Effects of choline and rumen protected choline (Reashure) on energy-related biochemical metabolites of lactating dairy cows

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Introduction

Choline is a quasi vitamin that has a variety of functions in mammalian metabolism

Choline functions:

As the predominant phospholipids contained in the membranes of all cells in the body (as Phosphatydil choline)

A component of the neurotransmitter acetyl choline

As a direct presource to betaine in methyl metabolism

Why choline is necessary for dairy cow?

Because :

Dietary choline availability In ruminant is low

Output of mehtylated components in milk is high

Choline and phosphatidyl choline content of plants is relatively small

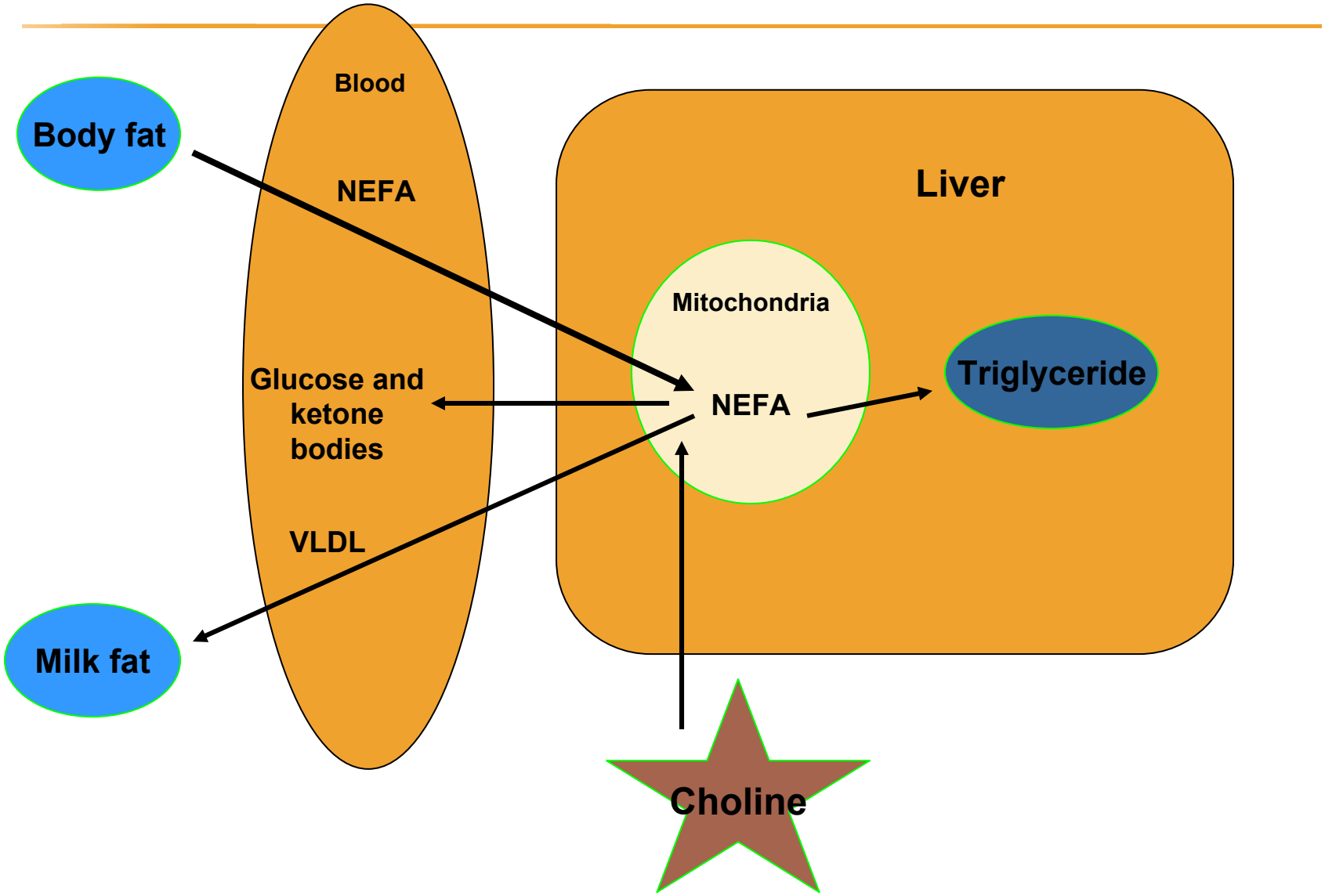
Ruminal degradation of choline and phosphatidyl choline is extensive

