

## Soluble Co(II) salts are essential for the production of supplement products

Differences in the properties of the Co(II) salts are critical to their use in animal nutrition. The use of Co(II) salts in boluses, drenches, liquid feeds and pastes are not possible without access to soluble Co(II) salts. Coated granulated Co(II) carbonate cannot substitute for soluble Co(II) salts in any of these applications.

Even where solubility issues may be overcome in certain products, the Co(II) content of the coated and granulated product is low (1-5%) compared to soluble Co(II) salts (20-50%). Re-formulating products to contain coated granulated Co(II) carbonate containing 10x less Co/g of product is technically challenging and would take significant time and investment. There may also be delivery issues providing significantly higher volumes of product to ruminants.

Co(II) salt	ID no.	Co content (%)	Solubility
Co(II) acetate tetrahydrate	3b301	Min. 23%	Water soluble
Co(II) carbonate	3b302	Min. 46%	Water soluble
Co(II) carbonate hydroxide (2:3) monohydrate	3b202	Min. 50%	Water soluble
Co(II) sulphate heptahydrate	3b305	Min. 20%	Water soluble
Coated granulated Co(II) carbonate	3b304	1-5%	Insoluble in water

Source: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:172:0014:0022:EN:PDF>

## Cobalt is an essential dietary mineral for ruminants

- Co(II) is an essential component of vitamin B12
- Ruminal microbes produce sufficient vitamin B12 to meet the nutritional requirements of ruminants provided there is an adequate dietary supply of Co(II)
- Ruminants are more sensitive to vitamin B12 deficiency than non-ruminants with sheep, young animals and lactating animals particularly affected due to their increased growth and energy demand
- Deficiency in Co leads to reduction in rumen microbial activity and hence feed digestion and nutrient supply to the animal

Source: González-Montaña *et al.* (2020): <https://www.mdpi.com/2076-2615/10/10/1855/pdf>

CFIA (2023) <https://inspection.canada.ca/animal-health/livestock-feeds/consultations/proposal/eng/1529086911792/1529086912448> and NRC (2001) <https://nap.nationalacademies.org/catalog/9825/nutrient-requirements-of-dairy-cattle-seventh-revised-edition-2001>

## Cobalt deficiencies present significant animal welfare concerns

Clinical signs of Co deficiency in ruminants

- Reduced feed intake
- Body weight loss
- Lethargy
- Reduced immune status

Most commonly observed in lambs at pasture during late summer/autumn

- Lethargy, poor appetite, poor quality wool with open fleece, small size and poor body condition

Adult ewes are less commonly affected, but secondary effects including infertility, and poor mothering are observed leading to reduced viability of offspring

Source: González-Montaña *et al.* (2020) <https://www.mdpi.com/2076-2615/10/10/1855/pdf> and GWA (2023) <https://www.agric.wa.gov.au/livestock-biosecurity/cobalt-deficiency-sheep-and-cattle>

## Low cobalt levels in soil can result in cobalt deficient herbage for grazing animals

Cobalt intake from the diet, along with other factors such as rumen and parasitic infections can greatly impact the availability of dietary cobalt to ruminants. Across the UK, soil cobalt levels can vary widely with the geology and geography with grasslands typically used for grazing animals, often relatively low in cobalt.

A study by the Scottish Rural College (SRUC) has mapped soils in Scotland as having a “high”, “moderate” or “low” predicted risk for cobalt deficiency. The SRUC has related this risk to the potential for the cobalt content of summer herbage to induce cobalt deficiency in ruminants:

Total Co in subsoil	Risk level of Co deficiency	Interpretation for summer herbage
< 5 mg/kg	High	Soil association on which probably >50% of fields produce summer herbage containing <0.08 mg Co/kg DM
< 10 mg/kg	Moderate	Soil association on which probably 10-50% of fields produce summer herbage containing <0.08 mg Co/kg DM
>10 mg/kg	Low	Soil association on which probably >90% fields produce summer herbage containing >0.08 mg Co/kg DM

Soils across Scotland were mapped:

