Feeding a Naturally Chelated Trace-Mineral Formula to Improve Feed Efficiency in Feedlot

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2- Objectives

During the trials in which the mineral formula used in the US Patent # 6,764,692 for horses produced significant improvements in weight gain in this species, the possibility of using the same mineral formula for feedlot arose. A test was scheduled and performed in Puerto Rico, during the latter months of the year 2003.

Method to increase food conversion and reduce dehydration in cattle

The purpose of the test to be conducted on tropical conditions, was to corroborate the hypothesis that these trace minerals, a natural combination of montmorillonite with the absorbed humic chelating compounds (humic acid and fulvic acid), would increase the rate of absorption of the nutrients fed, aid in the absorption of toxins if these were present and increase the weight gain considerably, compared with a similar lot that would be provided the same feed, but not the mineral compound.

The goal was to be able to develop a system that would allow the material to be used for a period of approximately 120 days, which would finish three feedlot cycles yearly.

The four months of the proposed study were divided in an **Initiation Phase** of two months, where the lots were fed 20 lbs of food per day and a **Finishing Phase** of two months, where the lots ate 26 lbs per day. The naturally chelated trace mineral formula described in the Figure # 1 was fed at a rate of **1.5 % during the Initiation Phase** and at the rate of **1 % during the Finishing Phase.**

Figure # 1

Naturally Chelated Trace Mineral Formula

ALUMINUM	Al	9.3%	HYDROGEN	H	.05	RUTHENIUM	Rue	7.8
ANTIMONY	Sb	10.5	INDIUM	In	.38	SAMARIUM	Sa	3.5
ARSENIC	As	.2	IODINE	I	7	SCANDIUM	Sc	3.7
BARIUM	Ba	22.5	IRIDIUM	Ir	.51	SELENIUM	Se	4.1
BERYLLIUM	Be	.10	IRON	Fe	1.6%	SILICON	Si	25%
BISMUTH	Bi	14.3	LANTHANUM	La	18	SILVER	Ag	.3
BORON	Bo	7	LEAD	Pb	15	SODIUM	Na	1.2
BROMIDE	Br	5.2	LITHIUM	Li	1.44	STRONTIUM	St	240
CADMIUM	Cd	1.12	LUTETIUM	Lu	.45	SULFUR	S	1.6%
CALCIUM	Ca	.23%	MAGNESIUM	Mg	.83%	TANTALUM	Ta	.50
CARBON	C	.19	MANGANESE	Mn	150	TELLURIUM	Te	.1
CERIUM	Ce	40	MERCURY	Hg	.166	TERBIUM	Tb	.62
CESIUM	Cs	183	MOLYBDENUM	Mo	61	THALLIUM	Tl	10.0
CHLORIDE	Cl	250	NEODYMIUM	Ne	20	THORIUM	Th	>100
CHROMIUM	Cr	70	NICKEL	Ni	60	THULIUM	Tm	.25
COBALT	Co	4.8	NIOBIUM	Nb	2.89	TIN	Sn	.44
COPPER	Cu	2.2	NITROGEN	N	.03	TITANIUM	Ti	.23%
DYSPROSIUM	Dy	4.0	OXYGEN	O	.2	TUNGSTEN	W	8.1
ERBIUM	Er	2.0	PALLADIUM	Pa	.74	URANIUM	U	> 100
EUROPIUM	Eu	.49	PHOSPHATE	P	320	VANADIUM	V	8
FLUORIDE	Fl	3.85	PLATINUM	Pt	.08	YTTERBIUM	Yb	1.4
GALLIUM	Ga	25	POTASSIUM	K	4.8%	YTTRIUM	Y	1.2
GERMANIUM	Ge	25	PRASEODYMIUM	Pr	2.0	ZINC	Zn	20
GOLD	Au	.68	RHENIUM	Rh	1.0	ZIRCONIUM	Zr	10
HAFNIUM	Hf	2	RHODIUM	Ro	.44			
HOLMIUM	Ho	1.1	RUBIDIUM	Rb	36.5			

3- Materials

The breed selected to work with was a Char-bray line, adapted to the terrain, although other Brahman crosses of commercial value were also used. The animals used were divided into

a group of heifers and a group of bulls. The heifers were divided into a control group composed of 12 individuals and a supplemented group, composed of 29 individuals. The bulls were divided into a control group composed of 9 individuals and a supplemented group, composed of 21 individuals.
The water conditions were excellent.
The diet was a mixture of corn, sorghum and by-products from the flour industry. It was supplemented with relatively small amounts of locally grown hay.
The trace mineral formula is a montmorillonite compound, with a high content of humic compounds. Most of the trace minerals in the mineral formula shown in the Figure # 1 are included or chelated in the humic and fulvic acids, present at a rate of no less than 10% of the montmorillonite compound. The structural alumino-silicate portion and the Arsenic are not.
The feed was primarily composed of milling mash and screenings; silage, hay, calcium carbonate, water and salt ad livitum.

