Sonderdruck aus

Journal of Animal Physiology and Animal Nutrition

Band 59 (1988), Heft 1, S. 45–58

Deparments of Animal Nutrition[1] and of Analysis of Food from Animal Origin[2] of the Veterinary Faculty of the State University of Liège. Belgium

Attempt to growth stimulation by vaccination against somatostatin and anabolisation with trenbolone oestradiol in young bulls

C. Van Eenaeme[1], P. Evrard[2], L. Istasse[1], E. Rommel[1], P. Baldwin[1], M. Gielen[1], G. Maghuin-Rogister[2] and J. M. Bienfait[1]

Receipt of Ms. 18. 05. 87

Introduction

Meat production by beef cattle can be defined as the process of transforming dietary and microbial nitrogen into myofibrillar protein. Compared to monogastric animals beef cattle perform this transformation with a low yield. Several attemps have been undertaken in order to increase the efficiency of protein deposition in ruminants. Anabolic steroids have been used successfully and extensively for this purpose. However, consumers are more and more against the use of "hormonal" compounds with regard to health hazards due to residues. Moreover, a recent EEC directive completely banned the use of anabolic compounds in beef production, regardless of the numerous scientific evidences for safety of the natural hormones and of two xenobiotics e.g. trenbolone and zeranol. So other ways of improving beef meat production have to be sought for.

The role of pituitary growth hormone (GH) in regulating growth has been the subject of several studies. However the anabolic effects of GH are mediated by the somatomedins (Sm) or insulin like growth factors (IGF) and depend also on the overal hormonal status. Neuroendocrine factors play an important rôle in the release of growth-promoting hormones. With regard to GH the principal neuroendocrine peptides appear to be somatocrinin or growth hormone-releasing factor and somatostatin or somatotropin release-inhibiting factor (SRIF). Somatostatin has been known to inhibit the release of GH, and other hormones including insulin and thyrotropin (TSH) which are important for growth regulation.

The administration of GH in order to improve musle protein deposition frequently resulted in contradictory observations. Other attempts have therefore been undertaken to modulate GH secretion. Spencer et al. (1983) suggested an interesting approach to improve growth of lambs. These authors proposed an autoimmunisation technique against somatostatin which might result in increased growth eventually by neutralizing the inhibitory effect of somatostatin on GH release. The technique appears promising with lambs but the effects on bovine are less well documented.

IGF, GH and other related peptides offer no problems with regard to residues due to their peptidic nature. Nevertheless, the immunisation technique proposed by Spencer might be difficult to accept in terms of public health due to the use of Freund's adjuvant. Indeed, other adjuvants avoiding this bacterial preparation should be sought for. A synthetic immunomodu-

U.S. Copyright Clearance Center Code Statement:
J. Anim. Physiol. a. Anim. Nutr. 59 (1988), 45–58
© 1988 Verlag Paul Parey, Hamburg und Berlin
ISSN 0044-3565

0044-3565/88/5901-0045 $ 02.50/0

lator based on muramyl-peptides coupled to gonadoliberin (LHRH) has been used for immunological castration by CARELLI et al. (1982). CLOSSET et al. (1986) proposed the use of analogous muramyl di-or tripeptide derivatives of somatostatin to produce active immunization in young bulls.

In the present communication we describe an attempt to utilize this immunization technique with young growing fattening bulls under practical conditions. As immunization is a relatively slow process a combined treatment with anabolic steroids was also incorporated in the trial. The effects of the treatments on growth rate, feed intake, blood metabolites, plasmatic GH levels, urinary excretion products of nitrogen metabolism, nitrogen balance, muscle protein turnover and slaughter data will be presented.

Material and methods

Animals

Twelve young bulls of the Belgian blue breed dual purpose type were used. They were housed individually on metabolic stalls. After a 10 weeks adaptation period the animals were subjected to the experimental treatments for a period of 105 days (15 weeks). The initial weight was about 380 kg.

Diets

All animals were given a diet consisting of a mixed silage made of pressed sugar beet pulp (0.85) and glutenfeed (0.15) supplemented with about 1.5 kg hay and 100 g of a mineral mixture. The daily intake was fixed at 90 g dry matter per kg metabolic live weight and was adjusted weekly. Water intake was ad libitum.

Treatments

The animals were divided into 4 treatment groups with 3 animals each: the bulls from the first group were vaccinated against somatostatin (S/S group). The animals from the second group were vaccinated and implanted during the first half of the experiment (15 weeks before slaughter) with an ear pellet containing 200 mg of trenbolone acetate and 40 mg of oestradiol (SA/S group). In the third group, the bulls were vaccinated and implanted during the second half of the experiment (7 weeks before slaughter-S/SA group). The 3 remaining animals were untreated and used as control.

The three groups which were vaccinated were injected 4 times with 100 µg of muramyldipeptide-somatostatin as described by CLOSSET et al. (1986). The conjugate was solubilized in 2 ml 9‰ sodium chloride containing 40% polyethyleneglycol 6000. This solution was injected intramuscularly in the neck of the animals on days 0, 10, 45 and 70 respectively.

Measurements

Food intake was measured daily. Individual live weights were recorded weekly. Nitrogen balance was measured on weeks −2–1, 1, 2, 5, 8, 9, 10 and 12 of the experimental periods. The data from weeks −2 and −1 were averaged and were assigned at week 0 immunisation.

