Funded by the European Union's Seventh Framework Programme

Trening radionica: Inovacije u proizvodnji i preradi maline
23 i 23 okt 2015

trafoon

Traditional Food Network to improve the transfer of knowledge for innovation

Safety of raspberry products: Bio hazards

Peter Raspor*,
Mateja Ambrožič, Sonja Smole Možina, Darja Barlič Maganja

***Prof. Dr., Dr.h.c.mult., Uni. dipl. eng.**
VICE DEAN for Research and International Cooperation
University of Primorska, Faculty of Health Sciences
Head of the INSTITUTE FOR FOOD, NUTRITION and HEALTH

Evolution of food safety management systems

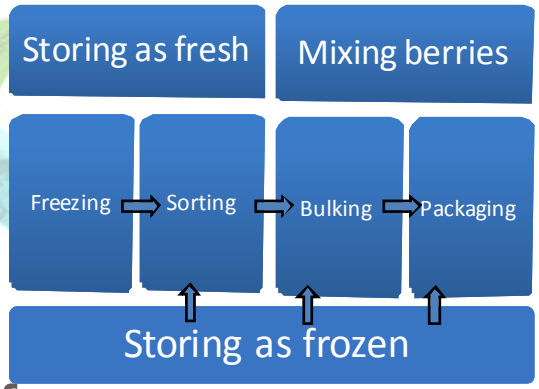
- Good practice-based
  - GHP, GAP, GMP, …
- Hazard-based
  - HACCP
- Risk-based
  - QMRA

- Qualitative, empirical knowledge, prescriptive
  - Prerequisite for all FSMS
- Quantitative (P/A, numbers), control at one step in the food chain
  - Primarily for processes with one major killing step
- Quantitative (consumer risk), applies to the whole food chain
  - Processes with hurdle strategies and/or without major killing steps

Legal and technical basis of QMRA-Quantitative microbial risk assessment in the EU

- 1995 WTO, SPS agreement
- 2000 JEMRA joint FAO/WHO expert meetings on microbiological risk assessment
- 2000 EU White paper on food safety
- 2002 General Food Law, Creation of EFSA

Processing flow



Concerns about Food safety

Fall into 4 categories

- Environmental
- Food and feed safety
- Economic
- Social

Therefore, decision making about is broader than just narrow safety

trafoon

Risk assessment methodology

1. Identify potential risk
2. Identify adverse effect that could result
3. Estimate the likelihood of the adverse effect being realised
4. Evaluate the consequences if the risk is realised
5. Consider risk management strategies
6. Estimate the overall potential impact

trafoon

Izazovi svježih proizvoda

- Inoculum **remains all the way** from the farm to the fork
- Usually **eaten raw** – no pathogen killing step
- Farmers, retailers and consumers require **training**

trafoon

Skroz od njive do trpeze

- Field- polje
- Harvest- berba
- Handling- rukovanje
- Processing
- Distribution
- Storage
- Retail
- Use areas (street, kitchen, serving etc)

trafoon

Commodities of concern

- **Category I:** Leafy vegetables
- **Category II:** Berries, fresh onions, melon, sprouts and tomatoes
- Category III: Carrot, cucumber, almonds, baby corn, sesame seeds, onion, garlic, mango, celery

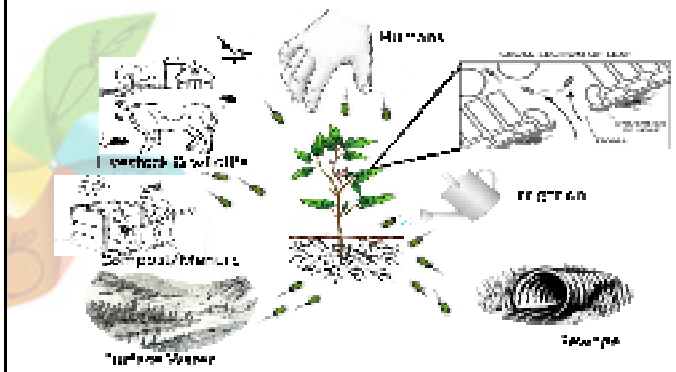
trafoon

Pathogens of concern

- Large epiphytic numbers
- **Pathogens**
  - *Salmonella*
  - *E. coli* O157:H7
  - *Listeria monocytogenes*
  - Viruses (Noroviruses, Hepatitis A)
  - Protozoa (*Cryptosporidium, Cyclospora, Giardia*)

