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WORKSHOP – SUSHI PRODUCTION

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Sushi meal origin

- It is not certain
  - Chinese dictionary 2nd century (nare-sushi)

- Edo style sushi (19th century)

Modern sushi history

- 1960. starting to spread to western countries
  - Eastern coastel cities in the USA (1960)
  - Europe (1990)

- Colority and diversity of edo style sushi (19th century)

- Reasons:
  - Changing diet to more healthy ones
  - Curiosity
  - Prestige

Modern sushi

Nigiri sushi

California roll

Tekkamaki

Futomaki

Gunkan-maki

Temaki

Chirashi

Inarisushi

Rainbow roll

Nutritional profile of sushi meal

Sample Label for Macaroni and Cheese

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 1.5g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

It is in dependence with portion of:

Advantages of sushi nutrition

- Low fat content
- High seafood content
- Low calorie meal < 6000 kJ

DISADVANTAGES OF SUSHI NUTRITION

- It is not low salt content food.
- Refined rice content.
- Lower microbiological quality due to contamination

Food standards Australia New Zealand	Satisfactory	Marginal	Unsatisfactory
Standard plate count (cfu/g)	$< 10^6$	$< 10^7$	$\geq 10^7$

Table 3. Microbiological risk evaluation of sushi meal

Country/sushi/year	Unsatisfactory percentage	Reasons
USA/ butterfly shrimp/2004	Enterotoxigenic *E. coli**	Poor food **handling/hand** hygiene
Denmark/maki, nagiri sushi/2014	TAPC, *E. coli, S. aureus*	Regulation for control of personal hygiene and **initial microbial** quality of product
Malaysia/sushi/2007	*Campylobacter* spp.	Contamination through **mishandling**
Portugal/sashimi/2013	TABC, *Enterobacteriaceae*, *S. aureus*, *B.cereus*, *Mould*,*Yeast*	HACCP should be better implemented
Singapore/sushi/2004	*Salmonella* *	The source could be contaminated raw sushi ingredients. **Inadequate hand washing** facilities and **bare hand contact** with ingredients.
Taiwan/sushi/1999-2000	TABC, Coliforms, *E.coli*, *B. cereus, S. aureus*, *Pseudomonas*	Not adequate implementation: -**Handling practices** -Temperature control
Spain/sushi/2006	*E. coli*, *S. aurues*	Good hygiene practice should be included and storage temperature monitored
USA, Seatle County/sushi/1990	TABC, *S. aureus*, *B. cereus*	**Improper handling** and inadequate sanitation during sushi preparation.
Norway/retail sushi (RTE)/2014	TABC, Aeromonas spp.	Ingredients of better microbiological quality should be used and adequate temperature control of product should be provided.

*outbreak

Table 4. Correlations between sushi ingredients and microbiological profile

Table 3. Correlations between sushi ingredients ratio and microbiological profile

Sushi Type		*Enterobacteriaceae*	Coliform bacteria	Total viable count	LAB	*Psychotropic bacteria*	*Pseudomonas* spp.
Salmon	Nigiri	pH: r=0.99 Rice: r=0.99	-	-	-	Wasabi: r=1.00	-
	Maki	Salmon: r=-1.00 pH: r=-1.00	-	-	-	-	-
Tuna	Nigiri	Rice: r=0.99 Tuna: r=-0.99	Tuna: r=-1.00	Rice: r=1.00 Tuna: r=-1.00	-	Rice: r=1.00 Tuna: r=-1.00	-
	Maki	Nori: r=-1.00	-	-	-	Nori: r=0.99	Rice: r=0.99 Tuna: r=-0.99
Shrimp	Nigiri	-	-	Shrimp: r=-0.99	-	-	-
	Maki	-	-	-	-	-	-

Legislation

- Regulation (EC) No 853/2004 of the European Parliament and of the Council as regards the treatment to kill viable parasites in fishery products for human consumption ammended by COMMISSION REGULATION (EU) No 1276/2011 of 8 December 2011
  - For parasites other than trematodes the freezing treatment must consists of lowering the temperature in all parts of the product to at least: (a) – 20 °C for not less than 24 hours; or (b) – 35 °C for not less than 15 hours

- COMMISSION REGULATION (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs
  - Listeria monocytogenes < 100 cfu/g

- pHof sushi meal should be lower than 4.4 (it serves as microorganism barrier)

Literature evidence about sushi meal nutrition profile

- Low caloric meal, low amount of fat and cholesterol, higher amounts of vitamins and minerals.
- Due to seafood content: higher protein content and **omega-3 fatty acids**
- Fish meat contains higher amount A, D and B complex, phosphorus, magnesium, iodine and iron.
- Ginger and wasabi have antibacterial properties and ginger helps to strengthen immune system against cold and flu. Wasabi is the good source of vitamin C

- It was found that 5 pieces of sushi which include 20 g of fatty seawater fish can satisfy the daily requirements for B6 vitamin.

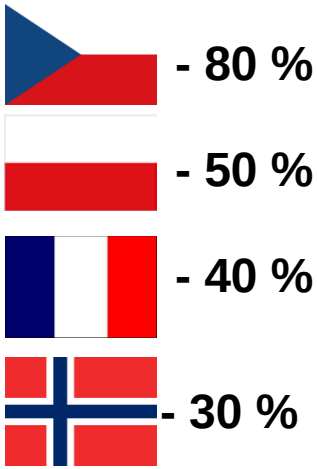
- Nutritional properties of nori indicates that it is a good source of fiber, proteins, minerals (calcium, iron, iodine) but it contains low amounts of fat. Porphyosin which has anticay ulcer activity is present in nori seaweed. Choline and inositol (B complex vitamins) are also found in higher amounts in nori.

- Fish meat contains higher amount A, D and B complex, phosphorus, magnesium, iodine and iron.

- Higher amount of lignans are it is suggested that bigger intake of these compounds is in correlation found in wasabi, and with lower prevalence of some chronic diseases in Japan, in comparison with other western countries. Ginger and wasabi are good sources of vitamin C.

WHAT SUSHI CONSUMERS THINK ABOUT SUSHI MEAL?

- Sushi contains certain amount of seafood.
- Seafood consumption is health beneficial.
- Sushi is an exotic meal. Asian food synonyms: fresh vegetables, low fat, seafood, exotic ingredients, good value for the money, unknown foods, healthiness.



- 80 %

- 50 %

- 40 %

- 30 %

Source: (De Silva and Yamao, 2006; Czarniecka-Skubina and Nowak, 2014)

- Nutritional profile of sushi meal can not be declared to be important reason for sushi popularity.
- Sushi is highly accepted in the Czech Republic as globally developed brand.

Sushi rice recepture

- 500 g rice
- 40 ml vinegar
- 30 g sugar
- 10 g of salt