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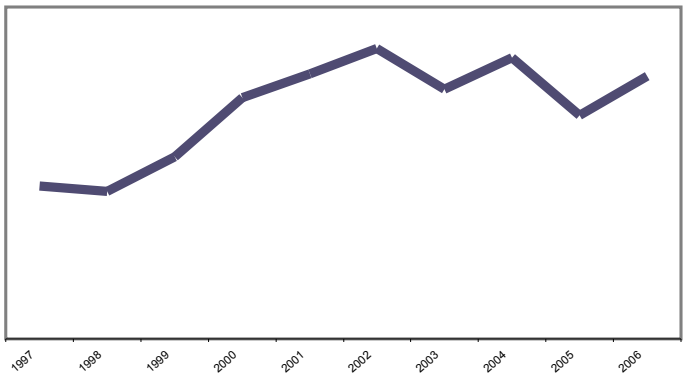
Contents

A MESSAGE FROM THE PRESIDENT



In 2006, the year of TWYDIL®'s 40th birthday, our sales in the world increased by 17 %!

Over the past 10 years, TWYDIL® has doubled its turnover by expanding sales within each continent and developing in many emerging markets.

Far from being satisfied, we will redouble our efforts by intensifying our research, diversifying our product range, welcoming new collaborators, and expanding our contacts with veterinary surgeons and the professional horse fraternity.

Together we will continue to work to justify the renowned image of quality and security of TWYDIL®.

Valère HENRY
President

EVALUATION OF AN ORAL SUPPLEMENT ENRICHED WITH GLUCOSAMINE AND CHONDROITINE SULPHATE ON THE JOINT ENZYMATIC BALANCE IN YOUNG HORSES

Drs Marie Daix, Jean-François Bastin & Nathalie Kirschvink

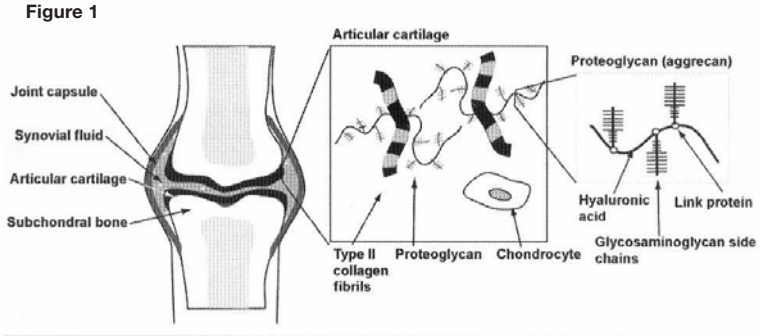
FUNDP- University of Namur, Veterinary Department, Animal Physiology, rue de Bruxelles 61, B- 5000 Namur

Implication of matrix metalloproteinase on osteoarticular disorder

For the sporting horse, the osteoarticular pathologies represent the major cause of lameness. Joints are complex structures made up of various entities (see figure 1). The neighbouring bones are covered with joint cartilage at the zones of contact to provide good mobility within the joint. This mobility is enhanced by the presence of synovial liquid which acts as a lubricant. The whole joint is enclosed within a synovial membrane and stabilised by ligaments and sometimes muscles which surround it. The structure of the joint cartilage plays a major role in its movement. It includes both chondrocytes and extracellular matrix. The extracellular matrix consists largely of collagen, which supplies the cartilage with its resistance, and proteoglycans and glycoproteins which create the elasticity reducing shocks caused by movement. The term " osteoarticular pathologies " in fact includes a large number of different diseases with a common denominator: the destruction of the joint cartilage extracellular matrix (Van Den Boom, et al., 2005).

Several authors have shown that this destruction of cartilage follows the activation of pro-inflammatory and enzymatic factors among which

Figure 1



Neil et al., JAVMA, 2005

the most important seems to be the matrix metalloproteinases (MMP) (Brama, et al., 2004, Neil, et al., 2005 a).

