

Balancing Ca and P, and Using Dilutions to Include Vitamin & TM Premixes

Once the diet is balanced for the major nutrients (CP and/or energy), then it needs to be balanced for Ca & P. To do this we calculate the Ca and P supplied by the major ingredients, and then subtract this number from the requirements. This tells us how much Ca and/or P needs to be added.

For example: The requirement for Ca is 20 g/d and the requirement for P is 10 g/d
The diet we have formulated supplies 9.6 g/d Ca and 5.5 g/d P.

Always do phosphorus first! This is because dicalcium phosphate, the most commonly used source for P, contains Ca also, and the additional Ca added when adding dical must be considered.

Dicalcium phosphate = 18.5% P, 22% Ca

Limestone = 39% Ca

P: 10 g/d reqd - 5.5 g/d supplied = 4.5 g/d P deficient

$(4.5 \text{ g/d})/0.185 = 24.3 \text{ g/d dicalcium phosphate needed to supply 4.5 g/d P}$

$24.3 \text{ g/d dical} \times 0.22 = 5.35 \text{ g/d Ca supplied by the added dicalcium phosphate}$

Ca: 20 g/d reqd - (9.6 g/d supplied + 5.35 g/d supplied by dical) = 5.05 g/d Ca deficient

$(5.05 \text{ g/d})/0.39 = 12.95 \text{ g/d limestone needed to supply 5.05 g/d Ca}$

So, we need to add 24.3 g/d dicalcium phosphate and 12.95 g/d limestone

If we are balancing the diet on a daily amount basis, then we just include the dicalcium phosphate and limestone used to supplement Ca and P in addition to the major feedstuffs.

However, if we are balancing on a percentage basis, just adding dicalcium phosphate and limestone would take us over 100%. Therefore, we must use a dilution factor to allow room in the 100% for any added mineral or vitamin ingredients (or other non-protein or non-energy supplying ingredients). Since these ingredients don't add any protein or energy, we need to increase the amount of protein or energy we are balancing for. Salt is usually added at between 0.25 to 0.5%, TM or vitamin premixes at 0.25 to 0.5% and other non-nutritive ingredients at 0.1 to 0.25%. Dical and limestone will vary depending on the Ca and P content of the other ingredients, but we usually allow approximately 1% for each of them.

For example: Balance a diet for 18% CP, 0.5% Ca and 0.3% P, using corn and SBM, and allowing room for salt, TM premix, and vitamin premix. Use a 3% dilution factor.

The 3% dilution factor means that 3% of the diet will not supply any protein, therefore the CP requirement must be supplied in the other 97% of the diet.

$(18\% \text{ CP})/0.97 = 18.56\% \text{ CP}$

This means that when we use Pearson Square to balance for %CP, we must use 18.56% CP as the requirement instead of 18% CP.

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It also means that when we find the % corn and the % SBM needed to supply the CP requirement, those percentages must be multiplied by 0.97, again to leave room for the vitamin & mineral additives.

For example:

corn 8.8% CP		27.24 parts	/37.0 = 73.62% corn
	18.56% CP		
SBM 45.8% CP		<u>9.76 parts</u>	/37.0 = <u>26.38%</u> SBM
		37.0 total parts	100%

(but 3% needs to be allowed for non-protein supplying ingredients)

$$\begin{aligned} 73.62\% \text{ corn} \times 0.97 &= 71.41\% \text{ corn} \\ 26.38\% \text{ SBM} \times 0.97 &= \underline{25.59\%} \text{ SBM} \\ &97.0\% \end{aligned}$$