trafoon

Mogući putevi kontaminacije u biljnoj proizvodnji sa ljudskim patogenima (Tsaltas, 2015)



trafoon

Stoka i divljač

- Livestock should be **kept away** from **crop** and **water** sources
- Create **buffer zones**
- Daily **inspections**
- Wildlife **control** (mice/rats, reptiles, amphibians, birds, insects)

trafoon

Ljudski faktor
Radnici → "food handlers")

- **Workers hands:** Biggest source of pathogens
- Washing hands
- Wearing gloves
- Monitor sicknesses
- Offer personal hygiene facilities (toilet, sink)
- Clean Clothing (uniform, hat, shoes)
- Potable water
- Training
  - Personal hygiene
  - Contamination
  - Role of pathogens

trafoon

Traditional Food Network to improve the transfer of knowledge for innovation

Fruit and Vegetables
Production / Personal Hygiene (VITAL)

trafoon

Traditional Food Network to improve the transfer of knowledge for innovation

Fruit and Vegetables
Production / Field Sanitary Accommodation- VITAL

trafoon

Traditional Food Network to improve the transfer of knowledge for innovation

Kompost / gnojivo/ đubrivo

- Well composted (matured)
- Application no later 120 days before harvest or well prior to edible parts emergence
- Appropriately stored
  - Care for water sources contamination

trafoon

Traditional Food Network to improve the transfer of knowledge for innovation

Fruit and Vegetables Production / Zoning-VITAL

trafoon

17

Voda: Navodnjavanje & Pranje

- General
  - Water in contact with produce – Need to be clean
- Irrigation/Spraying
  - Drip irrigation (preferred)
  - Spraying: potable quality
  - More care for surface water
  - Ground water and septic tanks
- Wash
  - Potable
- Hygiene & Drinking
  - Potable

trafoon

Raspor Peter, Trafoon, Ivanjica 23 i 24 okt 2015

Fruit and Vegetables Production / Water Supply-VITAL

trafoon

19

Fruit and Vegetables Production / Cleaning and Sanitisation- VITAL

trafoon

20

Fruit and Vegetables Processing / Design and Layout-VITAL

trafoon

21

Savladavnje rizika

- HACCP application not feasible
  - Difficult to identify Critical Control Points
- Good Agricultural and Hygienic Practices (USA)
- Regulation EC852/2004 & national legislations
- Thorough Management Risk
  - Via **traceability** systems
  - Via recall procedures (very difficult)

trafoon

Raspor Peter, Trafoon, Ivanjica 23 i 24 okt 2015

Uredba -Tehničke tačke

- Staff training in food safety and hygiene issues
- Staff inspections for same issues
- Personal hygiene
  - Acceptance of need
  - Keep high levels of personal hygiene
  - Use of proper clothing and protective gear (gloves, goggles, mask etc)
- High quality water (when needed)

trafoon

Raspor Peter, Trafoon, Ivanjica 23 i 24 okt 2015

Glavne tačke dobre poljoprivredne prakse GAPs

- Water quality
- Manure, slurry, sludge and composts application
- Workers health and hygiene
- Hygienic facilities
- Hygiene and tidiness of farm
- Hygiene and tidiness of packaging areas
- Transport
- Traceability of farm practices and operations

trafoon

Raspor Peter, Trafoon, Ivanjica 23 i 24 okt 2015

NEGATIVNO DELOVANJE MIKROBA U PROCESIMA

- Definicija pojmova kontaminenti, tehnološki kvarljivci, patogeni mikrobi (bakterije, plesni, kvasci, virusi).
- Podela Mikroba s obzirom na stepen rizika za konačnog potrošača.
- Trovanje zbog mikrobne kontaminacije i trovanje produktima mikrobnog delovanja.
- Tehnološki kvarljivci i tipični procesi kvarenja hrane.
- Tehnologija proizvodnje - mikrobiološko procesni aspekt.