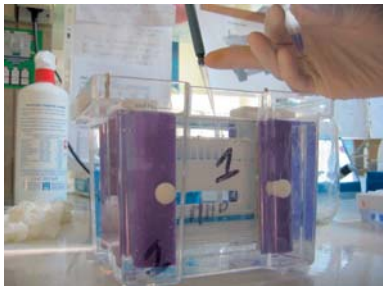
The MMP are zinc-dependent enzymes involved in numerous physiological and pathological processes. These proteinases are able to degrade the extracellular matrix. Their activity is subjected to complex control and notably depends on specific inhibitors: "Tissue Inhibitors of Metalloproteinases" or TIMP. It is largely the balance between the MMP and the TIMP that defines the proteinase activity. Indeed, the enzyme is inactive when bound to its inhibitor. It is only free when its lytic activity expresses itself, so creating the capacity to split the proteins contained in the extracellular matrix. Some pro-inflammatory factors such as cytokines and certain hormones seem capable of activating the MMP and so facilitating the destruction of the extracellular matrix.

These mediators appear to induce a chain reaction, in which the various components join with each other to produce an even more active proteinase (Nagase, et al., 2006). Repeatedly researchers have shown an increase in the activity of the MMP in case of joint pathology (Brama, et al., 2000, Clegg and Cartler, 1999); this increase seems to be the first step in the development of cartilage injury, additionally important and several positive correlations were observed by histological analysis (Van Den Boom, et al., 2005).

Glycosaminoglycans and their precursors such as glucosamine or chondroitine sulphate seem to be able to modulate the activity of the MMP and facilitate the synthesis of the extracellular matrix (Henrotin, et al., 2002).

In vitro studies carried out with a chondrocyte culture or in vivo with orally supplemented rodents showed the beneficial effect of these products on preventing cartilaginous degradation (Beren, et al., 2001, Neil, et al., 2005 b). A study showed that an oral supplement composed of glucosamine, chondroitine sulphate and manganese ascorbate delayed the appearance of auto-immune arthritis in laboratory rats (Beren, et al., 2001).

In man, there are numerous investigations concerning the effects of



Preparation for MMP activity measurement by zymography

glycosaminoglycans and their precursors on diverse osteoarticular pathologies. Most of these researches result in a decrease of the seriousness and the pain in treated patients. These supplements also seem able to prevent some of the osteoarticular pathologies, both in man and in animals (Henrotin, et al., 2002).

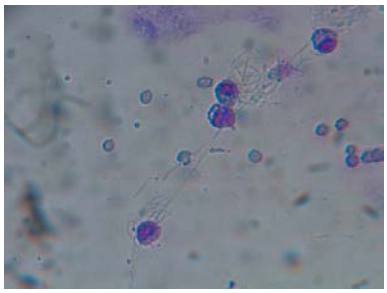
In addition, another study carried out on elderly horses showed that an oral supplement based on a combination of glucosamine hydrochloride and chondroitine sulphate over 12 weeks resulted in a significant increase in the length of stride, joint mobility and the duration of movement. This study seems to confirm the beneficial effect of this supplement on the locomotion of the horse (Forsyth, et al., 2006).

The aim of the present study was to estimate the effect of a feed supplement containing, amongst other products, glucosamine, chondroitine sulphate and harpagophytum on the balance of MMP-TIMP in healthy young horses at rest.

Study presentation

Sixteen healthy ponies with average age 2.5 years, average size of 1.35 m and 300 kg weight were used for this study. The ponies were accommodated on farms at Centres of Ovine research of the University of Namur (Belgium). Their food throughout the study consisted of concentrates given individually once a day and hay twice a day. The ponies had access to a meadow for one hour each day. Two weeks were allowed for the ponies to become acclimatized to their new environment. During this period of acclimatization the first investigation was undertaken (T0). General physical examinations as well as a specific examination of the locomotive system were made to produce a lameness score for each animal. Joint puncture allowed the extraction of synovial liquid. The ponies were divided into two homogeneous groups on the basis of size, weight, sex, age and lameness score. During the following six weeks, the ponies received an individual supply of supplement A* or B **, mixed into their concentrate ration.