Urinary excretions of urea N, creatinine and 3-methylhistidine were measured during the same weeks. Blood samples were collected weekly 3 hours after the morning feeding for glucose, alpha-amino N, urea N and creatinine determination. On day 90 blood samples were collected every 20 minutes over a period of 10 hours for the animals in the control, S/S and S/SA groups and, the plasma samples were assayed for GH. Carcass composition was estimated by the three rib cut technique as described by MARTIN and TORREELE (1962). Data were processed statistically by analysis of variance and t-test.

Chemical analyses

Most metabolites were analyzed by Autoanalyzer methodology: Kjeldahl nitrogen was estimated by block digestion and automated colorimetry using the Berthelot reaction, urea by the diacetyl monoxime method, glucose by o-toluidine, creatinine by the Jaffé method and alpha-amino N by the trinitrobenzene sulfonate method. 3-methylhistidine and non esterified fatty acids (NEFA) were estimated by fused silica capillary gas chromatography by an adaptation of the amino acid method of MC KENZIE and TENASCHUK (1978) and by the method of MUELLER and BINZ (1982) respectively. GH was determined using a homologous bovine radio immuno assay (CLOSSET et al. 1986). The detection in bull sera of free binding sites for somatostatin (SRIF) has been performed on various periods after initial treatment using (^{125}I)Tyr – SRIF as tracer. A charcoal separation was used for measuring bound and free radioactivity after a 48 h incubation period at 4°C of the tracer in the presence of several dilution of the serum samples.

Results

The animal performances are given in table 1.

Live weight gain (LWG)

The cumulated LWG is depicted in Fig. 1. At the end of the experimental period the total LWG was 164.7 kg in the control group and 161.0 kg in the S/S group. Both groups were identical during the whole period. Larger differences in LWG were observed with the vaccinated and anabolized group. For the SA/S treatment the LWG differed from the control group from weeks 2 to 7 ($P < 0{,}05$). During the first period the maximum difference was reached after 5 weeks (27.3 kg) and the mean difference in LWG between control and SA/S groups was 22.8 kg. However at the end of the whole experimental period the LWG had fallen down to the control group level (163.0 kg). The highest final LWG (174 kg) was obtained in the S/SA group. From the 9th to the 15th week the LWG was on average 9 kg higher than in the control group, the difference being not significant.

The daily gain over the whole experimental period was 1.57, 1.53, 1.66 and 1.55 kg per day for the control, S/S, S/SA and SA/S groups respectively. During the "effective" anabolization period (7–8 weeks after inplantation) daily gain amounted to 1.76 kg/day for the S/SA group and to 1.73 kg/day for the SA/S group, values which were not statistically different.

Table 1

Animal performances as influenced by somatostatin vaccination with or without anabolisation (mean ± standard error)

		Control	S/S		S/SA	SA/S
Initial weight	(kg)	386,6 ± 24,7	373,7 ± 29,9		384,7 ± 16,6	376,0 ± 13,8
Final weight	(kg)	551,3 ± 26,1	534,7 ± 35,6		558,7 ± 10,7	539,0 ± 24,8
Total live weight gain	(kg)	165,0 ± 6,1	161,0 ± 6,7		174,0 ± 6,6	163,0 ± 14,1
Average daily gain	(kg)	1,57 ± 0,06	1,53 ± 0,06		1,65 ± 0,06	1,55 ± 0,13
Daily feed intake silage	(kg/d)	24,1 ± 1,06	23,5 ± 0,95		24,3 ± 1,02	23,6 ± 1,09
Hay	(kg/d)			1,5		
Mineral mixture	(kg/d)			0,1		
Dry matter intake	(kg/d)	8,98 ± 0,37	8,82 ± 0,34		9,03 ± 0,36	9,01 ± 0,38
Feed conversion ratio (kg DM/kg gain)						
– whole period		5,88 ± 0,21	6,04 ± 0,20		5,25 ± 0,21	6,00 ± 0,21
– anabolisation period					5,13 ± 0,22	5,20 ± 0,26
Apparent digestibility	(%)					
– organic matter		81,20 ± 1,9	78,40 ± 0,2		81,80 ± 0,4	80,70 ± 1,1
– Nitrogen		72,20 ± 0,8	68,90 ± 1,0		72,80 ± 0,6	70,90 ± 2,0
– Crude fiber		79,10 ± 1,4	75,00 ± 0,4		78,50 ± 0,4	77,10 ± 1,4

