SUPPLIES OF RUMEN INFUSORIA AND BLOOD PLASMA LEVELS OF VITAMIN B_{12} IN HEIFERS DURING THE TRANSITIONAL PERIOD

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Introduction

It is important to know time required for animal adaptation to changed nutrition, especially adaptation of rumen microorganisms. To met ruminants´ demands for vitamin B_{12}, rumen function and Co intake are inevitable. Until the function of rumen microflora is well established, vitamin B_{12} must be provided via the feed. When rumen function is effected, for is instance when high concentrate-diets are fed, cobalt supplements will not be effective.[2] This work was aimed at study of changes of rumen infusoria and plasma vitamin B_{12} levels in heifers before and after the transition to green feeding.

Materials and methods

Twenty four Pinzgau heifers (mean body weight 240 kg) were divided into four groups. The first group (animals 1-6) was treated with 25 ml of Selevit (tocopherolum acetatum 25 mg,sodium selenite 2,2 mg,solubizers and water to 1 ml) subcutaneously. After two weeks the first and second groups (animals 7-12) were suddenly turned out to pasture without precedent feeding adjustment. The remaining two groups stayed at stall, where the third group (animals 13-18) was suddenly turned to green pasture forage feeding. In the fourth group (animals 19-24) the origin ratio of pelleted feed, hay and straw was gradually enriched with green forage. Rumen fluid was collected by the means of adjusted headed tube,[5] filtered through mull and conserved with 8% formaldehyde (1:1). Numbers of infusoria were estimated by available methods.[1,3] Samples of rumen fluid were collected one day before and on the 3^{rd}, 5^{th},8^{th} and 11^{th} days after the changed feeding. Heparinized blood samples were collected 2 and 1 month before and on the 1^{st}, 4^{th}, 6^{th}, 8^{th} and 11^{th} days after the turning to green feeding. Blood plasma vitamin B_{12} levels were determined by modified method originally designated to estimation of vitamin B_{12} content in foods.[6] The method is based on separation of cobalt bound in vitamin B_{12} molecule from inorganic cobalt with following estimation and calculation of vitamin B_{12} amount.

Results

Quantitative changes of rumen infusoria during the experiment are shown on figure 1.

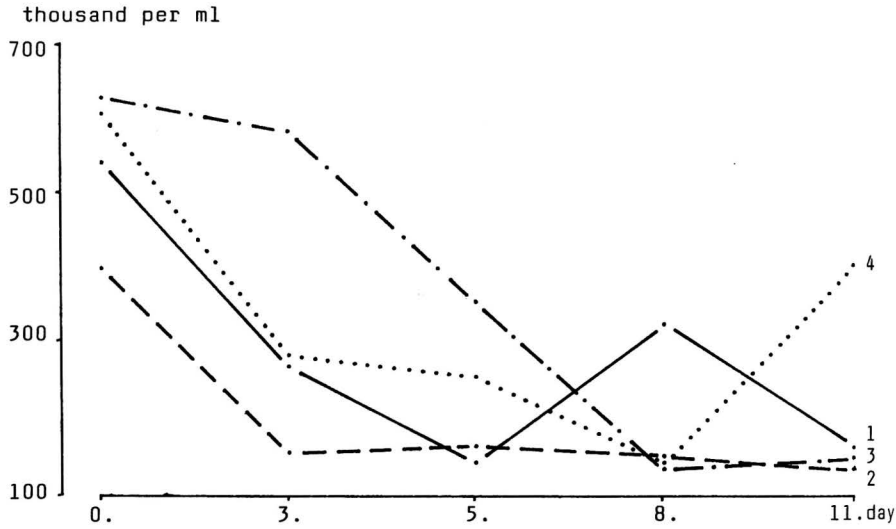

Figure 1. Counts of rumen infusoria in heifers

In the first treated group significant decrease of infusoria ($P \leq 0,05$) was observed on the 5th day (140 000.ml^{-1}) in comparison to day 0 (588 333.ml^{-1}). On the 8th day an increase (331 000.ml^{-1}) with subsequent decrease on the last day (168 000.ml^{-1}) were observed. In the second group suddenly turned out to pasture the significant decrease ($P \leq 0,05$) was observed on the 3rd day (155 333.ml^{-1}), which persisted to the end of experiment. In the third, stalled group with sudden change of feeding significant decrease ($P \leq 0,05$) were observed on the 8th day (133 666.ml^{-1}). In the last group, gradually accustomed to green feeding, the slower decrease was observed on the 3rd (284 000.ml^{-1}), 5th and 8th days (145 333.ml^{-1}) followed by significant increase on the 11th day of the experiment (408 000.ml^{-1}).