4- Method

The Qualitative Method of analysis was chosen to test the use of this particular kind of material, since the quantities of absorbed, secreted and excreted elements would not be easily measured at first, other than through a complicated system of analysis that would include at least a plasma spectrographer; which is not common to readily dispose of.
A very low amount of traceable elements should be normally found in cattle with a normal urinary function, after they have gone through the process of intestinal absorption. Furthermore, the availability of these in saliva, mucus, feces and sweat would be very difficult to measure. Most of the mineral ingested will combine with different molecules in the body, to intervene actively in the enzymatic cellular processes, leaving very small amounts of excretable substances.

Considering the eventual lack of these elements, the absorption of this compound would be observed externally in the overall condition of the supplemented population. The expected changes would include the visible change of coat, the increased growth of hoof tissue, the weight gain and the reduction of the toxicity level of different toxins inherent to the grain utilized in the manufacturing of the feedstuff.

5- Location:

City: Salinas.
Country: Puerto Rico, US.
Average Annual Temperature: 82° F (28° C).
Elevation: Slightly above sea level.
Climate Type: Tropical.

6- Population:

Within a population of up to 5,000 animals divided into lots of 100 individuals each, a group of 12 heifers in one corral and a group of 9 bulls in another corral, were ear marked and weighed monthly, providing the control data for this test.

Within the same population, a group of 29 heifers in one isolated corral and a group of 21 bulls in another isolated corral were fed the same diet as the control group, with the addition of the 76 oligoelements Trace Mineral formula.

7- Length of study and dates:

The study was conducted during the months of August through December of the year 2003. Each lot was weighed with the following schedule:

1) Weighed on August 19/03 and again on September 29/03. (First cycle)
2) Weighed on October 27/03. (Second cycle)
3) Weighed on November 24/03. (Third cycle)
4) Weighed on December 23/03. (Fourth cycle)

8- Dosage:

In accordance with FDA regulations both in the US and in Canada, the permissible amount of a montmorillonite compound should not exceed a 2% limit. In this particular case, it was decided to test the conversion capabilities of the 76 oligoelements Trace Mineral Formula, by feeding proportionally less food daily than usual and dividing the administration of this supplement into an **Initiation Phase** of two months, where the mineral was included in the ration at the rate of **1.5%**; followed by a **Finishing Phase**, where the mineral formula was included in the ration at a rate of **1%**.

9- Observations:

A) The average daily gain observed on the animals treated with the Mineral was:

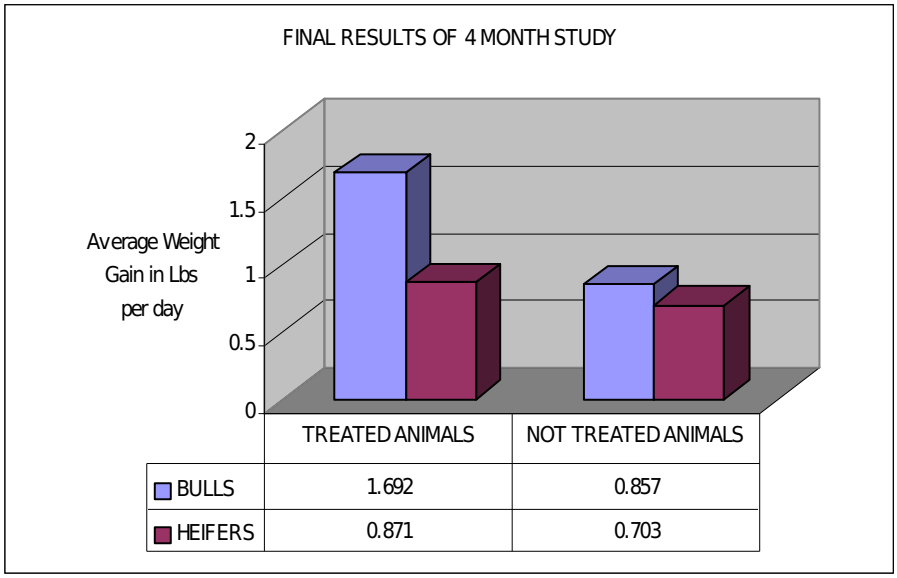
Males: 1.692 lb / day.
Females: 0.871 lb / day.