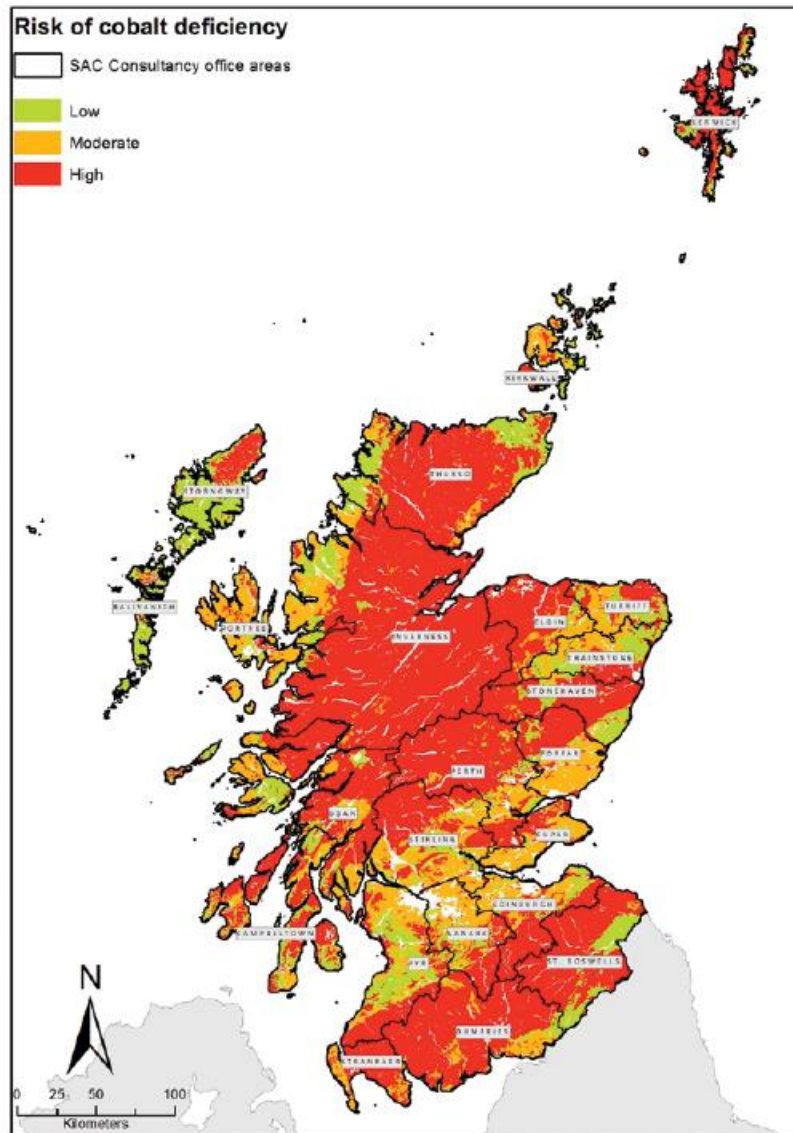


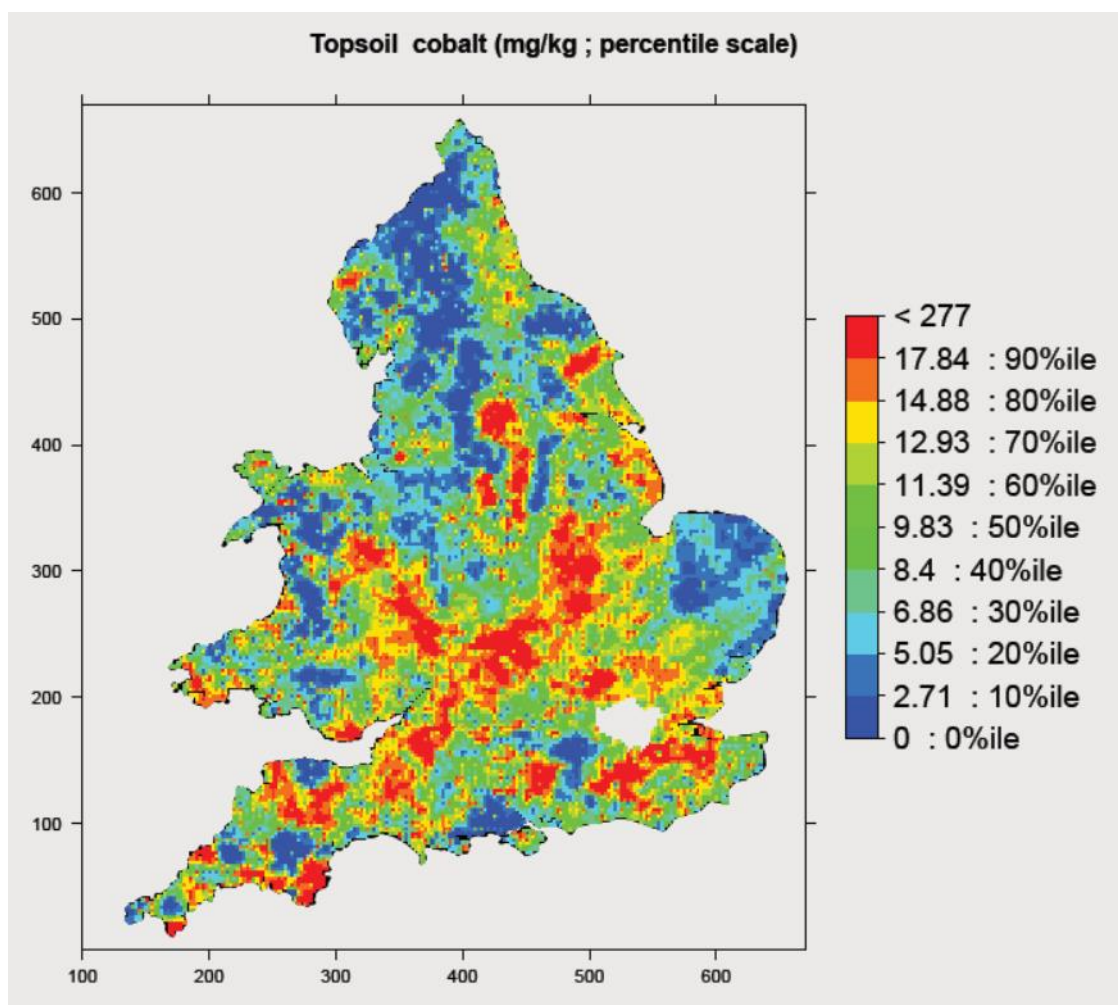
Table B. Soil associations with high, moderate or low risk of Co deficiency in summer herbage and association areas as % of the mapped area of Scotland.