The mean vitamin B_{12} levels ranged from 1 261 to 1 960 ng.l^{-1} during the experiment (individual values from 1 167 to 2 013 ng.l^{-1}). Through the observation, similar changes were recorded in all groups (Figure 2).

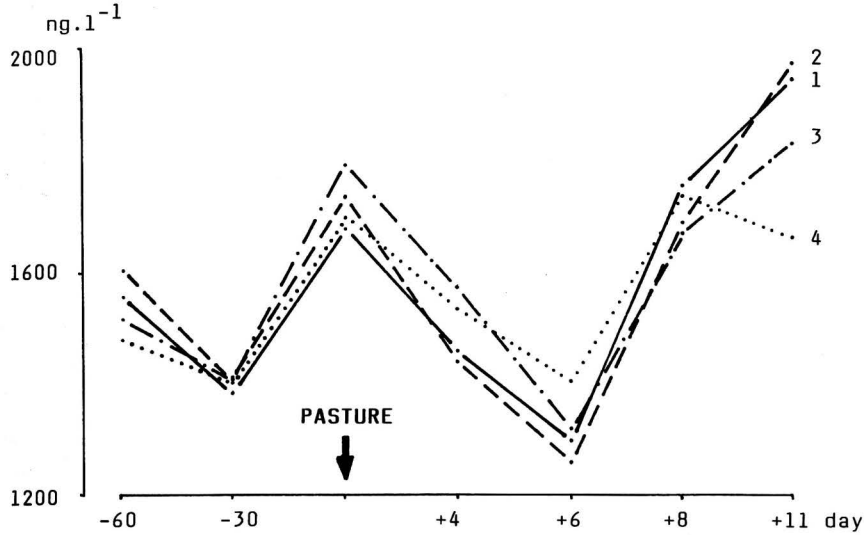

Figure 2. Blood plasma vitamin B_{12} levels in heifers

During the winter-feeding period a plasma vitamin B_{12} levels decreased 1 month before the beginning of green feeding followed by significant elevation ($P/0,01$). During the first 6 days after the turning to green feeding, a significant decrease of vitamin B_{12} levels was recorded ($P/0,01$) being the less pronounced in the fourth group gradually turned to green forage. After the 6^{th} day significant elevation of vitamin B_{12} levels were observed. A fore mentioned changes were relatively less marked in the fourth group in comparison to the remaining ones.

Discussion

The sudden changes of nutrition, feeding of young pasture forage rich in proteins with low fibre content affect the control of rumen pH. An adaptation of animals is impossible untill the fibre content in forage becomes higher. Supplementation with low protein forage such as hay and straw promoting rumination and saliva production and create optimal conditions for rumen microorganisms would be benefical.[4] With regard to observed changes of rumen infusoria and plasma vitamin B_{12} levels, our results justified a gradual shift from winter to summer feeding .

Summary

Quantitative changes of rumen infusoria and plasma vitamin B_{12} levels were studied in heifers in relation to feeding changes. Animals treated with Selevit before turning out to pasture showed significant decrease of rumen infusoria on the 5^{th} day of pasture period varying till the end of experiment. In the untreated group suddenly turned out to pasture, marked decrease of infusoria was observed on the 3^{rd} day persisting till the last day of experiment. Similarly in the stalled group with sudden change of stall feeding to pasture forage, decreasing of infusoria was observed from 0 to the 8^{th} day. In the last group, which stayed in the stall gradually accustomed to green forage the slow decrease of rumen infusoria was observed on the 8^{th} day followed by significant increase of total infusoria.

During the first 6 days of pasture feeding significant decrease of plasma vitamin B_{12} was recorded. Later, the vitamin B_{12} levels increase above the initial value. Probably, these changes are related to rumen microflora adaptation to new diet associated with temporary decreased vitamin B_{12} synthesis in the rumen. The mean plasma vitamin B_{12} levels ranged from 1 261 to 1 960 $ng.l^{-1}$ during the experiment.