B) The average daily gain observed on the animals not treated with the Mineral was:

Males: 0.857 lb / day.
Females: 0.703 lb / day.

As we can see in the Figure # 2, not only we can appreciate a considerable increase in body weight in the lot of treated bulls, compared with the lot of untreated ones, but also the fact that even the treated heifers gained more weight than the untreated bulls.

Figure # 2



Because the Trace Mineral Formula was added to the pre-existing feed program, which already included a mineral salt mix, the effects seen could be attributed to the use of the montmorillonite formula. Since the main constituents of this formula are the Aluminum and the Silica, the rest of the elements could be considered secondary in nature and effect. The traces of most of the other elements could be considered as acting synergically to obtain the reported effects. None of the other reported elements could be considered individually responsible for the observed gain, since the quantities present are too small to have an impact. Therefore, they must be acting within the humic montmorillonite compound's contribution as a whole.

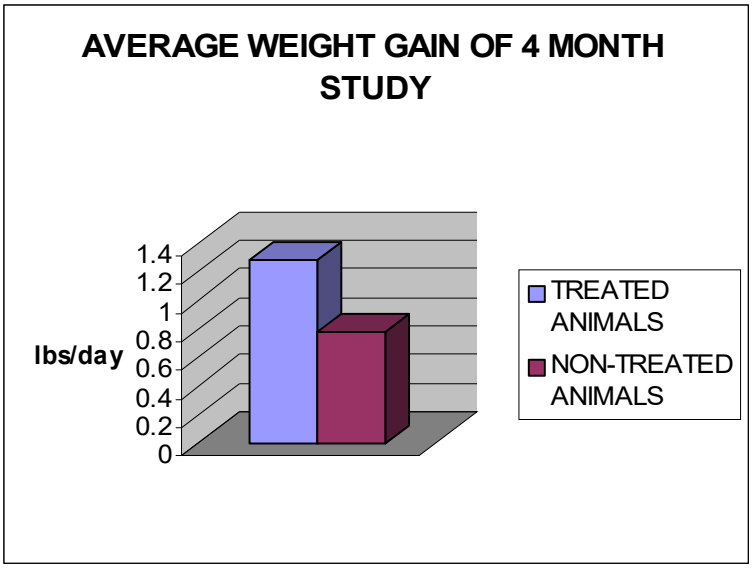
10- Conclusions:

The use of this humic-montmorillonite compound increased the conversion rate within the population supplemented with it. At the end of the test it became clear that the population treated with the trace mineral formula increased weight at a rate of almost 2 to 1, compared to the lot that was fed the same food, but did not receive the mineral. (Figure # 3)

One fact that seems important to consider is that the lot of treated heifers totaled 29 and the lot of treated bulls totaled 21. The test was not performed exclusively on steers, as it would be in

many feedlot operations, but instead in a mixed population of heifers and bulls; being the heifers the largest part of that population. Furthermore, bulls were chosen instead of steers, which slowed down considerably the overall gain.
Even if a small amount of heifers were used in future operations where these minerals were supplemented, it is sensible to presume that the results would be largely increased in the number of total pounds gained, by a reduction of the female population and the use of the males as steers, not as bulls.

Figure # 3



When a visual inspection of the lots used in the test was performed, it was clear that there wasn't an even criterion of selection of the individuals. There was a very visible difference between what we could consider the top of the lot and the bottom, speaking in terms of the phenotype. The average quality could be considered low.

Furthermore, several animals presented different degrees of lameness, predominantly laminitis, due to the hardened terrain where the tests were conducted. This was another parameter intended to be measured, since lame animals reduce the average gain of weight and affect the end result. When the population tested entered the second weighing, there was no significant lameness described. This could account for the same effects observed during the tests resulting in the US Patent # 6,764,692, Method to treat Laminitis and to reduce dietary intake for horses, since the etiology and the end results appear to be the same.
Lastly, the weight of the animals that died during the test was not added to the total weight, which also reduced the average.