Following the six weeks supplementation, a further physical exami-



Chondrocytes in synovial fluid

Figure 2 **MMP2 activity in synovial fluid**

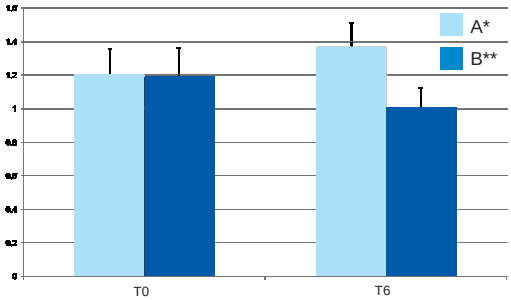
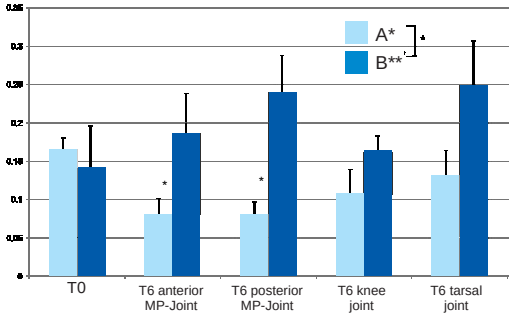


Figure 3 **MMP9 activity in synovial fluid**

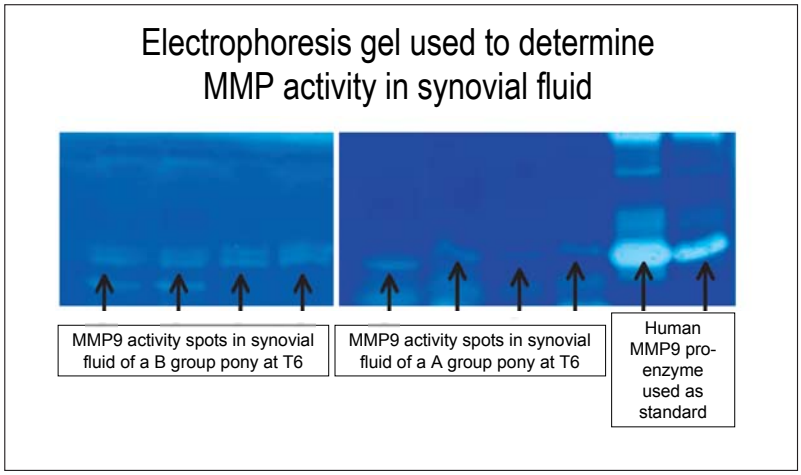


* TWYDIL® ARTRIDIL new formula ** control

nation was undertaken (T6) identical to the first.

The specific examination of the locomotive system produced a new lameness score for each pony. Synovial fluid was analysed for the following markers: activities of MMP2 and MMP9 and the activity of the TIMP as markers of the enzymatic stress. A cytological analysis of the synovial fluid was also undertaken. The investigators were not aware of the identity of supplements A* and B** until after all the analyses were completed.

The study was approved by the local commitee responsible for ethics in animal experimentation.



Results

a) Lameness scores :
At T0, the ponies' lameness scores in both groups were very low suggesting that none of them presented severe lameness. At T6, the lameness scores were similar to the start and showed no difference between groups A* and B**. There was no significant effect of the supplementation on these low lameness scores.

b) MMP2 activity:
At T0 the activity of MMP2 was similar within both groups. This activity did not show any significant difference after the period of supplementation. Groups A* and B ** thus showed comparable activities throughout the experiment (see figure 2).

c) MMP9 activity:
The activity of the MMP9 in the synovial liquid at T6 was significantly lower in the horses in group A* compared to the horses in group B **. Additionally, the activities of MMP9 in the joints of the ponies in group A*measured at T6 were different from their values at T0. In group B **, this activity at T6 was not significantly different from its value at T0 (see figure 3).

d) TIMP2 activity:
At T0 the activity of TIMP2 was similar within both groups. This activity did not show any significant difference after the period of supplementation.

e) Cytology:
The cytological analysis of the synovial liquid revealed no abnormality and no significant difference was noticed between ponies in group A* and group B **.

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In vitro, in a situation of joint enzymatic stress (greater activity MMP) mimicking a developing osteoarticular pathology, supplementation with glucosamine and chondroitine sulphate induced a reduction in the activity of the MMP (Byron, et al., 2003, Fenton, et al., 2002).

