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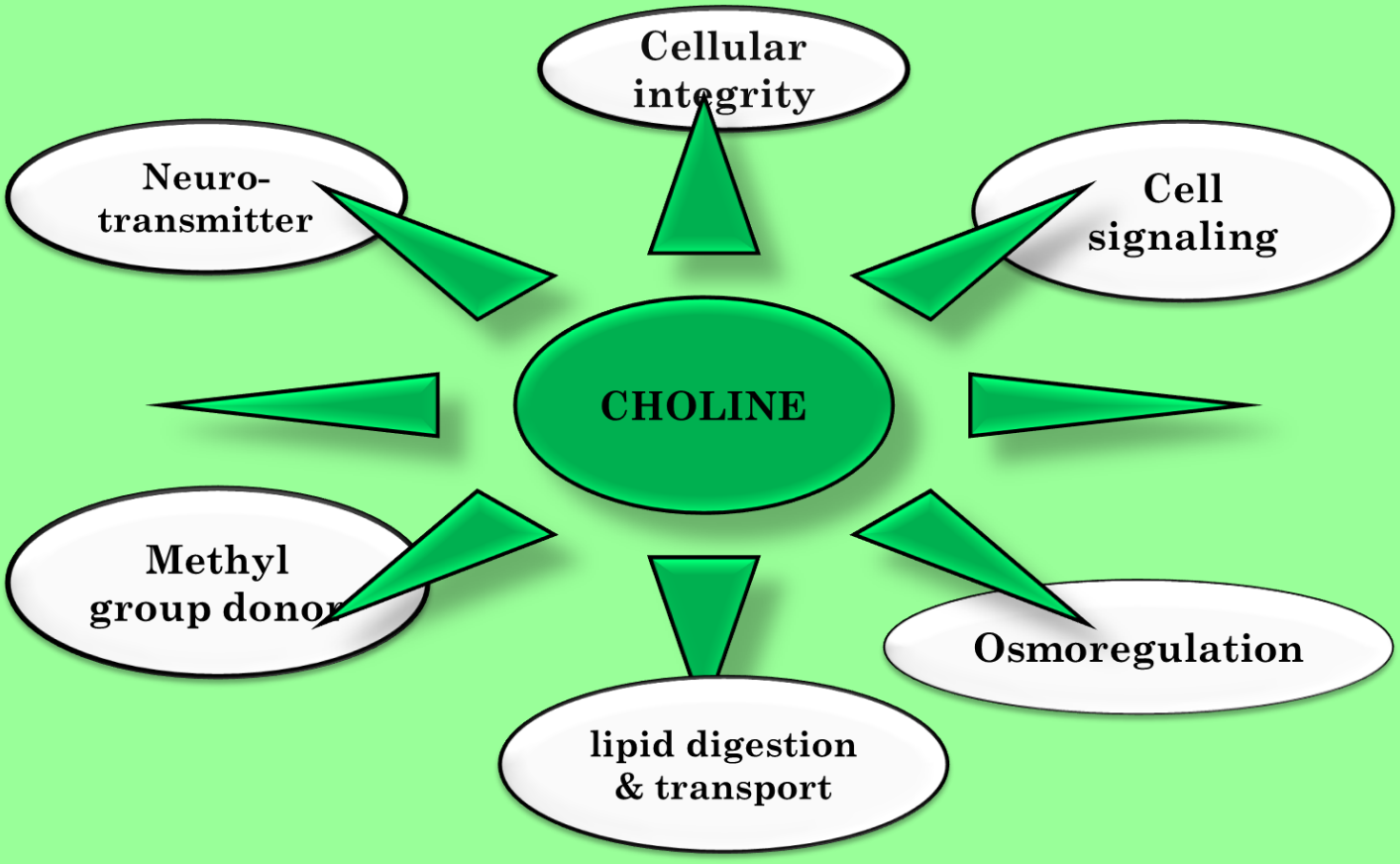

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Protected Choline – A Newer Concept in Ruminant Nutrition