11- Discussion:

When comparing the Treated and the Non-Treated lots, the gain observed is almost twice the pounds, in favor of the animals treated with the trace mineral formula. (Figure # 4)

To this comparative weight gain, we need to add the fact that, in effect, the minimum weight of slaughter had been achieved in 120 days. The Non-treated animals, obviously, would not enter in this minimum weight (no less than 850 pounds per head at the time of slaughter) schedule, but rather would have to stay in the Feedlot a total of 7 months and 23 days, compared with the 120 days of the herd supplemented with this formula.

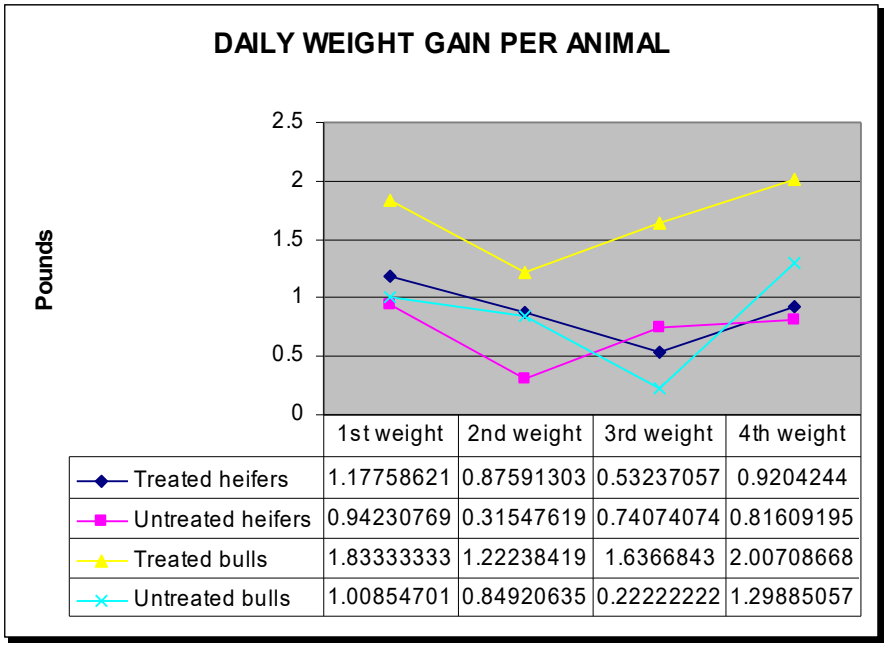
The obvious economic implication is that the savings obtained will be accounted for in days of production, which will be reduced with this finishing system.

THE DAILY COST OF FEEDING, PER ANIMAL, WOULD BE THE SAME WHETHER THE TRACE MINERALS ARE ADMINISTERED OR NOT. THIS COST IS INDEPENDENT OF THE PRICE OF ADMINISTERING THE TRACE MINERALS.

This consideration makes it imperative to try to achieve the maximum gain effect in the minimum amount of time, reducing expenses.

The feeding cost should not be considered in the final evaluation of the use of these Minerals, since the estimated gain achieved with their use is higher than the one obtained with the traditional fattening system. Therefore, the cost of the Trace Minerals should be extracted from the earnings achieved with its administration.

Figure # 4



	1st weight	2nd weight	3rd weight	4th weight
Treated heifers	1.17758621	0.87591303	0.53237057	0.9204244
Untreated heifers	0.94230769	0.31547619	0.74074074	0.81609195
Treated bulls	1.83333333	1.22238419	1.6366843	2.00708668
Untreated bulls	1.00854701	0.84920635	0.22222222	1.29885057

Since it is feasible to adjust the parameters to obtain three production groups per year, the difference in the amount of additional pounds will create the need to do this.

The animals that entered the Feedlot with an average of 650 lbs of weight will fatten an average of 200 lbs during the four-month period; which will put them within the minimum average weight to slaughter acceptable of 850 lbs per animal.

Some other additives could be used to increase the body weight even more (in fact we would recommend them), such as the coccidiostatic antibiotic monensin and Vitamins A and E. The monensin was not used in this trial, to allow the minerals to perform without any interference of other major feed ingredients.

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