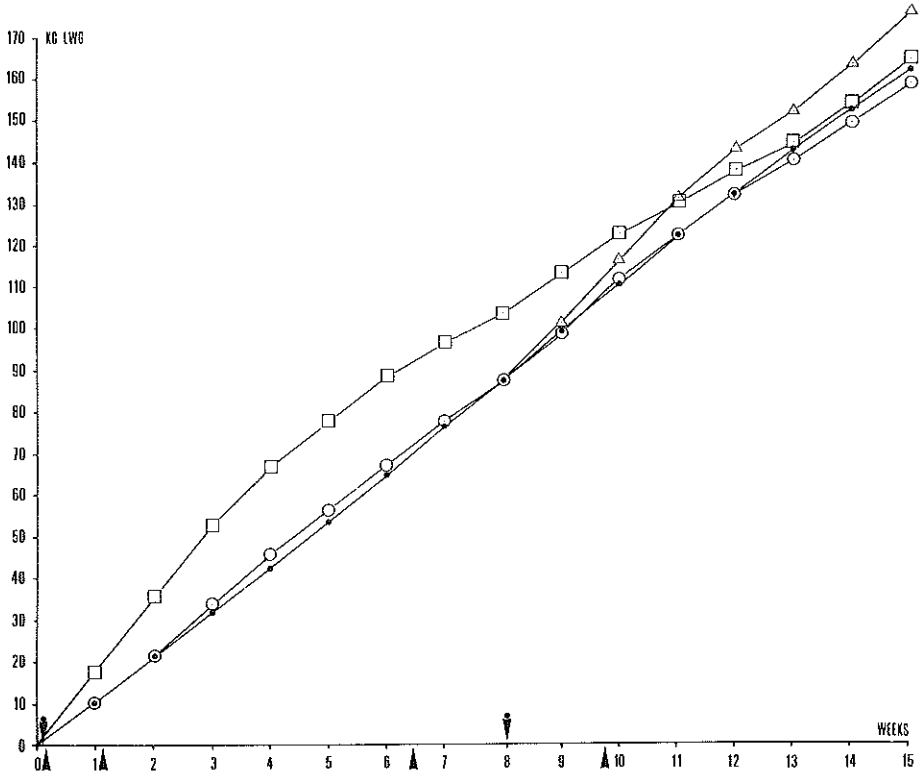

Fig. 1. Total weight gain (3 points moving averages) in control bulls (●——●) in bulls vaccinated against somatostatin only (○——○), in bulls vaccinated and anabolised in the first part (△——△) or in the second part (□——□) of the experiment. Arrows indicate the vaccination (▲) and the implantation (▼) times.

Feed intake and apparent digestibility

Chemical composition of the silage is briefly summarized in table 2. Feed intake is given in table 1. On average, the total dry matter intake was about 9 kg per day. Feed conversion ratio was 5.25 kg and 5.13 kg dry matter/kg LWG for the S/SA group over the whole experiment or during the anabolization period respectively. In the other three groups it was around 6 kg dry matter per kg LWG, the highest value being observed for the S/S group. The feed conversion ratio in the S/SA group was significantly ($P < 0.05$) lower than in the three other groups. The apparent digestibility coefficients for organic matter, nitrogen and crude fiber of the diet were on average 80.5, 71.2 and 77.4% respectively and were not significantly different between treatments.

Table 2

Chemical composition (Weende components) of the silage of pressed sugar beet pulp mixed with glutenfeed

		%	Standard error
Dry matter		31,3	0,18
Ash	(% in DM)	7,7	0,03
Crude protein	(% in DM)	16,0	0,19
Crude fiber	(% in DM)	16,7	0,11
N free extract	(% in DM)	57,0	0,31
Crude fat	(% in DM)	2,6	0,13

Slaughter data

Slaughter and carcass data are given in table 3. Mean slaughter and carcass weights were 526 kg and 322 kg respectively. The lowest values were observed in the S/S group although differences between groups were not significant. Dressing percentage was on average 61 % and differences

Table 3

Slaughter- and carcass data as influenced by somatostatin vaccination with or without anabolisation (mean ± standard error)

		Control	S/S	S/SA	SA/S
Slaughter weight	(kg)	536,0 ± 24,4	517,7 ± 30,0	533,7 ± 11,9	518,0 ± 23,0
Carcass weight	(kg)	326,0 ± 20,3	312,7 ± 21,1	326,3 ± 9,8	321,7 ± 12,7
Dressing %	(%)	60,7 ± 1,13	60,6 ± 0,65	61,1 ± 0,49	62,1 ± 0,96
Carcass composition	(%)				
– muscle		63,5 ± 0,35	61,2 ± 0,69	65,6 ± 0,46	63,6 ± 1,19
– adipose tissue		21,8 ± 0,79	24,8 ± 0,92	20,7 ± 0,15	22,3 ± 0,84
– bones		14,7 ± 1,06	14,0 ± 0,30	13,7 ± 0,52	14,1 ± 0,62
% longissimus dorsi in 3 rib cut muscle mass		18,9 ± 0,23	16,2 ± 0,95	17,6 ± 1,64	17,6 ± 1,13

between treatments were small. However significant differences between treatment groups were found in carcass composition: the proportion of muscle was significantly lower with the S/S- and significantly higher ($P < 0.05$) with the S/SA group as compared to the control. Moreover for the S/S group this difference was reflected in a significantly lower percentage (16.2 %) of the longissimus dorsi in the total muscle mass of the three ribcut as compared with the control (18.9 %). Consequently the adipose tissue proportion was highest for the S/S group although statistical significance was only reached at the $P < 0.1$ level.

Urinary metabolites and nitrogen balance

Urea N (fig. 2a).

Urea N excretion rose slowly in time from about 35–40 g/day to approximately 55 g/day for both control- and S/S-groups. No differences were observed between the two treatments. The anabolized animals showed a decrease in urea excretion immediately after implantation. The decrease was more important with the SA/S-than with the S/SA-group: from 39 to about 15 g N/day for the former ($P < 0.01$) and from 44 to 29 g N/day for the latter (NS). At the end of the experiment the SA/S animals exhibited the highest urea excretion.

Creatinine (fig. 2b).

Creatinine excretion (g/day) increased from about 13 g to 21 g/day for the control group. The lowest creatinine excretions were observed with the S/S animals. A rather sharp rise occurred in the S/SA group at the end of the experiment corresponding to the anabolisation period. Over most of the period creatinine excretion was highest with the SA/S group. Expressed per kg live weight creatinine excretions ranged between 30 to 40 mg/kg/day, the lowest values being observed with the S/S group during the first half period.