trafoon

NEGATIVNO DELOVANJE MIKROBA U PROCESIMA

- Opredeljenje roda i vrste s obzirom na kvar i njihova funkcija u tehnologiji i način dokazivanja prisutnosti *Acetobacter, Bacillus, Lactobacillus, Lactococcus, Leuconostoc, Micrococcus, Pediococcus, Pseudomonas Aspergillus, Botritis, Fusarium, Geotrichum, Monillia, Penicillium, Rhyzopus, Brettanomyces, Candida, Debaryomyces, Kluyveromyces, Pichia, Rhodothorula, Saccharomyces, Zygosaccharomyces*
- Štetni produkti razgradnje za kvalitet prehrambenih proizvoda.

trafoon

KVARENJE HRANE

- je svaka promena u stanju hrane, koja uzrokuje njenu manju privlačnost i kvalitet ali nije nužno, da je takođe i zdravstveno neispravna. Ovakve promene uključuju pored ukusa i miris, izgled i teksturu te predstavljaju najozbiljniji problem u prehrambenoj industriji (senzorno- organoleptičke promene). Moramo razlikovati kvarljivce (kvarne mikrobe, procese) i patogene mikrobe,
- Kvarljivi mikrobi su po pravilu gljive i bakterije, a patogeni mikrobi mogu biti iz istih grupa ali oni po pravilu ne menjaju senzorne karakteristike hrane.

trafoon

Štetni mikrobi za potrošača

- **Trovanje hranom,**
- **I. grupa mikroba- infekcije!**
- **II. grupa mikroba- toksikoinfekcije,**
- **III. grupa mikroba- alimentarne intoksikacije.**

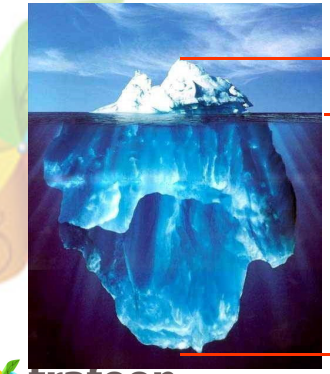
trafoon

Ravnoteža u patogenom delovanju mikroba

trafoon

Raspor Peter , Trafoon, Ivanjica 23 i 24 okt 2015

Uočljiv efekat infekcije



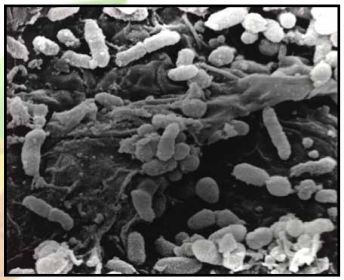
Očita bolest

Neuočljiva/ sakrivena bolest

Infekcija

trafoon

Normalna flora kože



Bakterije na koži

Impetigo
(*Staphylococcus aureus*)

trafoon

Raspor Peter , Trafoon, Ivanjica 23 i 24 okt 2015

Normalna Mikrobna Flora probavnog trakta

- usta
  - 1 ml slina = millions of bacteria
- Želudac i malo crevo
  - Nekoliko organizma prezive tretma s HCl
- Debelo crevo
  - 100 miljardi bakterija na gram feseca
  - 40 % fekalne mase je mikrobni material
    - *Lactobacillus, Bacteriodes, Enterobacter, E. coli. Proteus spp.*

trafoon

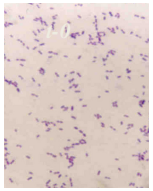
Raspor Peter , Trafoon, Ivanjica 23 i 24 okt 2015

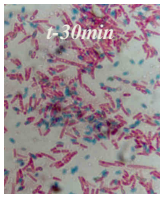
Zašto vidimo mikrobe kao glavni hazard?

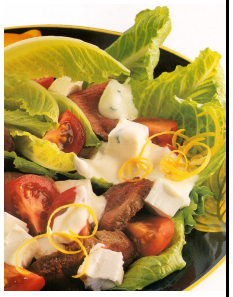
trafoon

Važno !!!!!!!!

