

Assessment of dioxin in biota for human consumption – Noosa Lakes

August 2020



Background

Queensland Health assessed the data provided by Department of Environment and Science (DES) on biota samples for human consumption collected in the Noosa lakes. Biota sampling was undertaken following detection of dioxins and dioxin-like compounds in lake sediments. In this assessment, dioxin means dioxin and dioxin-like compounds as selected by DES in their analysis and report. All values are Toxic Equivalents (TEQ) for these compounds.

Results

Dioxin analysis results of biota samples (Table 1) collected from Lake Weyba, Lake Cootharaba and Lake Cooroibah in the Noosa area were used in this assessment. As the difference between the two fish samples was small and not expected to make a substantive difference to the calculation, 1.7 pg TEQ/g value was selected for the initial exposure calculation. For the oysters, a 100 g serve (approximately 6 oysters) at the mean of both samples and a 200 g serve (approximately 12 oysters) of Lake Weyba oysters were chosen for the calculations. The latter option was to provide reassurance around the higher concentration of the dioxin in the Lake Weyba sample. No calculation was made for the crab meat, as the concentration of dioxins was very low.

Table 1 Results reported by Department of Environment and Science of dioxin analysis of biota for human consumption in Noosa

Sample ID	Matrix	Location	FAT (%)	TEQ _{DF} (pg/g)	Sample
WEY-MUL-28520	Mullet	Lake Weyba	4.1	1.7	Composite Sample (5 Fillets)
COO-MUL-29520	Mullet	Lake Cootharaba	8.6	1.3	Composite Sample (4 Fillets)
COI-OYS-2752	Oyster	Lake Coolibah	ND	1.7	Composite Sample (7 pieces)
WEY-OYS-27520	Oyster	Lake Weyba	ND	3.2	Composite Sample (9 pieces)
COO-MUD-00520	Mud Crab	Lake Cootharaba	0.6	0.036 (0.014 - 0.057)	Composite Sample (flesh of 2 crabs)

ND = not determined

Guideline Value

The NHMRC established a Tolerable Monthly Intake (TMI) guideline value (GV) for dioxins of 70 pg TEQ/month (NHMRC, 2002). By taking into account background exposures and consumption data, FSANZ estimated the limit for dioxins in fish and seafood for human consumption was 6 pg TEQ/g (pg of dioxin toxicity equivalence per g fresh weight of fish) (FSANZ, 2007). The FSANZ assessment is based on a single serve of fish from the contaminated area per week.

Exposure

Exposure values (Equation 1) and hazard quotients (Equation 2) have been calculated for consumption of 1, 2 and 3 serves of fish per week, or one serve of oysters per week. If an adult were to consume up to 3 serves per week of fish from the Noosa area as sampled, the intake could reach around 60% of the TMI - approximately 44 pg TEQ/Kg bw per day (Table 2). Exposure values for children are not reported

separately. If exposure as a child (6 years of a total 70 year lifetime) and exposure as an adult (balance of 70 year lifespan) is considered, the risk is not significantly different.

$$Intake (dioxin) = \frac{Conc \times (portion\ size * frequency)}{Body\ weight} \quad \text{Equation 1}$$

Where

Intake is intake of dioxin in pg TEQ/kg

Conc is the concentration of dioxin in fish

Portion size is the weight in g of fish consumed in a meal

Frequency is the number of meals consumed per month

Body weight is the default body weight for a child or adult in kg.

$$HQ = \frac{Intake}{Guideline} \quad \text{Equation 2}$$

Where

HQ is the hazard quotient

Intake is the intake of dioxin from Equation 1

Table 2 Calculated exposure and hazard quotient for consumption of fish and oysters sampled from Noosa lakes.

Parameter	Units	1 meal per week	2 meals per week	3 meals per week	Oysters (all)	Oysters (Weyba)
Concentration	pg/g	1.70	1.70	1.70	2.50	3.20
Portion size (fish)	g/meal	150.00	150.00	150.00	100.00	200.00
Frequency	meals/month	4.00	8.00	12.00	4.00	4.00
Ingestion Rate (fish)	g/month	600.00	1200.00	1800.00	400.00	800.00
Body weight	kg	70	70	70	70	70
Intake (dioxin)	pg/kg bw month	1.46E+01	2.91E+01	4.37E+01	1.43E+01	3.66E+01
GV (NHMRC)	pg/kg bw month	70	70	70	70	70
HQ		0.21	0.42	0.62	0.20	0.52

Uncertainties

As the sample size is very small, and collected over a short time frame, the result may not be representative of all biota in the area that may be consumed. The extent of recreational fishing, and the amount of catch kept and consumed for the specific area is not known but is assumed to reflect general patterns in Queensland.

Conclusion

Consumption of fish from the Noosa area sampled by DES is unlikely to result in an unacceptable risk to public health. Recreational fishers consuming relatively significant amounts over extended seasons may approach the recommended TMI. Seasonal consumption patterns, lifetime patterns of activity, and locality changes mitigate against the possibility of exceeding the dioxin tolerable intake guideline value. This assessment has not considered the risks associated with commercial fishing. As the concentration in fish is below the FSANZ limit of 6 pg TEQ/g, the risk is not expected to be a concern. However, this may need to be further investigated with Department of Agriculture and Fisheries if there is significant commercial fishing in the area.

Recommendation

No specific advice on the consumption of fish due to dioxins in the Noosa area is required. If public concerns are noted, media reminders of the recommendations of consumption of fish with respect to mercury could be issued, as these guidelines would also be protective of exposure to dioxins.

References

- FSANZ. (2007). *Dioxins in Seafood from Sydney Harbour A Revised Assessment of the Public Health and Safety Risk. Technical Series Report No: 32. Food Standards Australia and New Zealand. Canberra*
- NHMRC. (2002). *Dioxins: Recommendation for a Tolerable Monthly Intake for Australians. Environmental Health Monograph 26. National Health and Medical Research Council. Canberra:*