Zusammenfassung

In der Arbeit untersuchten wir die Veränderungen in der Gesamtzahl von Infusorien der Pansenflüßigkeit und die Konzentration von Vitamin B_{12} im Blutplasma der Färsen in Abhängigkeit von Vorbereitungsmethode der Tiere zur Grünfutterernährung.

In der ersten Versuchsgruppe, die vor dem Austreiben auf die Weide mit Selevit behandelt wurde, wurde bedeutendes Herabsetzen von Infusorien vom 0-en bis 5-en Tag ihres Aufenthaltes auf der Weide vermerkt. Dann folgte milderer Aufstieg und wiederholtes Herabsetzen. Die Tiere mit plötzlichem Übergang auf die Weide, ganz ohne Behandlung, zeigten schon am 3-en Tag ihres Aufenthaltes auf der Weide markantes Herabsetzen von Infusorien und dieser Zustand konnten wir auch am Ende des Versuches merken. In der Gruppe, die im Stall geblieben ist, und deren Futterration plötzlich auf die Aufnahme von Grünfutter geändert wurde, wurde vom 0-en bis 8-en Tag sukzessive Verminderung beobachtet, die bis zum Ende des Versuches blieb. In der letzten Gruppe, im Rahmen deren zur ursprünglichen Futterration Grünfutter zugegeben wurde, konnte am

8-en Tag allmähliches Herabsetzen von Infusorien vorgemerkt werden, und am 11-en Tag merkten wir einen bedeutenden Aufstieg.

Bei der Untersuchung der Veränderungsdynamik in der Konzentration von Vitamin B_{12} im Blutplasma während der 6 ersten Tage nach dem Übergang auf Grünfutter zeigt sich dessen bedeutendes Herabsetzen. Im nächsten Verlauf stieg die Konzentration von Vitamin B_{12} auf Ausgangsniveau. Diese Veränderungen hängen wahrscheinlich mit der Addaptation der Pansenmikroflora auf das neue Futter zusammen, die mit dem vorrübergehenden Herabsetzen der Synthese von Vitamin B_{12} verbunden ist. Die durschnittlichen Niveaus von Vitamin B_{12} im Blutplasma bewegten sich im Verlauf des Versuches zwischen 1 261 - 1 960 $ng.l^{-1}$.

Résumé

Notre travail scientifique a pour but l´observation des changements du nombre d´infusoires dans le liquide de la panse et aussi l´observation de la vitamine B_{12} dans le plasma sanquin chez les génisses en relation avec la mode de la préparation de la nourriture verte. On a observé chez un groupe des animaux utilisant avant la paturage Selevit, un abissement expressif des infusoires du jour 0 jusqu´au 5 jour de la paturage. Apres nous avons observé une augmentation lente et un nouvel abaissement. Chez les animaux d´un passage rapide a la paturage sans aucun emploi des médicaments on a démontré un abaissement rapide des infusoires déja le 3-eme jour de la paturage et l´abaissement a continué jusqu´a la fin de l´expériment. Chez les animaux qui ont resté dans la vacherie et brusquement on a changé leur nourriture en fourrage verte, du jour 0 jusquáu 8-ieme jour on a observé lábaissement tranquille des infusoires lequel a continué jusqu´a la fin de l´expériment. Chez les genisses qui ont recu la nourriture melangée des alimentation d´origine avec la fourrage verte, on a signalé augmentation significativ des infusoires le 11-eme jour.

En observant le dynamique de la concentration de la vitamine B_{12} dans le plasma sanquin pendant les premiers 6 jours apres le passage a la nourriture verte, on a constaté un abaissement exéssif de la vitamine. Suivant, la concentration de la vitamine B_{12} augmente et arrive au niveau primaire. Ces changements probablement sont en relation avec l´adaptation de la microflore de la panse a la fourrage nouvelle laquelle est réunie avec l´abaissement transitif, de la syntese de la vitamine B_{12} dans la panse. Le niveau moyen de la vitamine B_{12}

dans le plasma sanquin varient pendant l´expériment dans le diapason 1 261 - 1 960 $ng.l^{-1}$.

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