3-methylhistidine (fig. 2c).

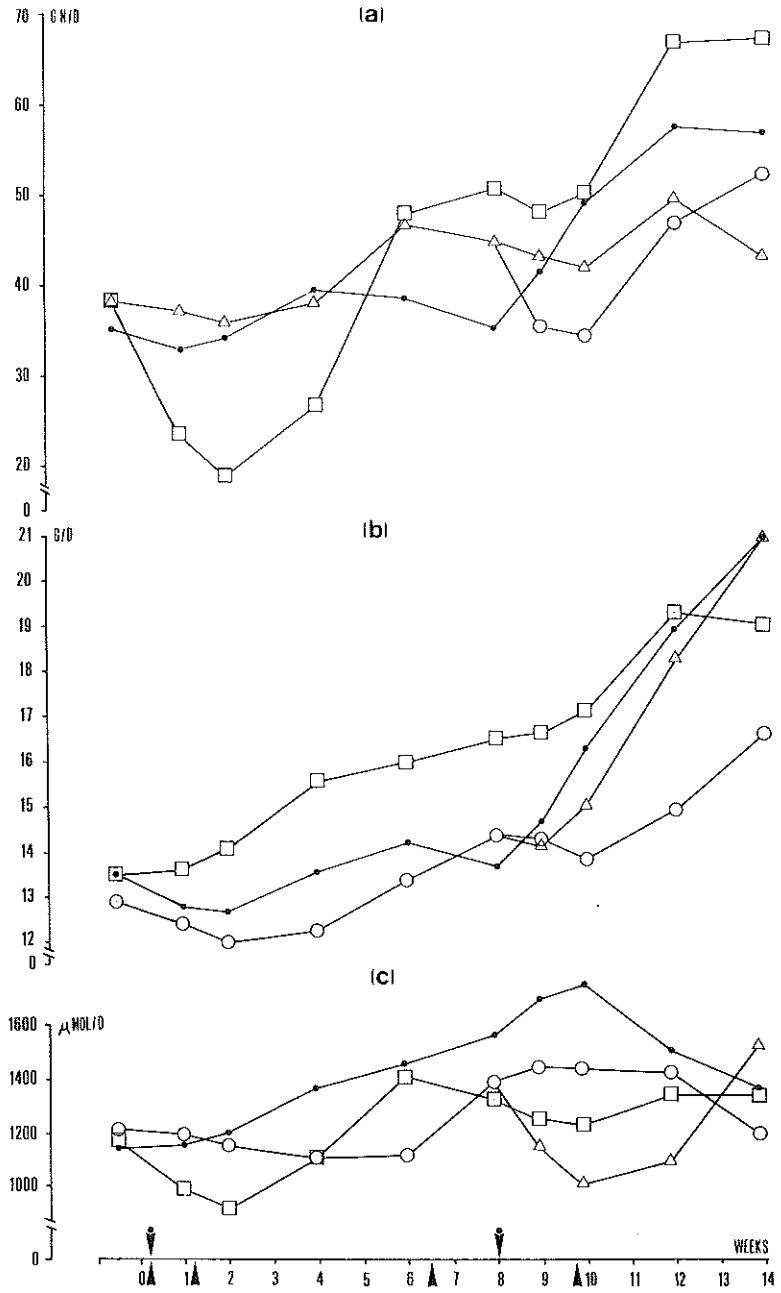

Fig. 2. Urinary excretion (3 points moving averages) of urea N (fig. a), creatinine (fig. b) and 3-methylhistidine (fig. c) for the different groups. See fig. 1 for legends description.

The excretion of 3 methylhistidine (3 MH) was used as an in vivo marker of muscular protein breakdown. For the control group it increased gradually from 1175 µmoles/day to around 2000 µmoles/day on week 10 and it decreased afterwards to about 1400 µmol/day towards the end of the experiment. For the anabolized groups, especially the S/SA treatment a clear fall in 3 MH excretion from around 1600 to 1000 µmol/day was observed after implantation: ($P < 0.05$). For the S/S animals 3 MH-excretion remained almost constant for about 6 weeks and then paralleled the control group, albeit at a lower level.

Nitrogen balance (fig. 3).

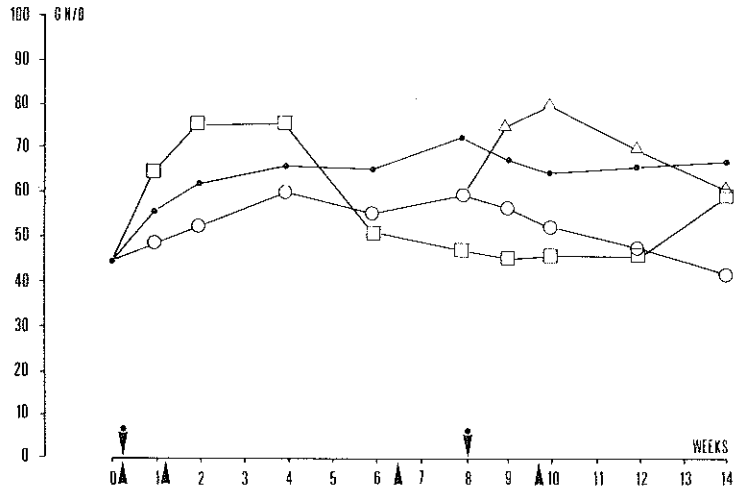

Fig. 3. Nitrogen balance (3 points moving averages) for the different treatment groups. See fig. 1 for legends description.