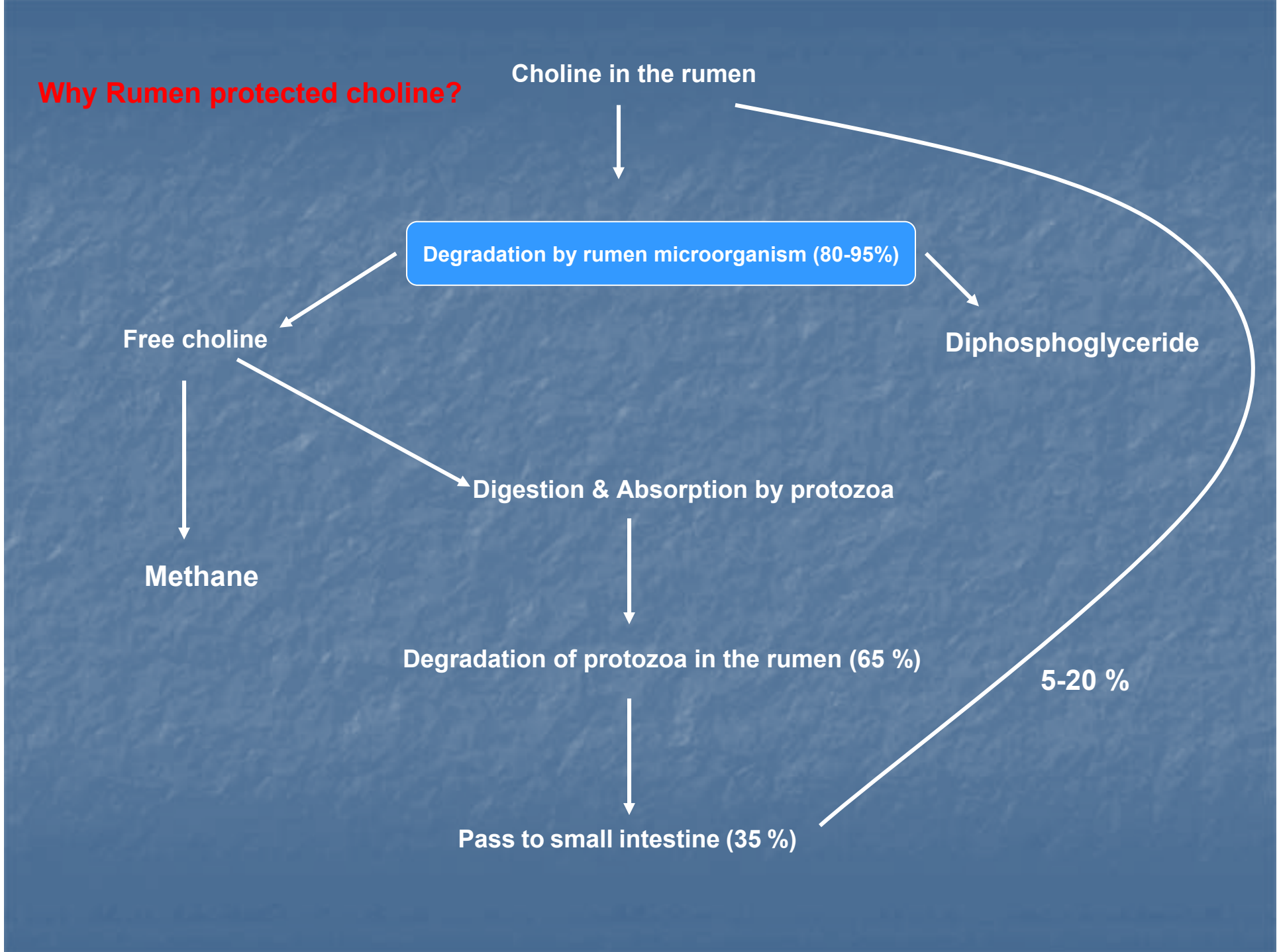
Intestinal supply of choline is not enough to meet tissue requirements

