HRVATSKOJ

U skladu sa zakonom Hrvatski zavod za javno zdravstvo organizira i provodi statistički program praćenja zdravstvene ispravnosti namirnica koje su u prometu u Hrvatskoj. Laboratoriji koje je Ministarstvo zdravstva Republike Hrvatske ovlastilo za kontrolu ispravnosti namirnica izvješćuju na propisanim obrascima o analizama namirnica prema broju i vrsti. Osim toga, oni naznačuju odgovara li namirnica vrijedećim domaćim propisima ili ne, a u slučaju ustanovljenih prekršaja zakona navode uzrok prekršaja. Ovaj članak ilustrira neke rezultate praćenja u razdoblju 1993.–99. U tom periodu, od ukupno pregledanih uzoraka namirnica zdravstveno neispravno bilo je 6,96–9,60% zbog mikrobioloških parametara, a 3,90–10,0% zbog kemijskih parametara.

Kao najčešći uzroci neprikladnosti namirnica za ljudsku uporabu zapaženi su povećani broj mikroorganizama i enterobakterija, koagulaza-pozitivnih stafilokoka, *E.coli* te prisutnost salmonela. Kod kemijskih parametara najčešći uzroci zdravstvene neispravnosti bili su neprikladni sastav hrane i organoleptička svojstva, kao i upotreba aditiva nedopuštenih u određenoj vrsti namirnice. Otkriveno je nekoliko pojedinačnih slučajeva povećane količine aditiva za namirnice.

Ključne riječi:
laboratorijska analiza, trovanje hranom, zakonski propisi, zdravstvena ispravnost

Requests for reprints:

Krunoslav Capak, M. D., Ph. D.
Hrvatski zavod za javno zdravstvo
P. O. Box 684, HR–10000 Zagreb, Croatia
E-mail: *marijan.katalenic@zg.tel.hr*