N balance was around 45 g N per day for all groups at the beginning of the experiment. For the control groups N retention increased slowly to about 65 g N/day and then remained fairly constant. The S/S groups gave a quite similar pattern as the control group, although N-retention was always lower. With the SA/S and S/SA groups the expected increase in N-retention was observed 2 to 3 weeks after implantation. With the SA/S group, N-retention dropped to lower values than in the control group during the second half of the experimental period (cfr. urea excretion).

Blood metabolites

Weekly blood collections

Creatinine (fig. 4a).

Creatinine did not vary to a large extent for the control group. The S/S treatment resulted in a slight decrease in blood creatinine levels, while the creatinine concentration rose after implantation.

Urea N (fig. 4b).

Blood urea N increased gradually with time from 65–75 mg N/l to 130–160 mg N/l for all treatments. The pattern in urea N concentration was similar between control and S/S groups. For the anabolized groups a fall in urea concentration is observed about 3 weeks after implan-

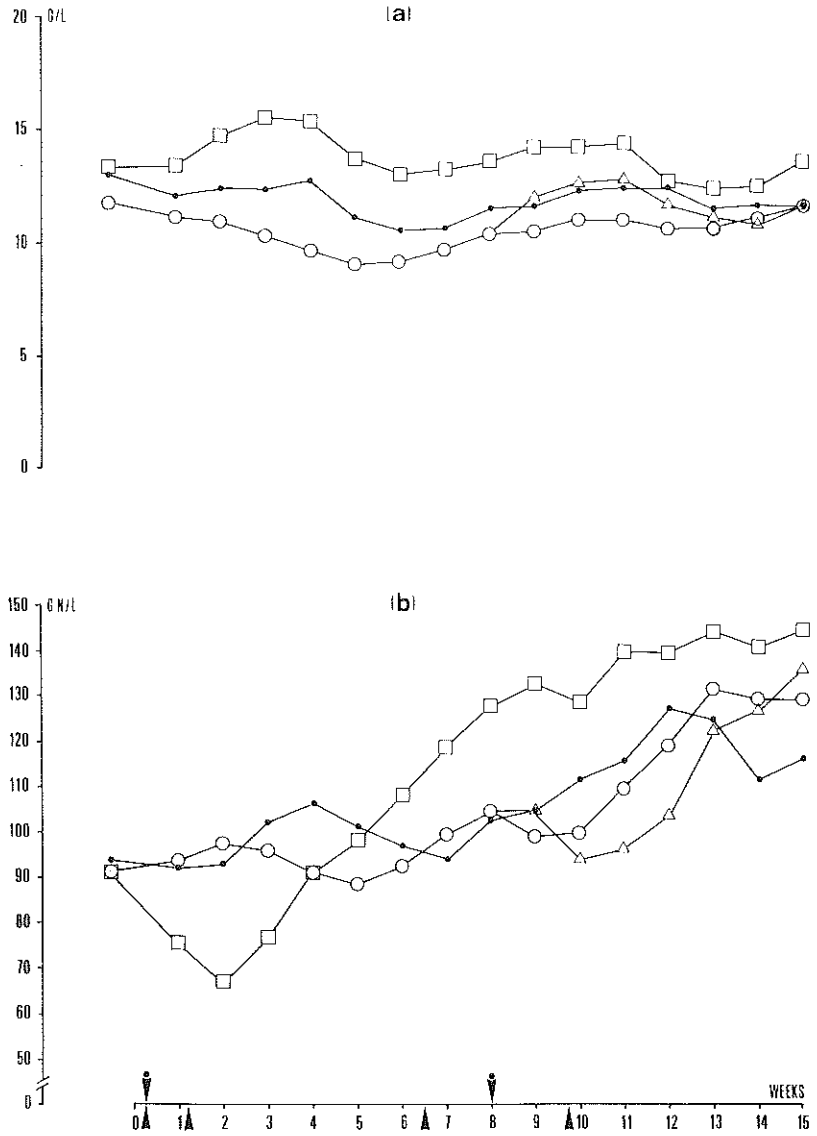

Fig. 4. Plasma concentration of creatinine (fig. a) and urea N (fig. b) for the different treatment groups. See fig. 1 for legends description.

tation; a subsequent increase occurred 4 to 5 weeks later. The decrease was more important with the early implantation.

Alpha-amino N.

Alpha-amino N variation did not show any particular pattern; it ranged between 50 and 80 mg N/l. No systematic differences were observed between treatments.

Glucose.

Blood glucose concentrations decreased slowly in time from about 950–1000 mg/l to 800 mg/l over the whole experimental period. No differences were observed between treatments.

Non esterified fatty acids (NEFA).

NEFA increased slightly from about 100 µmol/l to 150–180 µmol/l during the experiment. Most of the time the treated groups had lower NEFA levels than the control. The mean NEFA concentration over the whole period was significantly lower ($P < 0.01$) for the S/S group with regard to the control.