Jer se umnožavaju!







trafoon

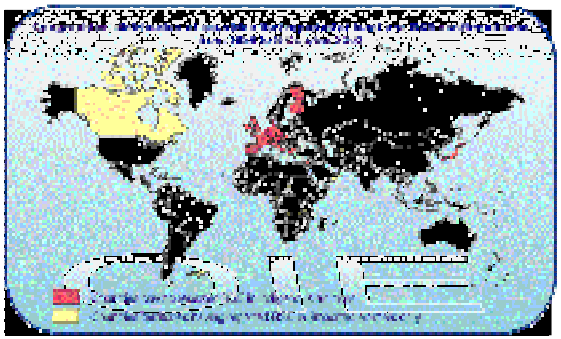
Biološki agensi koji uzrokuju bolest

- PATOGENE BAKTERIJE (Cca.20 sp)
- PARZITI (CCA 10)
- VIRUSI (5 groupa)
- PRIRODNI TOKSINI (10 groupa)
- PRIONI (Bovina Spongiformna Encefalopatija (BSE)-TSE

trafoon

PRIONI

- Bolest ludih krava
- http://www.oie.int/eng/info/en_esb.htm



trafoon

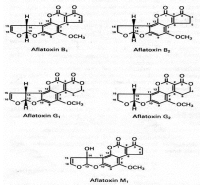
Biološki agensi koji uzrokuju bolest

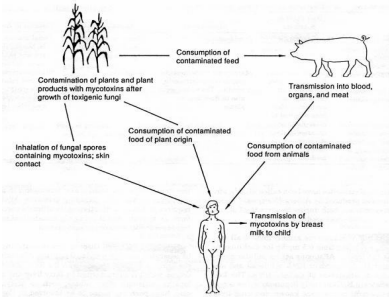
- PATOGENE BAKTERIJE (Cca.20 sp)
- PARZITI (CCA 10)
- VIRUSI (5 groupa)
- **PRIRODNI TOKSINI (10 groupa)**
- PRIONI (Bovina Spongiformna Encefalopatija (BSE)-TSE

trafoon

Prirodni tokisni

- Aflatoksini





trafoon

BRIGE O BEZBEDNOSTI HRANE
Prirodni toksini

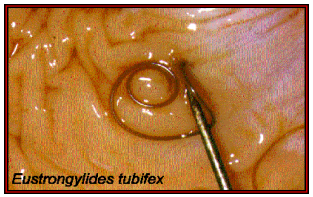
Zagađuju širok spektar hrane i izazivaju mnoge bolesti- mycotoxicose – **Izazivaju akutne ili hronične bolesti. Organi koje napadaju su jetra i bubrezi.**

Mkotoksini predstavljaju veliku opasnost za ljude, s obzirom na dugoročne kanceroene efekte: Akutni beri beri, nefropatije (Balkanska endemična nefropatija, svinjska nefropatija, drhtavica, neurološki poremećaji, rak, tumori, oštećenja jetre i bubrega (nekroza bubrega, tumori na bubrezima), izliv krvi u plućima i mozgu, ili čak smrt.

trafoon

Biološki agensi koji uzrokuju bolest

- PARZITI (CCA 10)
- PATOGENE BAKTERIJE (Cca.20 sp)
- VIRUSI (5 groupa)
- PRIRDONI TOKSINI (10 groupa)
- PRIONI (Bovina Spongiformna Encefalopatija (BSE)-TSE



trafoon

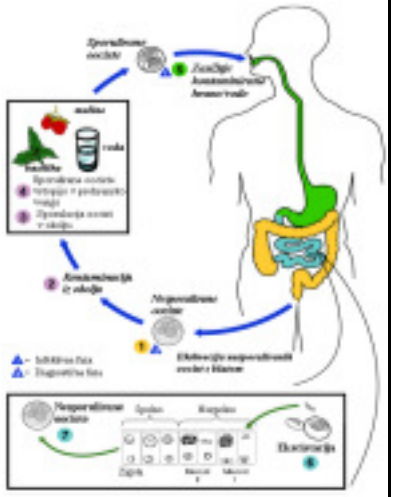
Primarne zoonotički paraziti povezani sa hranom (Slifko et al. (2000) Int. J. Parasitol. 30:1379-1393)

