

A short note on radioactivity in minke whale meat (*Balaenoptera acutorostrata*) from Icelandic waters

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Introduction

Cesium is naturally present in various ores and soil as Cesium-133 (Cs-133). The natural form of Cesium has the atomic weight of 133, Cs-133, but there are 11 radioactive isotopes and thereof three that have half life causing concern, cesium-134, cesium-135 and cesium-137, all emitting beta particles when decay. Cesium-137 (Cs-137), which has a half-life of 30years is of most concern as the decay product is Barium-137m (Ba-137m, “m“ means metastable) with a half life of about 2.6min, that stabilizes itself by emitting a hazardous energetic gamma ray making it “external hazard” (meaning it enters the body without being taken in). Origin of radioactive Cs-137 is the fission occurring when nuclear fuel, mainly uranium-235 and plutonium, is “burned”. Radioactive cesium can be found in soil around the globe mainly as a fallout from past atmospheric nuclear weapons tests (Argonne National Laboratory 2005).

Cesium has been shown to biomagnify in aquatic food chains (Topcuoğlu 2001, Wang et al. 2000).

Results

Several samples of minke whale meat were analyzed at the Icelandic Radiation Safety Authority. The samples were measured in 200-ml polyethylene boxes. Sample size ranged from 100 to 200 ml. Uncertainty in the Cs-137 activity concentration measurements, due to counting statistics, were relatively high in general due to the small sample sizes and the low Cs-137 activity. The Cs-137 activity concentration was measured using Ortec HPGe gamma detectors of 48.6% and 55.4% relative efficiency for the 1.33-MeV peak of ⁶⁰Co and calculated in Becquerels per kilogram fresh weight. The analysis was carried out using software developed at IRSA in the early 1990s and validated in numerous intercomparisons. The Cs-137 activity concentration in the samples was very low (in all cases below 1 Bq/kg fresh weight; some below detection limits), and far below the guideline levels of 1000 Bq/kg set for food moving in international trade set in Codex General Standard For Contaminants And Toxins In Food And Feed (1995). In comparison to other routinely measured food, the numbers in Icelandic fish are below 0.25 Bq/kg, in Icelandic lamb the range is 0.5-150 Bq/kg with average of 11.7 from 2005 to 2011 (Guðnason et al. 2012), but in sea around Iceland the numbers are from 1.1 to 2.3 Bq/m⁻³ (Ólafsdóttir 2005).

Table 1: Cs-137 in minke whale meat

Nr	Date	Location	Bq/kg	Remarks
A0302	23.08.2003	66°04'00N 22°48'20W	0,27	
A0303	25.08.2003	65°55'00N 19°36'00W	0.19	
A0304	26.08.2003	66°10'20N 19°16'90W	<0.20	Under detection limits
A0305	28.08.2003	66°27'00N 15°45'00W	0,22	
A0306	29.08.2003	66°15'30N 14°39'80W	0,42	
A0307	30.08.2003	66°12'50N 14°39'50W	0.29	
A0308	31.08.2003	66°36'00N 17°29'90W	0,34	
A0310	12.09.2003	65°39'80N 21°27'30W	0,51	
A0311	16.09.2003	66°10'70N 18°40'20W	0,73	
A0312	25.09.2003	66°17'40N 15°36'70W	0,32	
A0313	30.09.2003	65°40'40N 21°34'50W	0.21	
A0501	06.06.2005	66°03'95N 22°42'66W	0,29	
A0502	15.06.2005	66°16'80N 23°30'90W	0.27	
A0503	06.07.2005	66°43'68N 20°55'91W	0,3	
A0507	22.07.2005	66°36'05N 16°02'72W	<0,39	Under detection limits
A0510	17.08.2005	65°40'65N 21°32'86W	0.18	
B0303	27.08.2003	63°50'00N 22°49'00W	0.20	
B0304	30.08.2003	64°36'00N 22°51'00W	0.17	
B0305	31.08.2003	65°04'00N 24°13'00W	0,34	
B0307	15.09.2003	64°13'00N 22°39'00W	0.22	
B0308	22.09.2003	64°48'00N 23°14'00W	0,33	
B0309	25.09.2003	64°54'00N 24°07'00W	0,35	
B0310	26.09.2003	64°58'50N 23°42'60W	0,24	
B0311	28.09.2003	65°07'50N 24°05'00W	0.18	
B0409	03.07.2004	63°41'01N 16°57'01W	0,31	
B0501	06.07.2005	64°03'23N 22°56'47W	0,71	
B0502	19.07.2005	63°46'14N 16°26'74W	<0,26	Under detection limits
B0506	04.08.2005	63°43'86N 16°32'73W	<0.20	Under detection limits
B0509	09.08.2005	64°17'56N 22°41'87W	<0,33	Under detection limits
C0305	28.08.2003	64°16'00N 14°47'00W	0,27	
C0306	03.09.2003	65°47'00N 14°07'00W	0,68	
C0307	06.09.2003	65°46'00N 14°14'00W	0,29	
C0309	16.09.2003	64°12'00N 14°57'00W	0,32	
C0311	19.09.2003	63°50'00N 21°16'00W	0,35	
C0504	21.07.2005	63°19'67N 18°31'22W	0.22	
C0506	27.07.2005	64°27'35N 22°58'80W	0.34	
C0511	09.08.2005	64°12'55N 22°50'09W	< 0.16	Under detection limits
C0513	11.08.2005	65°46'28N 23°44'91W	<0.30	Under detection limits
C0514	14.08.2005	65°36'15N 24°06'30W	<0.44	Under detection limits

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