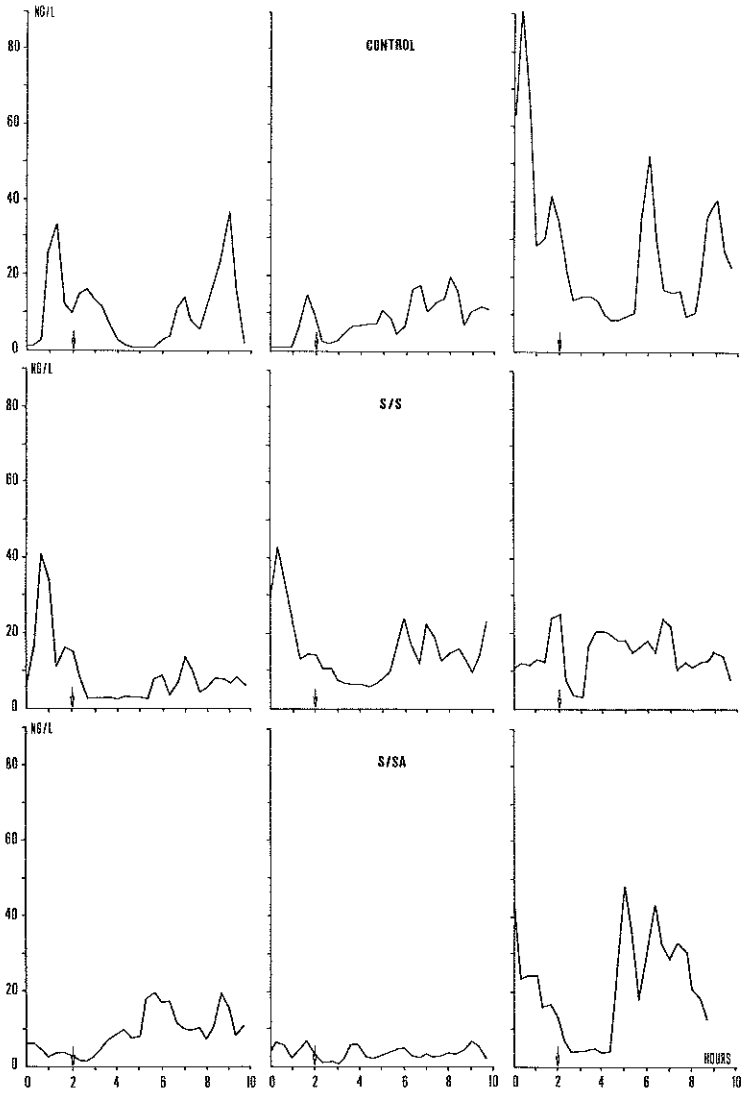

Fig. 5. Plasma GH concentration patterns observed in 3 bulls of each of the following treatment groups: control, S/S and S/SA during a period of 10 hours with a sampling frequency of 20 minutes. The arrow shows (↓) feeding time.

Anti SRIF antibody titers

(^{125}I)Tyr SRIF binding in animal sera was not different from non specific binding (determined in the presence of a large excess of somatostatin). The results were similar in the various treated groups and in the control group.

Plasma growth hormone concentration

The individual GH secretion patterns obtained on day 90 during a 10 hours period are given in fig. 5, for the control, S/S and S/SA animals respectively. Large individual variations were observed between animals when base line level and pulse amplitude and frequencies were compared. No systematic tendency towards higher GH levels in the immunized animals could be detected.

Discussion

Active somatostatin immunization aiming at growth improvement by neutralizing the endogeneous growth hormone release inhibiting factor or somatostatin is clearly a controversial technique. SPENCER et al. (1982) obtained substantial growth increase with Dutch moore lambs and with St. Kildare lambs, two breeds with rather low growth potential. In a later publication however, SPENCER et al. (1985), were unable to obtain statistical differences in weight gain with a commercial breed of sheep, only a transient difference being observed. LAARVELD et al. (1986) reported during the first five weeks growth increase with fast growing lambs from a commercial cross bred line. This data showed equally a transient growth advantage obtained at the beginning of the treatment "while starting from the 7th week after the first immunisation growth curves for the immunised and the control animals were parallel". Furthermore the growth advantage observed resulted for a large part from a depression of growth in the control lambs, which the authors assigned to severe cold stress. VARNER et al. (1980) even observed a significant decrease in weight gain for immunized lambs. The results in other species are even less convincing. SPENCER (1984) reported on a preliminary experiment with somatostatin immunization in Large White pigs resulting in faster growth rates for the immunized animals but failed to repeat the effect on a larger scale experiment. Few data are available on somatostatin immunization in beef meat production. VICINI et al. (1985) carried on an experiment with young dairy calves on the effect of immunization against somatostatin on growth performances. They obtained a slight increase in total gain, although this values adjusted for equal weight at the time of immunization did not reach statistical significance levels. On the contrary CLOSSET et al. (1986) reported a successfull application of a somatostatin immunization in young bulls of the Belgian blue breed, a fast growing beef breed. They used a vaccine based on a muramylpeptide conjugate of somatostatin and obtained an average growth increase of 11% over control ($P < 0.1$). However in the present experiment with the same immunogen we obtained no significant difference in growth rate for animals that were vaccinated without an additional anabolic treatment. The technique even gave slightly worse results: lower weight gain and fatter carcasses. Higher growth rates were observed only with the bulls which were vaccinated and anabolized, the best final weight gains being observed with the late implants. These results are in agreement with former observations (GIELEN et al. 1982).