Parazit	Prenos hranom (%)
Microsporidia	ND
Cyclospora cayetanensis	ND
Giardia duodenalis	10
Cryptosporidium parvum	10
Toxoplasma gondii	50
Trichinella spiralis	100
Taenia solium/T. saginata	100
Anisakis simplex	100

trafoon

Primer

- *Entamoeba histolytica, Giardia lamblia, Cryptosporidium parvum* and *Cyclospora cayentanensis*.



trafoon

Paraziti, Protozoe i Gliste

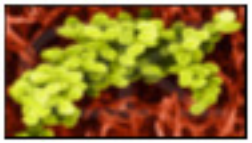
Data collected from 1983-1997. Mead et al. (1999) Emerg. Inf. Dis. 5: 607-625 for USA

Agent	Bolest (%)	Bolnica (%)	Smrt (%)
Viral	67.2	34.8	7.1
Bacterial	30.2	59.9	71.7
Parasitic	2.6	5.3	21.2

trafoon

Biološki agensi koji uzrokuju bolest

- PATOGENE BAKTERIJE (Cca. 20 sp)
- PARZITI (CCA 10)
- VIRUSI (5 grupa)
- PRIRDNI TOKSINI (10 grupa)
- PRIONI (Bovina Spongiformna Encefalopatija (BSE)-TSE



trafoon

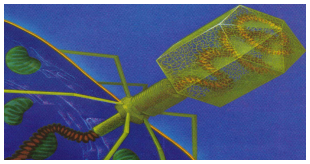
Novi patogeni mikrobi u hrani

- Oportunisti- patogeni koji su ušli u nove kanale u tehnologiji i prehrambenom lancu
- Primer Listeria i Yersinia
- listerioza
- yesionioza;

trafoon

Biološki agensi koji uzrokuju bolest

- VIRUSI (5 groupa)
- PATOGENE BAKTERIJE (Cca.20 sp)
- PARZITI (CCA 10)
- PRIRODNI TOKSINI (10 groupa)
- PRIONI (Bovina Spongiformna Encefalopatija (BSE)-TSE



trafoon

Agenti bolesti uzrokovane hranom(Guzewich 2000)

Agent	Učestalost%
Nespecifični viralni gastroenteritis	25.7
Salmonellae	23.6
Clostridium perfrigens	8.3
Scombrotoxin	7.3
Gastroenteritis od Norwalk virusa	6.6
Staphylococcus aureus	5.9
Ostali hemijski izvori	5.3
Bacillus Cereus	4.6
Campylobacter spp.	2.4
Hepatitis A	1.6
Trovanje gljivama	1.4
Rotavirus	1.1
Teški metali	0.9
Trichinella spiralis	0.86
Ostalo	4.54