High risk	% area	Moderate risk	% area	Low risk	% area
Organic soils	15.3	Rowanhill	3.1	Lochinver	2.9
Arkaig	12.4	Darfeith	2.9	Tarves	1.9
Ettrick	8.5	Foudland	2.8	Thurso	1.0
Aberlour	7.4	Balrownie	1.7	Sorn/Humbie/Biel	0.6
Strichen	6.7	Torridon	1.4	Kintyre	0.5
Countesswells	4.7	Insch	0.6	Stirling/Duffus/Pow/ Carbrook	0.5
Corby	2.8	Forfar	0.5	Gourdie/Callandar/ Strathfinella	0.5
Sourhope	1.5	Rhins	0.5	Torosay	0.4
Durnhill	1.3	Mountboy	0.4	Kilmarnock	0.4
Hobkirk	0.7	Canonbie	0.4	Whitsome	0.4
Yarrow	0.5	Fraserburgh	0.4	Canisbay	0.4
Darvel	0.4	Berriedale	0.3	Glenalmond	0.3
Kippen	0.4	Carpow	0.2	Stonehaven	0.3
% of mapped area in Scotland	62.6		15.1		10.5

The findings demonstrate that a significant amount of grazing land in Scotland is identified as containing low cobalt (<10 mg/kg) resulting in herbage with a high risk of being deficient in cobalt based on ruminant dietary needs (<0.08 mg Co/kg DM).

Source: SRUC <https://www.fas.scot/downloads/tn664-management-of-cobalt-in-grassland-soils/>

Likewise, cobalt levels in soil also vary widely across the rest of mainland UK with National Grid and Ordinance Survey data published by the British Geological Society showing that low cobalt concentrations occur in many of the upland areas of the North of England, Wales and the South West which are of important for animal nutrition.



Source: NERC (p. 66)

[https://nora.nerc.ac.uk/id/eprint/18016/1/Advanced\\_Soil\\_Geochemical\\_Atlas\\_of\\_England\\_and\\_Wales.pdf](https://nora.nerc.ac.uk/id/eprint/18016/1/Advanced_Soil_Geochemical_Atlas_of_England_and_Wales.pdf)

### Scope of use of cobalt(II) additives

- Coated granulated cobalt(II) carbonate is suitable for use in compound feeds and complementary feeds only
- Large numbers of ruminants are on systems where free access buckets and dietetic feeds (drenches, boluses, pastes for direct feeding) are the only practical and viable method to supplement their mineral status (e.g., hill animals where feed concentrates are not appropriate)
- Competition horses are also commonly fed pastes

It is therefore, essential to have a soluble cobalt(II) salts for use in ruminants.

>25% of BAFSAM members sell animal health products containing soluble cobalt(II) salts. Individual company sales can be in the region of ~£400-500k, equivalent to in the region of 15 million doses. The estimated costs to customers of 15 million doses of product is estimated to be ~£1.5-2 million.

### Summary

It is essential to have soluble cobalt(II) salts available for use in animal nutrition. Much of the soil in the UK where animals graze is low in cobalt leading to a risk of herbage deficient in cobalt (<0.08 mg/kg DM). **Boluses, drenches, pastes for direct feeding which require a soluble cobalt(II) salt are the only practical and viable method of supplementing the mineral status of these animals.** Re-formulation or alternative feeding practices is not technically feasible and certainly not an option in the short-term with the potential for cobalt and vitamin B12 deficiencies to arise, and a **high risk of animal welfare issues.**