
(*Rutilus frisii kutum*)

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(Perkin Elmer, FIAS-100)

(*Rutilus frisii kutum*)

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(HQ)

FDA FAO WHO USEPA

FAO

JECFA USEPA WHO

(PTWI PTDI)

(*Rutilus frisii kutum*)

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(De Mora *et al.*, 2004)

(FAO, 2009)

(PUFA¹)

(EPA³)

(DHA⁴)

(Kojadinovic *et al.*, 2006)

(Kojadinovic *et al.*, 2006)

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Esmaili-Sari,)

Burger *et al.*, 2007,B; Dietz *et al.*, 2000; 2008
(Houserova *et al.*, 2006; Porcella, 1994

- (Kojadinovic *et al.*, 2006)

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Sabaghe)

(Yazdaninasab, 2005)

(Kashani, 2001

(Ruelas-Inzunza *et al.*, 2008; Human Health of
Canada., 2007)

⁵ Risk assessment

⁶ Methyl mercury

⁷ Biomagnification

⁸ Methylation

¹ Poly Unsaturated Fatty Acid

² Omega-3

³ Eicosapentaenoic acid

⁴ Decosahexaenoic acid

(Clarson, 1990; Yamaguchi, 2004)

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Agusa et al., 2004; Anan et al.,)
2005; Froghi et al., 2007; Pourang et al., 2005;
Taheri-e Azad et al., 2008; Sabaghe Kashani, A.
(2001; Yazdaninasab, 2005

-
Kojadinovic Castilhos *et al.*, 2006)
Gochfeld, Ruels-Inzuna *et al.*, 2008; *et al.*, 2006;
2003; Burger *et al.*, 2007,A; Agusa *et al.*, 2005
(Turkmen *et al.*, 2009

Rutilus frisii)
-) (kuttum
(

Hosseini, 2004;)
(Vossoughi and Mostajeer, 1994

(S1-S12)

Fisheries statistical)

(yearbook, 2009

² Human health risk assessment

³ Exposure assessment

⁴ Exposure pathways

⁵ Exposure concentraion

⁶ Toxicity assessment

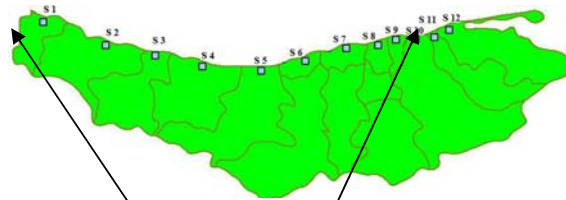
⁷ Quantitative cancer endpoint

⁸ Quantitative non-cancer endpoint

⁹ Risk characterization

¹ Hydrophobic

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 S) (S 6) (S 5) (S 4) ()
 (S 10) () (S 9) (S 8) (7)
 (S 12) (S 11)
 (S 3) (S 2) (S 1)



(Vossoughi and Mostajeer, 1994)

Fisheries statistical)

(yearbook, 2009

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NRC-DORM-2⁷

FIAS-100, Perkin)

(USEPA, 1998, Method SW-

(Elmer
.1311)

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(HClO₃)

(HNO₃)

Kojadinovic,)

(J., *et al* 2006; Goldblum *et al.*, 2006

HQ

/ SnCl₂

(Hg²⁺)

(Hg⁰)

⁵ Detection limit

⁶ Standard reference material

⁷ Dogfish muscle; national Research council, Canada

⁸ Mercury toxicity assessment

⁹ Fixed conversion factor

¹⁰ Risk characterization

¹¹ Hazard quotient

¹ Cold vapor technique

² Cold vapor-Atomic absorption spectrophotometry;
CV-AAS

³ Tin(II) chloride

⁴ Volatile mercury atoms

$$DI = C_m \times IR$$

$$HQ = (MTCC \times CR / BW) / RFD$$

(Castilhos *et al.*, 2006; Goldblum *et al.*, 2006)

(Agusa *et al.*, 2005; Kojadinovic, J., *et al* 2006)

$$DI = C_m \times IR$$

$$HQ = (MTCC \times CR / BW) / RFD$$

SPSS

(One way ANOVA)

