

Calculating Sulfur Intake of Dairy Cattle

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There are four basic steps to the calculation:

1. Analyze all feeds and estimate total feed intake
2. Add sulfur contributions from supplements that may not be analyzed as part of the TMR
3. Add the sulfur contribution from estimated water intake
4. Express the sum of sulfur intakes as a % of total DMI

This assessment is relatively easy, but requires careful attention to the measurements and conversions between various analyses. When the estimated total sulfur concentration (TSC) has been calculated, it can then be compared to the maximum tolerable sulfur concentration. For dairy cows maximum tolerable TSC is recommended to be 0.26% to 0.4% on a dry matter basis.

To estimate sulfur concentration relative to DMI, contributed by water:

1. Determine the concentration of sulfate (SO₄) in the water by laboratory analysis.

Sulfate(SO₄) concentration is usually expressed as mg/L.

Milligrams per liter (mg/L) = part per million (ppm).

Sulfate (SO₄) is 1/3 sulfur (S), therefore milligrams of SO₄/L divided by 3 = mg S/L of water.

2. Daily water intake of dairy cattle is influenced by many factors.

An estimate of water intake in liters for lactating cows is = 16 + (1.6 X DMI in kg) + (milk production in kg) + (1.2 X minimum daily temperature in degrees C).

A simpler estimate is 3.5 to 5.5 L water per kg of dry diet for temperatures up to 80 degrees F.

A crude estimate of average water intake is 25 to 35 gallons per day = 95 to 135 L per day

3. Liters of water intake multiplied by mg S/L = intake of S in mg.

Divide by 1000 for intake of sulfur (S) in grams.

4. Daily dry matter intake = (1.85% X BW in lbs) + (0.3 X daily milk in lbs).

Divide by 2.2 to get DMI in kg.

% Sulfur (S) on DMI basis from water = total intake of S from water in grams divided by kg, DMI divided by 10.

To estimate sulfur concentration relative to DMI provided by feed:

1. Determine the concentration of sulfur (S) in the total mixed ration or individual diet ingredients. These are usually reported as % S as DM.
 - If a total mixed ration is analyzed, this is the value to be used as %S for feed.
 - If individual feed ingredients or forage components are analyzed, multiply the % as DM for each ingredient by the proportion of the diet it represents. Then add the proportionally adjusted sulfur concentrations for all the components. This sum is the %S of feed or forage.
2. In situations where individual's animals may consume more of a particular dietary ingredient selectively, dietary total sulfur concentration (TSC) may be elevated. Assessment of sulfur (S) content of each dietary component individually will help identify those that could increase TSC, if consumed selectively.
3. Be sure to include sulfur (S) contributed by feed additives used to adjust DCAD. If these are reported as sulfate (SO₄), remember to divide by 3 to calculate the actual sulfur (S) content.
4. To calculate the estimated total sulfur concentration (TSC) as a percentage of dry matter consumed: $TSC = \%S \text{ from water} + \%S \text{ from feed}$.