The role of choline on dairy cow metabolism

Choline plays a major role in metabolism, particularly in lipid transport. It is a lipotropic agent because of its ability to prevent or correct excess fat deposition in the liver generally arising as a result of its dietary deficiency.

Impaired triacylglycerol secretion to VLDL is considered a major cause of fatty liver in dietary choline deficiency


Blood
Body fat
NEFA
Liver
Mitochondria
Glucose and ketone bodies
NEFA
Triglyceride
VLDL
Milk fat
Choline


Why Rumen protected choline?
Choline in the rumen
Degradation by rumen microorganism (80-95%)
Free choline
Diphosphoglyceride
Methane
Digestion & Absorption by protozoa
Degradation of protozoa in the rumen (65 %)
5-20 %
Pass to small intestine (35 %)

Materials and Methods

1- Animals and management:

Eight Holstein cows from a herd were selected for the 84- days experiment.

Eight days before the experiment, cows were moved from the herd to individual tiestalls.

Cows were provided with rations twice daily

2- Experimental design and dietary treatment:

Cows arranged with in a change over design with four periods of 21 days (14 days for adaptation and 7 days for data collection).

Experimental treatments:

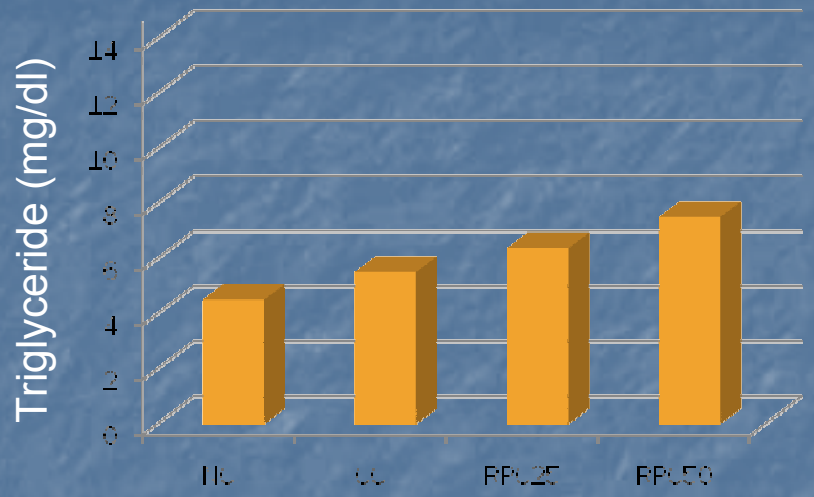
1) Control (without choline)
2) Rumen unprotected choline (50 g per day)
3) Rumen protected choline (25 g per day)
4) Rumen protected choline (50 g per day)