USEPA

(USEPA, 2000)

$$CR_{lim} = (RFD \times BW) / C_m$$

$$/ \pm / \pm \times = BW^8$$

⁹ Measured concentration
¹⁰ PTDI (Provisional permissible tolerable daily intake in µg/Day/kg body weight) or ADI
¹¹ PTWI (Provisional permissible tolerable weekly intake in µg/week/kg body weight)
¹² Daily Intake (Dietary mercury exposure)
¹³ Ingestion rate

¹ Exposure level
² Unitless
³ Mean tissue contaminant concentration
⁴ Consumption rate (Mean daily consumption)
⁵ Fish safety limits
⁶ Consumption rate limite (Maximum allowable fish consumption: kg or gr / day)
⁷ Reference dose
⁸ Body weight

(*Rutilus frisii kutum*)

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FAO

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USEPA

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/ HQ

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(Kojadinovic *et al.*, 2006)

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(FAO,

2009)

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¹ Food and Agriculture Organization (FAO)

³ Benthophagous

HQ	DI	DI	CR
()	FAO	()	()
/	/	/	

JECFA
USEPA

() Yazdaninasab /

- / / ()

() Froghi

/ / /

Ruels-) (2004 Agusa *et al.*,
) (Inzuna *et al.*, 2008
Ruels-Inzuna *et al.*, 2006 Kojadinovich *et al.*,
(Walkuska *et al.*, 2010) (2008

(Wagemann *et al.*, 1997) Shi *et al.*,
() Henry (Ruelas-Inzunza *et al* 2008; 2005)

Henry *et*) (۲۰۰۷) Froghi .

(WHO, 1990)

() Anan /

³ Location of feeding ground

¹ Threshold level
² World Health Organization(WHO)

(FAO,

.2009)

HQ

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(Kojadinovic, *et al* 2006)

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(Human

Health of Canada, 2007)

()

(Burger *et al.*, 2007,A)

¹ Gastrointestinal tract

² Shark

³ Swordfish

⁴ Mackerel king

⁵ Tile fish

Goldblum *et al.*, Kojadinovic *et al.*, 2006)
(2006;

(Gochfeld, 2003)

()

Kojadinovic

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DNA

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(/)

Goldblum *et al.*, 2006;) C
(Human Health of Canada, 2007; USEPA, 1997

() FDA

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(/)

(PTDI)

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(Goldblum *et al.*, 2006)

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(Kojadinovic *et al.*, 2006)

Castilhos

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³ Swordfish (*Xiphias gladius*)
⁴ Reunion
⁵ Comoros
⁶ Mauritius
⁷ Tatelu
⁸ Galangan

¹ Genotoxic
² Adult

HQ

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()

(Castilhos *et al.*, 2006)

HQ

Ruels-) ...

(Inzuna *et al.*, 2008)

Türkmen

()

Cd, Co, Cr, Cu, Fe, Mn, Ni,)

(Zn Pb

(PTWI PTDI)

-

(Turkmen *et al.*, 2009)

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HQ

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¹ Aegen Sea
² Mediterranean Sea

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Risk assessment of mercury due to consumption of kutum of the Caspian Sea (*Rutilus frisii kutum*) in Mazandaran Province

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Abstract

Mercury is one of the most toxic heavy metal which can enter the human body mainly through consumption of seafood contaminated with mercury. In this study, the human health risk due to consumption of kutum (*Rutilus frisii kutum*), in the Caspian Sea, were evaluated by measuring the concentration of mercury in muscle samples using Atomic absorption spectrophotometer (Perkin Elmer FIAS-100) and cold vapor technique. A total of 60 fresh kutum were collected by local fisherman from 12 stations on the southern coast of Caspian Sea in Mazandaran province. The average concentration of mercury in kutum muscle was 0.112 µg/g of fresh weight (0.382 µg/g dry weight) which was less than the allowable amount for human consumption determined by the international organizations such as USEPA, WHO, FAO and the FDA. HQ Index was below 1 (0.48). Also, the calculations indicated that daily and weekly mercury uptake for Iranian consumers, according to FAO (the amount consumed per capita) is lower than the guide values (PTWI and PTDI) provided by WHO, USEPA and JECFA. Therefore, the consumption of the kutum is not a serious threat to the consumer's health and a consumption permitted rate of 62 g is recommended.

Keywords: Allowable fish consumption, Mercury, Kutum (*Rutilus frisii kutum*), Risk assessment

