

Effects of ammoniumiron-hexacyanoferrate on the accumulation of radiocesium in reindeer

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Summary: The effect of different daily doses of the cesium binder ammoniumiron (III) hexacyanoferrate (II) (70% pure, Giese-salt, Riedel de Haën) were studied in 5 parallel experiments with 2 reindeer calves. The animals received a daily ration of 1 kg pelleted reindeer feed (RF-71) and 0.25 kg of lichen dry matter providing 8-10 KBq/d. The lichens were collected in an area of Norway which received high levels of radiocesium from the Chernobyl accident. Ammoniumiron hexacyanoferrate cesium binder (1.5, 0.75, 0.3, 0.15 and 0.05 g respectively) was given once daily sprayed on the lichens. Four animals which received the same rations without ammoniumiron hexacyanoferrate cesium binder served as controls. The animals were kept in metabolic cages which allowed quantitative collection of faeces and urine.

After the six week observation period red blood cell radiocesium concentrations in the control animals had increased from 0 to 400-500 Bq/l and appeared to be still increasing. No accumulation of radiocesium could be detected in the three groups receiving 0.3-1.5 g/d, while a slight increase could be observed in the other two groups. Daily excretion of radiocesium (urine+faeces) matched the intakes in the treated animals, while a net retention of about 20% was observed in the control group. The experiments indicate that a daily dose of about 100 mg of ammoniumiron-hexacyanoferrate will be sufficient to prevent absorption of radiocesium from lichens.

In a preliminary experiment 5 calves were given a sustained release bolus made in our laboratory. The bolus composition was based on a fatty acid matrix and contained 20% (9 g) of ammoniumiron-hexacyanoferrate. The animals were given lichens supplying 12-18 KBq radiocesium per day. The bolus effectively prevented accumulation of radiocesium. One of the animals was slaughtered after 49 days and remains of the bolus weighed 17 grams (37% of the initial weight). Two of the animals concluded the trial after 70 days and the last two after 100 days

without any increase in blood radioactivity. It is concluded that a sustained release bolus for administration of a cesium binder of the ironhexacyanoferrate type provides a promising method for reduction of radiocesium uptake from contaminated pastures.

Diskusjon etter Hoves foredrag:

Diskusjonen gikk hovedsakelig på disse problemene:

- Rent tekniske sider ved vomtablett, størrelse, form og konsistens for å sikre en mest mulig jevn avgift av Cs-binder. Forsøkstabletten som ble laget på Ås later til å slites fra endene. Det ble pekt på de problemer man har hatt med industriell fremstilling av tablett. Forsøkstabletten er støpt. Industrielt ble den presset og det ga en tablett med for kort levetid.
- Spørsmålet om nødvendigheten av en slik tablett, dersom problemene kan løses ved tidlig slakt. Tre momenter taler for at tablett likevel er aktuell i dette langvarige problem:
 1. Ikke alle distrikter har driftsmessige muligheter for en så tidlig slaktning at reinen ennå har det lave sommernivå av radioaktivitet.
 2. Ved tidlig snefall går reinen straks over på lav og da stiger radioaktiviteten raskt på kontaminert beite. Av denne grunn kan det være at man ikke rekker å slakte i tide.
 3. Årskalver har mye høyere radioaktivitet enn morydret p.g.a. melkeinntaket. Det er behov for en kalvetilpasset vomtablett for å gjøre disse kalvene egnet til slakt om høsten. Det ble også reist spørsmål om berlinerblått binder andre mineraler i den grad at dyrene kan få mangel på enkelte mineraler. Hove antok at det var liten fare for dette når det gjelder kalium, men at det ikke kan utelukkes for enkelte mikromineraler, der det er snakk om meget lave verdier.