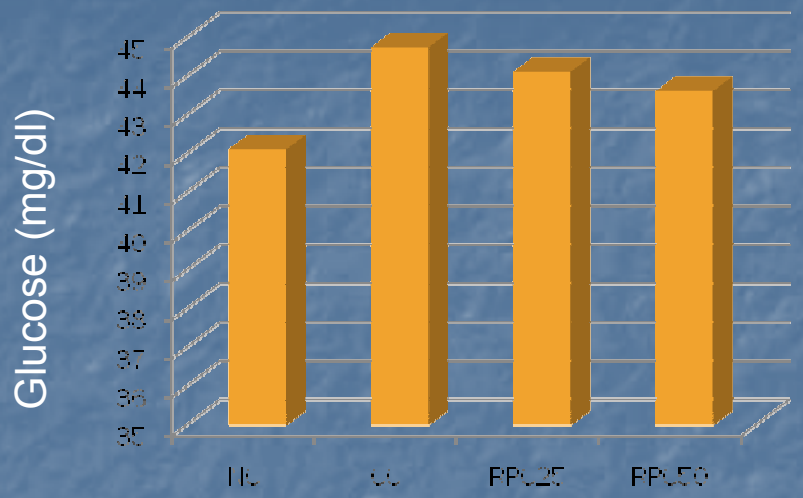
3- Blood sampling and analysis:

Blood samples from coccygeal vessels were collected

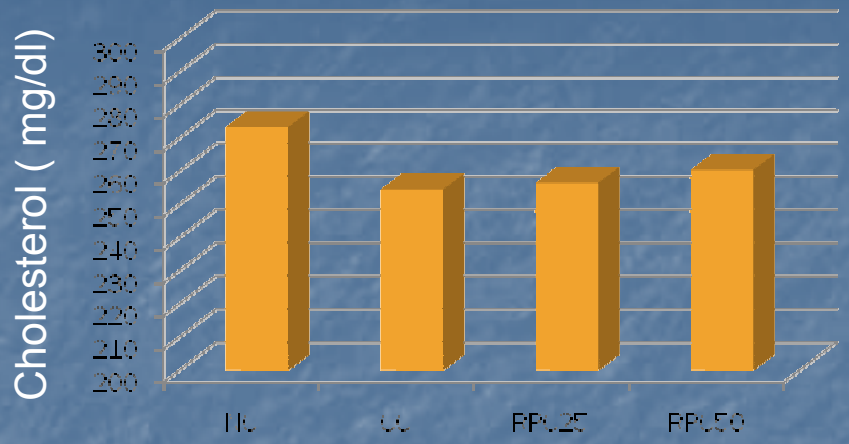
The samples analyzed for determine glucose, triglyceride, cholesterol, BUN, VLDL, LDL and HDL concentration