trafoon

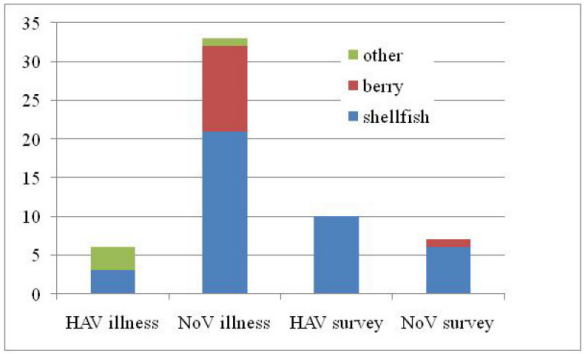
Food borne viruses

Virus	Classification	Genome	Foodborne transmission	Food-handler transmission	Zoonotic transmission	Clinical signs	Reported foodborne outbreaks	Priority level
Hepatitis A virus (HAV)	*Picornaviridae* Hepatovirus	ssRNA positive	Proven	Proven	Not documented	- Hepatitis - Never chronic - 4 weeks incubation - Usually asymptomatic under 6 years of age	Yes	1
Noroviruses	*Caliciviridae* Norovirus	ssRNA positive	Proven	Proven	Not documented	- gastroenteritis - 1-2 days incubation	Yes	1
Sapoviruses	*Caliciviridae* Sapovirus	ssRNA positive	Proven	Proven	Not documented	- gastroenteritis - 1-2 days incubation	Yes	2
Hepatitis E Virus	*Virus family unassigned (proposed Hepeviridae)*	ssRNA positive	Proven	Possible	Proven	- Hepatitis - only chronic in immunosuppressed patients - 4 weeks incubation - Fulminant hepatitis (1% to 30% of pregnant women)	Yes	2
Rotaviruses	*Reoviridae* Rotavirus	dsRNA segmented	Proven	Suspected	Proven	- gastroenteritis - asymptomatic in adults - 3 days incubation	No	2
Aichi virus	*Picornaviridae* Kobuvirus	ssRNA positive	Proven	Not documented	Not documented	- gasteroenteritis	Yes	3
Tick-borne encephalitis virus (TBEV)	*Flaviviridae* Flavivirus	ssRNA positive enveloped	Proven	Not documented	Proven	- fever, neurologic symptoms - 7-14 days incubation	Yes	3

ANNEX TO THE PUBLICATION OF THE SUPERIOR HEALTH COUNCIL No. 8386 VIRUSES AND FOOD (SHC 8386) Scientific report; www.health.fgov.be/CSS_HGR

trafoon

Food borne viruses



Number of notifications for suspected viral contamination of food products from 2000 until March 2010, based on illness reports or virus detection in products

Scientific Opinion on anupdate on theprese rt knowledge on theocaurrence andcontrol of foodborne viruses:EFSA Panel on Biological Hazards,EFSA Joumal9 (2011) 2190.

trafoon

Primeri novih patogena otkrivenih u protekloj deceniji

God	Mikrob	Bolest
1990	*Guanirito virus*	Venecuelanska hemoragič na groznica
1991	*Encephalitozzon hellem*	Konjuktivitis, raširena bolest
1992	*Vibrio cholerae 0139*	Novi oblik kolere
1992	*Bartonella henselae*	Groznica i otklina limfnih žlezda izazvana ujedom ili ogrebotinom mač ke
1994	Sabia virus	Brazilska hemoragič na groznica
1995	Hepatitis G virus	Hepatitis ne tipa A, ne tipa b
1995	Human herpes virus 8	Karposi Sarkom
1996	TSE Agent	Varianta Creutzfeldt-Jakob bolesti
1997	Avian influenza A: (H5A1)	Influenca
2003	SARS Coronavirus (new?)	SARS

trafoon

Malina može biti kontaminirana:

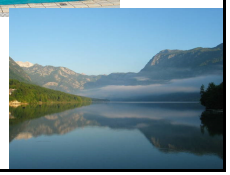
- contact with (human) faeces or faecally contaminated w ater
- contact with faecally soiled materials (including hands)
- contact with vomit or w ater contaminated with vomit
- contact with environments in which infected people w erepresent, even if the surface w as not directly contaminated with stool or vomit
- aerosols generated by infected people

trafoon

Raspor Peter , Trafoon, Ivanjica 23 i 24 okt 2015

Izvor kontaminacije- voda

- sewage contaminated water
- contaminated drinking /irrigation water
- recreational waters (waters for swimming, canoeing, surfing ...)
- groundwater
- urban rivers
- marine environment



trafoon

Izvor kontaminacija – prpremljena hrana

- dishes containing fresh (or fresh frozen) fruits and vegetables
- deli meat, sandwiches, bread rolls, bakery products, berries, ice cubes

trafoon

Detekcija virusa u uzorcima hrane i vode

Very problematic!

- the level of contamination with virus may vary greatly within a product
- diagnostic methods for food or water are not routinely available in food microbiology laboratories
- only a few viral particles are normally present in water samples

trafoon

Prevalenca virusa- Produkcijska faza u lancu maline (from Vital 2012)