It should also be noted that our control animals achieved high growth rates which could be

ascribed to both the growth potential of the breed and to the nutritive value of the diet. Indeed, the apparent digestibility of the diet was high but no differences were observed between treatments. This contrasts apparently with the observation of FADLALLA et al. (1985) that passive immunization against somatostatin retarded Cr_2O_3 clearance in sheep suggesting a role for somatostatin in the regulation of the rate of flow of digesta through the gastrointestinal tract. It could be argued however that in the present experiment the initial weight of the bulls was rather high and that the somatostatin treatment appeared to be more efficient in young animals. A further trial (unpublished results) was conducted with 12 3-months old calves weighing on average 130 ± 8.6 kg. They were divided into 2 groups: animals vaccinated twice against somatostatin and control animals. With the exception of the first week, the LWG of the vaccinated animals was always slightly lower than that of the control group; the experiment was stopped after 15 weeks.

In the experiment described in the present paper, the effects of the vaccination on carcass composition were rather negative: the muscle proportion being significantly reduced and the proportion of adipose tissue accordingly increased. Taking into account the lower carcass weight for the S/S group (312.7 kg vs. 326 kg for control animals) somatostatin vaccination did not produce any beneficial effects on meat production. The results presented by SPENCER (1986) showed equally somewhat higher fat contents in the carcasses of treated lambs, but since significantly higher carcass weights were obtained the overal result remained positive.

Of the different treatments only the anabolic implantation resulted in changes in urinary and blood metabolites illustrating mainly the expected improvement in efficiency of nitrogen metabolism, e.g. lower blood urea concentration and urea excretion, higher N-balance, higher blood creatinine and urinary creatinine excretion and a temporary decrease in 3-methylhistidine excretion during the first weeks after the implantation. 3-methylhistidine excretion was slightly lowered in the S/S group indicating a possible weak effect of the immunization treatment. It should be remembered however that lower muscle protein turnover does not necessarily mean higher net growth rate. It is a well known fact that in fast growing individuals protein turnover is rather high. This is well illustrated by the influence of trenbolone acetate 17β oestradiol implantation in young bulls where the highest net deposition occurred when both synthesis and degradation rates were high (VAN EENAEME et al. 1983).

In our experiment we were unable to detect any increase in antisomatostatin antibody titers during the treatment. This could be a possible explanation for the lack of response of our animals. However, it should be noted equally that VARNER et al. (1980) obtained higher antibody titers but lower growth rates with immunized animals. SPENCER (1984) mentioned in the discussion following his paper that there is no relationship between antibody titers and growth performance in immunized animals. He stated that if one observes a measurable antibody titer this means an excess over that required to neutralize the endogeneous somatostatin. On the other hand CLOSSET et al. (1986) did observe both growth increase and higher antibody titers. It seems therefore that no clear cut explanation on the relationship between growth stimulation and antibody titers can be proposed.

Large differences are observed in immunization technique used by the different authors with regard to nature of the immunogen, dose, immunization frequency, adjuvant(s), injection technique and place. So clearly, a lack of standardization seems to exist in this respect, which could be correlated to the differences between the published results.

In conclusion it can be stated that up to now the effects of somatostatin immunization on growth are not well defined. So the contradictory results reported in the literature can be ascribed to a multitude of factors such as species differences (e.g. bulls vs. sheep), genetic

growth potential (slow vs. fast growing breeds), differences in physiological age as well as to differences in immunogen and immunization techniques. Clearly further studies on the fundamental aspects of immunization are needed, before applying the somatostatin immunization as a practical growth promoting technique on commercial breeds of high productivity.

Summary

An attempt to growth stimulation was carried out with 12 young growing fattening bulls (380 kg) by somatostatin immunization using a synthetic vaccine based on a muramylpeptide conjugate of somatostatin. The vaccination was combined with a trenbolone-oestradiol (TBO) implantation. The following treatments were tested: control, somatostatin immunization alone (S/S), somatostatin immunization and TBO implantation either 15 weeks (SA/S) or 7 weeks before slaughter (S/SA). The somatostatin vaccination alone did not result in any improvement of weight gain, feed intake, nitrogen balance, urinary excretions of urea, creatinine and 3-methylhistidine and blood metabolites (urea, creatinine, alfa-amino N, glucose, non esterified fatty acids) as compared to the control animals. Plasma growth hormone concentrations showed also no systematic treatment effects. Each TBO implantation produced a transient modification in some of these parameters indicating a more efficient N metabolism; however, only the late implantation resulted in a lasting weight improvement at slaughter. Muscle proportion was significantly lower in the S/S group and higher in the S/SA group.

Zusammenfassung

Der Einfluß einer Vakzination gegen Somatostatin und Anabolika-Behandlung mit Trenbolonacetat auf das Wachstum von Bullen

Zur Untersuchung einer Vakzination gegen Somatostatin in der Bullenmast mit Hilfe eines Muramyl-Peptid-Somatostatin-Konjugates im Vergleich mit einer Anabolikabehandlung mit Trenboloacetat und Östradiol (TBO) wurden vier Behandlungsgruppen gebildet: Eine Kontrollgruppe, eine Gruppe mit alleiniger Somatostatinvakzination (S/S), eine dritte Gruppe mit Somatostatinvakzination und TBO-Behandlung 15 Wochen vor der Schlachtung (SA/S) und einer vierten Gruppe mit gleicher Behandlung wie bei Gruppe SA/S 7 Wochen vor der Schlachtung (S/SA). Als Versuchstiere dienten in jeder Gruppe 3 Bullen der Rasse Weißblaue Belgier mit einem Durchschnittsgewicht zu Beginn des Versuches von 380 kg.