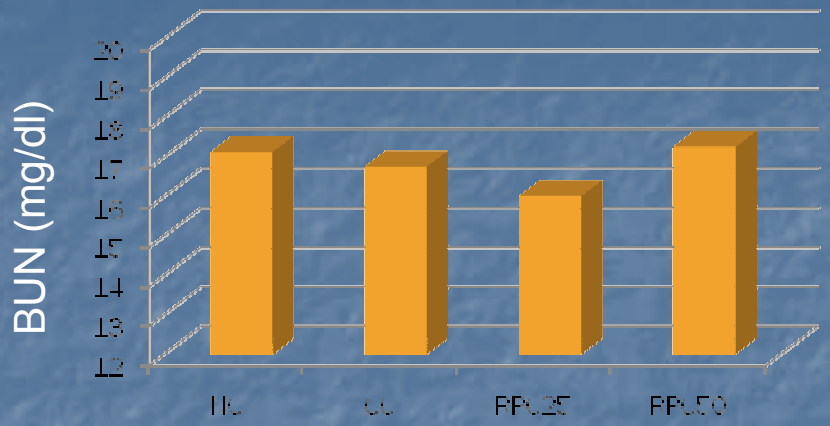
Results and Discussion



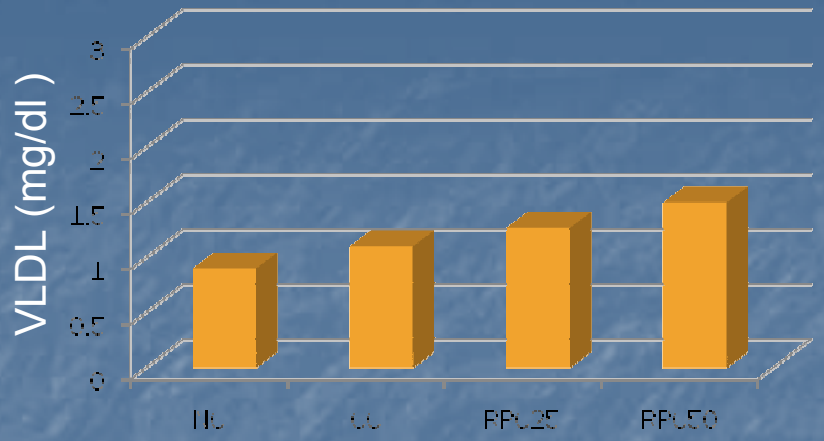


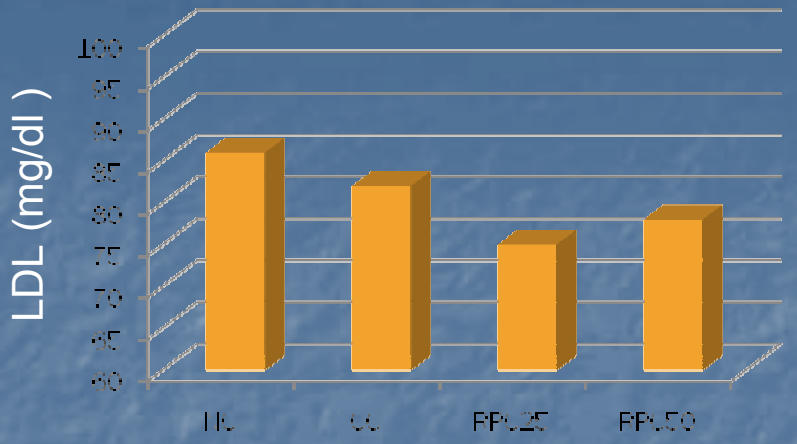
Blood metabolites such as glucose and triglyceride were not affected by treatments, but triglyceride level showed tendency to increase by RPC level. This results agree with the result of Erdman et al., (1984) that reported blood serum TG was not affected by choline, whereas had a low increase in blood serum TG, but was not significant .

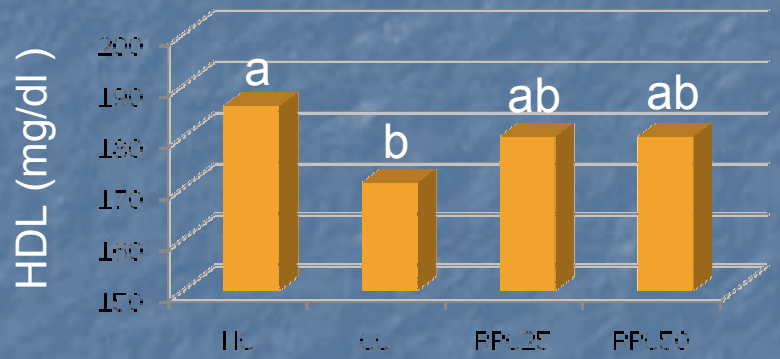




Also, there were no any significant difference between choline treatment in cholesterol and BUN levels, that agree with the result of Bindel et al. (2000) that observed numerical decreases in plasma NEFA in response to choline supplementation, but no response in plasma cholesterol, glucose, or insulin. The response of dairy cattle to supplemental choline has been attributed to its role as a lipotropic agent that can play a valuable part in decreasing liver adiposity, which is frequently observed in the periparturient period







Level of HDL decreased by unprotected choline, but rumen protected choline had no significant effect on HDL levels, also concentration of LDL and VLDL levels between the treatment were same. As in nonruminant species, esterified triglyceride can be export from the liver as VLDL, but the rate of this process is limited in ruminants compared with other species.

Conclusion

The results discussed above suggested that choline and rumen protected choline don’t have any positive effect on some blood metabolites of dairy cows in early lactation.