Point of interest	HAdV	PAdV	BPoV	HAV	HEV	NoV GG1	NoV GG2
Irrigation water	9/95 (9%)	4/89 (4%)	1/89 (1%)	0/56	0/56	0/56	2/56 (4%)
Toilets/latrines	2/22 (9%)	n.d.	n.d.	0/9	n.d.*	0/9	0/9
Toilet doorhandles	2/22 (9%)	n.d.	n.d.	0/10	n.d.	0/10	0/10
Harvesters' hands	10/72 (14%)	n.d.	n.d.	0/15	n.d.	0/15	0/15
Seasonal workers' hands	4/171 (2%)	n.d.	n.d.	0/98	n.d.	0/98	0/98

trafoon

SPREČAVANJE KONTAMINACIJE VIRUSIMA KOT MAILNE

- **GENERAL RECOMMENDATIONS**

- Food business operators should ensure that all appropriate good hygienic practices are being followed and HACCP systems are in place.
- Training in food hygiene is essential and should be performed regularly. This must include training on good hygiene for temporary/seasonal staff.
- Training should be documented and verifiable.
- The food business operator should ensure that good sanitary practices are being followed, for example by effective supervision and verification through random inspections.

trafoon

SPREČAVANJE KONTAMINACIJE VIRUSIMA KOT MAILNE

Contamination vehicles	Potential contamination points:
Food handlers' hands	Manual picking and handling berries
Untreated Water	Spray irrigation
	Spraying pesticide and/or fertilizer
Untreated manure	Contact with low growing berries
Unclean harvesting equipment and utensils	Contact with berries

trafoon

Quantitative microbial risk assessment

Zaključak

Diskarpanca tačka prodaje i pojava bolesti – sugeriše da ima malo kontaminacije

Regulatori traže HACCP strategiju da se preči kontaminacija

Pojava bolesti- outbreaks- povezani s malinom sugerišu da je to sporadično

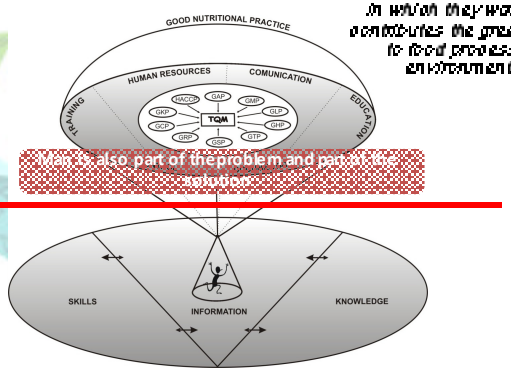
Danas industriaja još uvek računa na intervencije poslje berbe

Prevencija od kontaminacije se preferira i proizvađači moraju slediti GAP, GMP i GHP te sledljivost

trafoon

Ljudski faktor

Human behavior regardless of the sanitary environment in which they work, still contributes the greatest risk to food processing environments.



Food safety platform: balanced model for ensuring food safety from Good Nutritional Practice viewpoint

Raspor P, Jelenik V, 2008. Good nutritional practice from producer to consumer. Critical Reviews in Food Science and Nutrition, 48, 276-292

trafoon

Efikasno procesiranje hrane

- Pasterizacija
- Fermentacja
- Dehidracija
- Hlađenje
- Smrzavanje

- I brojni moderni postupci
- zračenje
- Visoki pritisak
- Svetlost…

trafoon

Pitanja?

trafoon

Raspor Peter , Trafoon, Ivanjica 23 i 24 okt 2015

Hvala lepa! Thanks to:
TRAFooN
*www.**trafoon**.eu/*
VITAL European Project FP7
http://eurovital.org/
Biotehniška Fakulteta UL, Slovenija
*www.**bf**.uni-lj.si/*
Fakulteta za vede o zdravju UP, Slovenija
www.fvz.upr.si

CONTACT: Prof. Dr. Peter Raspor, Dr.h.c.mult., Uni. dipl. eng.
VICE DEAN for Research and International Cooperation
University of Primorska, Faculty of Health Sciences
Head of the INSTITUTE FOR FOOD, NUTRITION and HEALTH
Polje 42 SI – 6310 Izola SLOVENIA
Peter.raspor@fvz.upr.si

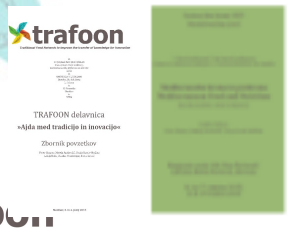
Publikacije

knjige

2014 2015 2015

konference

2015



trafoon

UP FVZ Institut for food and health since 2014

trafoon