Die alleinige Somatostatinimmunisierung zeigte keine positiven Effekte hinsichtlich Gewichtszunahme, Futterverbrauch und Stickstoffbilanz und keine Veränderungen in den Ausscheidungen von Harnstoff, Kreatinin und 3-Methylhistidin über den Harn sowie den Plasmakonzentrationen von Harnstoff, Kreatinin, Aminosäuren, Glucose und freien Fettsäuren. Auch in der Konzentration von Wachstumshormon konnte kein systematischer Behandlungseinfluß ermittelt werden. Bei gleichzeitiger TBO-Anwendung wurde ein positiver Einfluß auf den N-Stoffwechsel beobachtet. Nur in der Gruppe S/SA zeigte sich eine Erhöhung der Gewichtszunahme. Der Muskelanteil im Schlachtkörper lag in der Gruppe S/SA höher als in der Gruppe S/S.

Resume

Le but du présent essai a été des tester sur 12 taurillons de 380 kg en croissance-engraissement l'effet stimulateur de croissance d'une immunisation antisomatostatine utilisant un vaccin synthétique à base d'un dérivé muramylpeptidique de la somatostatine. Une anabolisation au moyen de trenbolone-oestradiol (TBO) fut également incluse dans l'essai. Les traitements furent les suivants: groupe témoin, immunisation antisomatostatine seule (S/S), immunisation antisomatostatine accompagnée d'une implantation au TBO, soit 15 semaines (SA/S) soit 7 semaines avant l'abattage (S/SA). La vaccination antisomatostatine seule n'a pas amélioré les gains de poids, l'efficience alimentaire, le bilan azoté, les excrétions urinaires d'urée, créatinine et 3-méthylhistidine, les métabolites sanguins (urée, créatinine, alpha-amino N, glucose, acides gras libres) par rapport aux animaux témoins. De même les profils de l'hormone de croissance n'ont pas été influencés par les différents traitements. Chaque implantation au TBO a induit des modifications au niveau de certains métabolites reflétant une meilleure efficience du métabolisme azoté. Seule l'implantation tardive a résulté en un poids plus élevé à l'abattage. La proportion de muscles de la carcasse fut significativement plus basse pour le groupe S/S et plus élevée pour le groupe S/SA.

Acknowledgements

The I.R.S.I.A. (Institut pour l'Encouragement de la Recherche dans l'Industrie et l'Agriculture) is gratefully acknowledged for financial help.

References

Carelli, C.; Audibert, F.; Gaillard, J.; Chedid, L., 1982: Proc. Natl. Acad. Sci., U.S.A., **79**, 5392.

Closset, J.; Maghuin-Rogister, G.; Tran Quang Minh; Lambot O.; Hennen, G., 1986: Proceedings of the 32nd European Meeting of Meat Research Workers, Ghent, August 24th, 1986.

Fadlalla, A. M.; Spencer, G. S. G.; Lister, D., 1985: J. Anim. Sci. **61**, 234.

Gielen, M.; Bienfait, J. M.; Lambot, O.; Van Eenaeme, C.; Istasse, L., 1982: Ann. Méd. Vét. **126**, 133.

Laarveld, B.; Chaplin, R. K.; Kerr; D. E., 1986: Can. J. Anim. Sci. **66**, 77.

Martin, T.; Torreele, G., 1962: Annales de Zootechnie **11**, 217.

Mc Kenzie, S. L.; Tenaschuk, D., 1979: J. Chromatog. **171**, 195.

Mueller, H. W.; Binz, K., 1982: J. Chromatog. **228**, 75.

Spencer, G. S. G.; Garsen, G. J.; Hart, I. C., 1983: Livestock Prod. Sci. **10**, 25.

Spencer, G. S. G., 1984: Effect of immunization against somatostatin on growth rate of lambs. In: Manipulation of Growth in Farm Animals. Eds. Roche, J. F.; O'Callaghan, D., The Hague: Martinus Nijhoff Publishers, p. 122.

Spencer, G. S. G.; Hallet, K. G.; Fadlalla, A. M.; 1985: Livestock Prod. Sci. **13**, 43.

Spencer, G. S. G., 1986: Hormonal manipulation of animal production by immunoneutralization. In: Control and Manipulation of Animal Growth. Eds. Buttery, P. J.; Haines, N. B.; Lindsay, D. B., London: Butterworths, p. 279.

Van Eenaeme, C.; Baldwin, Paule; Lambot O.; Bienfait, J. M., 1983: Les colloques de l'INRA **16**, II, 81.

Varner, M. A.; Davis, S. L.; Reeves, J. J., 1980: Endocrinology **106**, 3, 1027.

Vicini, J. L.; Clark, J. H.; Hurley, W. L.; Bahr, J. M., 1985: J. Anim. Sci. **61**, Abstract 201, p. 242.

Authors' adresses: C. Van Eenaeme, L. Istasse, E. Rommel, P. Baldwin, M. Gielen, J. M. Bienfait, Department of Animal Nutrition.
P. Evrard, G. Maguin-Rogister, Department of Analysis of Food from Animal Origin. Faculty of Veterinary Medecine, State University of Liège, 45, rue de Vétérinaires, 1070 Brussels – Belgium.