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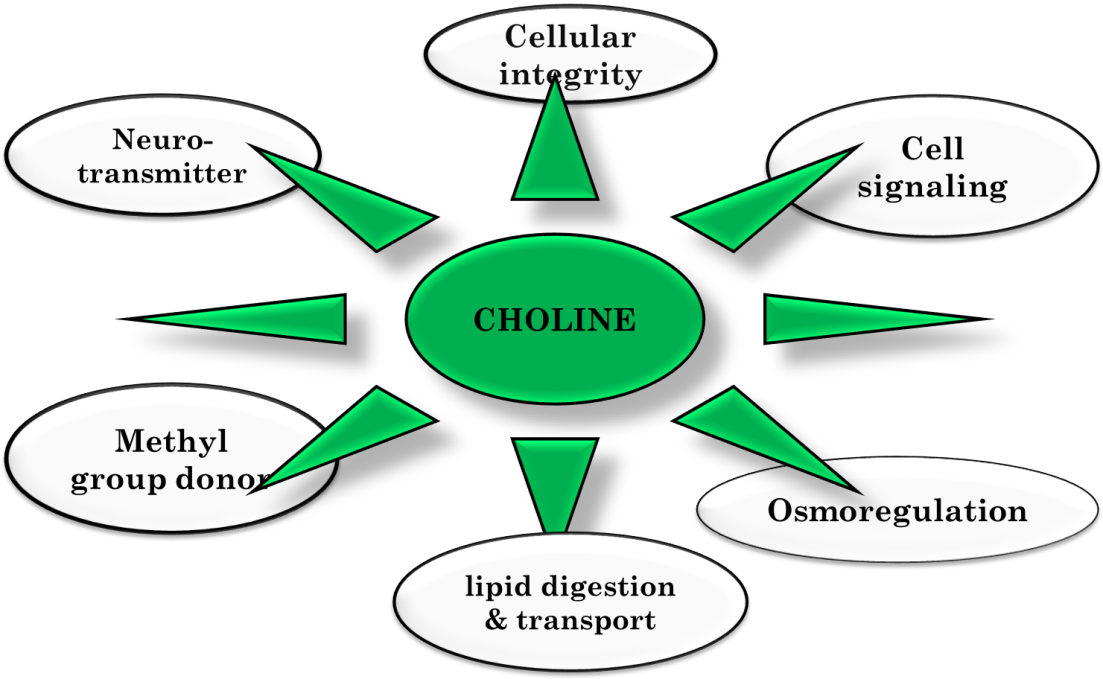
The dairy farmers are well aware of the importance of rumen protected protein and protected fat in milk production and reproduction. However, these two plays important role in postpartum only but the protected choline is very much important during peripartum period. As choline do so many metabolic activities like lipid transport and utilization within the cells. High-producing dairy cows experience negative nutrient balance during late gestation and early lactation that induces excessive tissue mobilization, primarily of fat but also of protein, leading to subclinical and clinical ketosis and fatty liver (Drackley, 1999). About 50 to 60% of transition cows experience moderate to severe fatty liver (Bobe *et al*., 2004). This fatty liver condition is a classical deficiency symptom for choline in dairy animals and also in chicken. Hence, there will be choline deficiency in transition cows a period which extends between three weeks pre and post-calving (Grummer, 2012). Choline is a vitamin-like compound whose metabolism interacts very closely with methionine and vitamin B12 metabolism (Mohensen *et al*., 2011). Choline (trimethyl, 2-hydroxy ethyl ammonium hydroxide) was first identified in 1862 by Andreas Strecker from hog bile.

Role of Choline

In the body choline plays numerous functions, however, the six main functions of choline are:

1. Cellular integrity – as a component of cell plasma membrane it is essential for the maintenance of cellular integrity.
2. Cell signalling – the metabolic products of phosphatidyl choline like phosphatic acid, platelet activating factor, etc. responsible for wound healing and reproduction.
3. Osmoregulation – plays an important role in cell water metabolism through betaine, as it reduces the muscle drip loss.
4. Lipid transport and metabolism – Lecithin a component of bile, reduces the surface tension and improves fat assimilation.
5. Methyl donor – the oxidation prod-



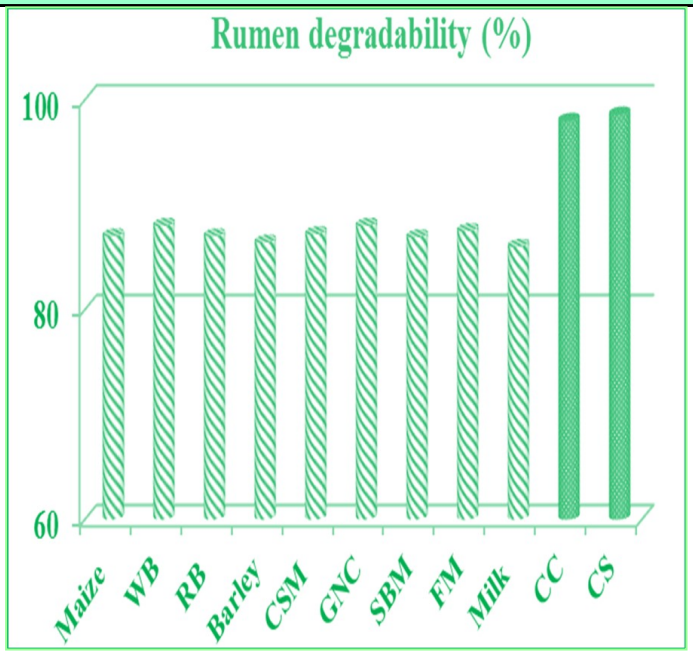
uct of choline – betaine is a potent methyl donor for synthesis of biomolecules like plasma membrane, RNA, DNA, carnitine, creatinine, etc.

6. Neurotransmitter – as a component of acetyl choline, it involved in nerve impulse transmission (Hartwell *et al.,* 2000).

