

Mercury monitoring activities in the Pacific Island Region

An update from Fiji

15 August, 2019

Jakarta, Indonesia

Background

- The Institute of Applied Sciences (IAS) is based at the University of the South Pacific (USP) in Fiji



IAS Analytical laboratories

- Service as a regional laboratory for the 12 member countries of USP
- Biofuel, Food, Water, Microbiology and Natural Products Research
- Facilitating regional research and commercial testing of mercury in different matrices since 2004
- Accredited to ISO/IEC 17025 since 2004, mercury is an accredited test (food and water samples) since 2006

Past experience and projects

- Thesis

Kumar, Maureen C. and Aalbersberg, William G.L. and Mosley, Luke M. (2004) *Mercury levels in Fijian seafoods and potential health implications*

- FAO Pacific Islands Food Composition Tables (2004)

The laboratory was accredited for 22 nutritional parameters, mercury testing was developed but was accredited in 2006

- Laboratory analysis of mercury in tuna since 2004 – 2019 at approximately 1000 samples per year

Seafood Sample	n	Average Length (cm)	Average Weight (kg)	Range [Hg] (mg/kg)	Average [Hg] (mg/kg) ± SD
Albacore Tuna	31	72.7	21.3	0.03 – 1.01	0.34 ± 0.22
Yellowfin Tuna	24	71.3	15.2	<0.02 – 0.40	0.11 ± 0.11
Skipjack Tuna	12	45.7	2.4	<0.02 – 0.16	0.06 ± 0.04
Bigeye Tuna	3	103.3	28.3	0.28 – 0.80	0.53 ± 0.21
Marlin	5	167.6	67.4	0.45 – 5.60	1.76 ± 1.94
Reef fish	5	17.2	0.09	<0.02 – 0.04	0.04 ± 0.01
Barracuda	4	61.25	1.32	0.18 – 0.38	0.26 ± 0.07
Mussels	3	-	-	<0.02 – 0.04	0.03 ± 0.01
Shellfish	3	-	-	<0.02 – 0.05	0.03 ± 0.01
Crab Meat	3	13.3	-	0.03 – 0.07	0.05 ± 0.02
Parrot fish	2	31-35	0.75	<0.02	<0.02
Wahoo	1	92	6	0.17	0.17
Goatfish	1	28	0.31	0.03	0.03
Rabbit fish	1	32	0.5	0.15	0.15
Peacock cod	1	33	0.62	<0.02	<0.02
Unicorn fish	1	39	1.07	<0.02	<0.02
Opah	1	111	65	0.27	0.27

Hg levels (range and average) in different fresh fish and shellfish from the Fiji Islands, with length and weight data where available. (note: n = number of samples, SD = standard deviation)

Canned Fish Type	n	[Hg] range (mg/kg)	[Hg] average (mg/kg) ± SD
Canned Albacore	6	0.16 – 0.27	0.20 ± 0.03
Canned Skipjack	9	0.06 – 0.11	0.08 ± 0.02
Canned Tuna in oil	3	0.05 – 0.16	0.09 ± 0.05
Canned Mackerel	6	0.18 – 0.22	0.21 ± 0.01
Canned Salmon Style Mackerel	6	0.17 – 0.29	0.23 ± 0.05

Hg levels in canned fish sold in the Fiji Islands. (note: n = number of samples, SD = standard deviation)

The total Hg levels in some of the large predatory fish species (marlin and swordfish) exceeded the Food and Agriculture Organization (FAO)/World Health Organization (WHO) Codex Alimentarius guideline level of 1 mg/kg. Other types

The total hair [Hg] in all men exceeded the USEPA safety limit of approximately 1 µg/g in hair and 85% of them exceeded the recommended FAO/WHO safety limit of 3 µg/g in hair. Only 69% of the childbearing age women had total hair [Hg] below the FAO/WHO safety limit and 6% of the childbearing age women had hair [Hg] above WHO safety limit of 10 µg/g, an earlier safety limit derived from the Iraqi data which estimated level at which health effects occur but did not include some uncertainty factors included in later safety limit. In the total fish consuming population 44% of the participants have exceeded the FAO/WHO safety limit.

Recent projects and capacity building in Fiji

- IDEA Inc Consultants and MOEJ (Government of Japan) - 2018 training and mercury monitoring studies in ambient air, human hair and ocean water in Fiji, PNG and Samoa
- APMMN workshop in Philippines (2018), a wet deposition sampler for mercury to be set-up in Fiji in 2019
- Taoyuan, Taiwan (ROC) – 2019 Training workshop on mercury wet deposition sampler and laboratory analysis



IDEA Consultants Researcher Miwako Ueda assists IAS Lab Technician Anaseini Turukawa in measuring hair samples for Mercury Analysis.



Recent reports on mercury

- Water (Ocean) and near shore in Laucala bay and Suva harbour, Fiji

Site	Depth (m)	Concentration (ng/L)
1	10	0.41
2	10	0.83
3	1	1.76

- Air (ambient) from Laucala bay, Fiji – (1.2 ng/m³)
- Hair (human) for USP-IAS Laboratory staff – (1.46 ng/mg)

Current instrument capacity for heavy metals

- Flow Injection Mercury System (using FIA cold vapor AA)
- ICP-OES
- MP-AES
- GF-AAS
- IDEA Inc Consultants – ambient air sampler (with pump)
- APMMN – set-up of sampler system for wet deposition (2019)

Future directions

- Training on mercury samplers, sampling and laboratory analysis
- Method development and further capacity building in laboratory analysis (e.g. matrices – air, biological samples, reference methods or instruments)
- Postgraduate student (MSc. And PhD) and Postdoctoral research
- Strengthen collaboration (MoU, LoA)
- Accreditation of test methods (technical assistance from experts)

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Thank you