Regulatory and Practical Approach for Management of Reindeer in Norway

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Chernobyl fallout in 1986
Some maximum measured values, caesium-134+137

1986

- Goat’s milk: 2890 Bq/kg
- Cow’s milk: 1160 Bq/kg
- Freshwater fish: 30 000 Bq/kg
- Lamb meat: 40 000 Bq/kg
- Reindeer: 150 000 Bq/kg
- Mushrooms: 1-2 MBq/kg
Reindeer and the Sami population

- The Samis are an indigineous population group
- Reindeer herding is a fundamental, integral part of Sami culture
- The Samis has a strong spiritual and cultural connection to the reindeer and the nature

NRPA
http://reindriftsopplaering.org
Chernobyl fallout in Norway

Fallout in Norway (Cs-137, Bq/m²)  Reindeer pastures (in green)
Reindeer herding at risk

- Reindeer are free ranging animals on natural pastures – lichen, green plants, mushrooms

- Much more vulnerable than other animals to radiocaseium contamination
Permissible levels in food in Norway

• Non-existing pre Chernobyl

• Temporarily decided in May 1986:
  – 1000 Bq/kg for I-131
  – 300 Bq/kg for Cs-137

• Decided in June 1986 for total caesium (Cs-134+137):
  – Basic foodstuffs 600 Bq/kg
  – Milk and infant food 370 Bq/kg
Permissible levels and the need for countermeasures

**Permissible levels**
- Basic foodstuffs 600 Bq/kg
- Milk and infant food 370 Bq/kg

**Measured levels**
- Goat’s milk: 2890 Bq/kg
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Dose target for the public: <5 mSv/y the first year, <1 mSv the following years
A range of countermeasures introduced

- Monitoring of radiocaesium in animals before slaughter (“live monitoring”)
- Clean feeding of animals before slaughter
- Caesium binder (Prussian blue) in feed, salt licks and rumen boli to prevent absorption of ingested radiocaesium in the animals
- Dietary advice and monitoring of internal contamination.
Specific for reindeer and Sami population

- Change of slaughter time (from winter to autumn)
- Elevated permissible levels for reindeer (and game, freshwater fish) for sale
- Dietary advice and compensation scheme (until 2007)
  - To buy less contaminated reindeer from other areas
  - To buy other kinds of meat
  - To clean feed the animals consumed in the household
Cs-137 in reindeer
Raising the permissible level

• A level of 600 Bq/kg for total caesium in reindeer meat would mean a complete liquidation of reindeer herding in Norway which would lead to the extinction of the Sami culture

• To save the Sami culture and reindeer herding as an industry the permissible level was raised to 6000 Bq/kg in November 1986

• **Rationale:**
  – The general public consume little reindeer meat (~0.5 kg/y)
  – The value of preserving the Sami culture outweighs the exposure to the general public

• The **decision making process:** meeting with Sami people in their district, consultations with the industry and the reindeer herders’ associations, consideration by radiation protection and health experts
Live monitoring

- Implemented during 1987/88
- Measurement result a basis for decision on slaughter
- Every animal if some $\geq$ permissible level
- $\sqrt{n}$ if lower levels
Brochure in Norwegian and Sami with advice:

- Cooking procedures to reduce caesium in food
- Consumption frequency based on radiocaesium content
- Not more than 80,000 Bq/year per person
- Not more than 40,000 Bq/year for pregnant/nursing women, children
- Description of health risks
Dietary advice and WBC of Samis

- Advice to reduce levels to below 600 Bq/kg of Cs-134+137 for reindeer consumed in the Sami household
- Compensation payed to Sami households
- Invited to whole body counting at regular intervals
  - Both measurements and dialogue
WBC results from ongoing programme
Individual variations

Reindeer herding districts

Bq/kg

Men 2007
Women 2007
Children 2007
Mean - Adults
Median - Adults
Averted doses due to countermeasures (Cs-134+137)

- Change in slaughter time
- Clean feeding
- Dietary vigilance
### Changing permissible levels in Norway, Bq/kg

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Cs-137 in reindeer

Vågå reindeer

137Cs in reindeer meat (Bq/kg)


Autumn
Winter
## Changing permissible levels in Norway, Bq/kg

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<tr>
<th>Food product</th>
<th>May 1986</th>
<th>June 1986 134+137Cs</th>
<th>Nov. 1986 134+137Cs</th>
<th>July 1987 134+137Cs</th>
<th>1994 134+137Cs</th>
<th>Today 134+137Cs</th>
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**Tomorrow** - 1500 Bq/kg? 600 Bq/kg?
Costs 1986-2011

- Total costs 1986-2011: ~9500 millions ¥
  (radiological monitoring, management, countermeasures, compensation, research)

- ~195 million ¥ annual costs up to 2011
  - 135 million ¥ for sheep, goats, cows, food monitoring
  - 60 million ¥ for reindeer, reindeer herder compensations, whole body counting

- Costs today lower due to lower contamination levels, but countermeasures still necessary

- Covered by the Ministry of Agriculture and Ministry of Health
Socio-cultural aspects of food

Cultural heritage
- Traditional land use
- Personal value of farming, hunting and fishing
- Value of regional produce

Social value
- Sharing of food with friends and family – e.g. ‘sansei’
- Food important part of social events

www.flicr.com

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Napa Valley wineries
Thank you for your attention!

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