Feed	Choline Content ppm (as such basis)
Maize	320
Wheat Bran	1240
Rice Bran	1470
Barley	1080
Cotton Seed Meal	2930
Ground Nut Cake	1960
Soybean meal	2990
Fish Meal	2850
Milk	130
Choline chloride (g/kg)	850
Choline Stearate (g/kg)	800

Even though choline is considered as a B vitamin is endogenously synthesized by sequential methylation process. The dietary choline, betaine, methionine, folic acid, Vitamin B12 all contribute to the body choline content. In adult dairy animals, choline is extensively degraded in the rumen; dietary choline therefore contributes insignificantly to the choline body storage. The various protein (protected or unprotected) sources are rich sources of choline but due to rumen degradability (85-95%) the animal will depend on its endogenous choline synthesis for their metabolic needs. Hence, there is need for use of protected choline in the diet of dairy animals for better health and productivity.

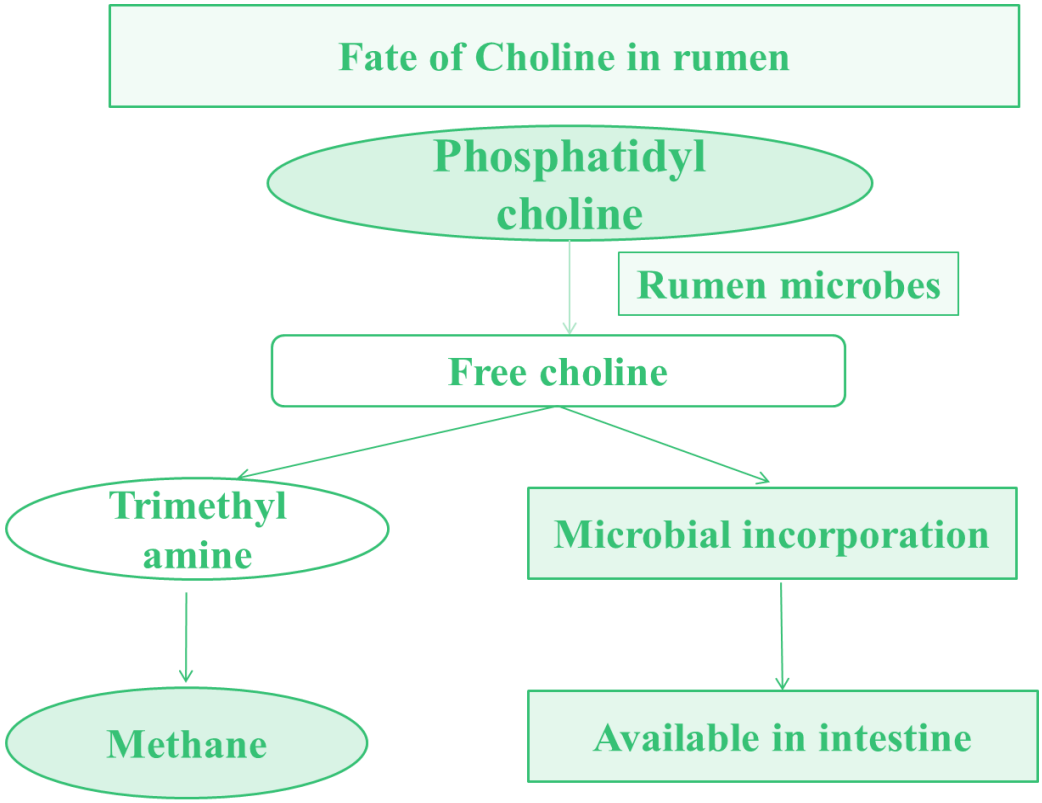
Microencapsulation is used to protect a substance from degradation in the rumen. Commercially available microencapsulated products contains about 28–50% choline chloride, out of which about 85% its choline rumen undegradable. These products can be added directly to the compound feed or administered as a top dress.



Courtesy the data obtained from Pandurang (2012)

conception rate was higher in protected choline supplemented animals than the control Oelrichs *et al.* (2004). Feeding of protected choline will improve the milk production in newly calved animals (Hartwell *et al.*, 2000; Scheer *et al.*, 2002). Feeding protected choline increased the milk yield, milk fat percentage, milk protein content in animals fed with protected fat than feeding protected fat alone. Feeding choline in this form not only meeting the requirement of choline it also reduces the requirement of methionine and lysine as these two amino acids involved in the endogenous synthesis of choline. Hence, obtaining choline from individual supplement is more economically beneficial than through feed

Protected choline supplementation will reduces the fatty liver condition in transition cows because, higher fat content in the liver is associated with poor reproductive performance (Bobe *et al.*, 2004). The first service



(Neil *et al.*, 1998)

ingredients or endogenous synthesis.

Conclusion

Choline increase productive performance and prevents the metabolic disorders with better nutrient digestibility, increases milk yield and milk fat percentage. It also increases reproductive efficiency in dairy cows. Choline especially during transition cows @ 10 to 20 g per animal per day as protected form will be helpful for better health and performance.

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