In our in vivo study, the MMP activity of synovial liquid was low given that the ponies were healthy animals. Due to individual variability within groups A* and B **, no significant effect of the supplement was evident. However, a significant modulation of the MMP9 activity was present in ponies receiving supplement A* for 6 weeks suggesting a decrease of the protease activity at the articular level.

Conclusion

In this experiment, supplement A* had no significant effect on the MMP2 activity or on TIMP2. A significant decrease of the MMP9 activity was noticed. These results allow us to conclude that supplement A* modulated the articular enzymatic balance.

PERSPECTIVES

Prof. N. Kirschvink

HPH: what does this particular study reveal?

Prof. N. Kirschvink: For the first time, the evaluation of a chondroprotector supplement was carried out in horses by clinical examination including the investigation of joint markers, making it possible to study the effect of the supplement directly on the level of the target structures.

HPH: For years scientists, for lack of tangible proof, have been divided on the proven effectiveness or not of the chondroprotectors that flood the market. Does the original formula tested provide evidence of effectiveness?

Prof. N. Kirschvink: Our study seems to indicate that a preventive effect exists for the formula tested making it possible to maintain joint health. This assumption however remains to be confirmed when young healthy horses are subjected to intense physical exercise - a factor which could not be taken into account in the present study.

HPH: Are you surprised by the absence of effect on the clinical signs used in this study?

Prof. N. Kirschvink: Given that the size of the experimental group was small, that the ponies were clinically healthy and that they showed a very low lameness score before the supplementation, a significant improvement of the clinical signs was far from probable. It would be nevertheless interesting to carry out this type of study on a large scale under field conditions.

CURRICULUM VITAE PROFESSOR KIRSCHVINK

Nathalie Kirschvink is a native of the German-speaking part of Belgium. She worked for a brilliant university degree in the FUNDP (University of Namur) then moved to the University of Liège where she undertook a doctoral thesis in veterinarian science, studying physiology under Professor Lekeux (ULg, Belgium). Her thesis was entitled "Study of the role of F2-iso-prostanes as marker and actor of the lung oxidizing stress". This specialist in oxidative stress then continued with studies in pharmacology and toxicology under Professor Gustin (Ulg, Belgium) where she studied, among other subjects, enzymatic stress. This horse enthusiast has been in charge of the animal physiology department at the University of Namur, Belgium, since 2005.

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The authors thank Ing. Marianne Raes, Laetitia Wiggers, Melanie Vandendriessche, Bénédicte Dehandschutter and the Laboratory of Professor Jean-Marie Giffroy for their contribution to this study.

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40 YEARS
HAPPY BIRTHDAY TWYDIL®

Daniel Stofer (left), TWYDIL® initial president with Valère Henry, actual TWYDIL® president.

In 2006 TWYDIL® celebrated 40 years of existence.
TWYDIL® was established on 4 April 1966 by Mr Daniel Stofer, who died in 1988.

Having already achieved a brilliant career as a banker, Mr Stofer and his associates had the idea to exploit the world wide recognized vitamin experience of the Basel region within the equine sector.

With TWYDIL® they had the ambition to offer to veterinarians and to horsemen, a scientifically established range of feed supplements produced with the same serious quality as those in the human sector.

The success was immediate.

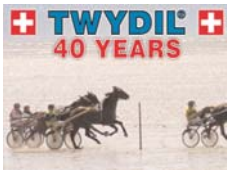
Mr Stofer was then assisted by Valère Henry, business man, an agricultural specialist with a passion for race horses.

After the sudden death of Daniel Stofer, Valère Henry became president of TWYDIL® and the team has been reinforced to develop the international marketing success.

President :	Valère Henry
Administration :	Sandra Schubiger
Finance :	Barbara Borer
Legislation :	Michael Putnam
Marketing :	Philippe Henry
Production :	Ruedi Bernet
Research and Development :	Brieuc de Moffarts

To make the most of the celebration of this anniversary, last year TWYDIL® launched a collection of post stamps, depicting the trade mark.

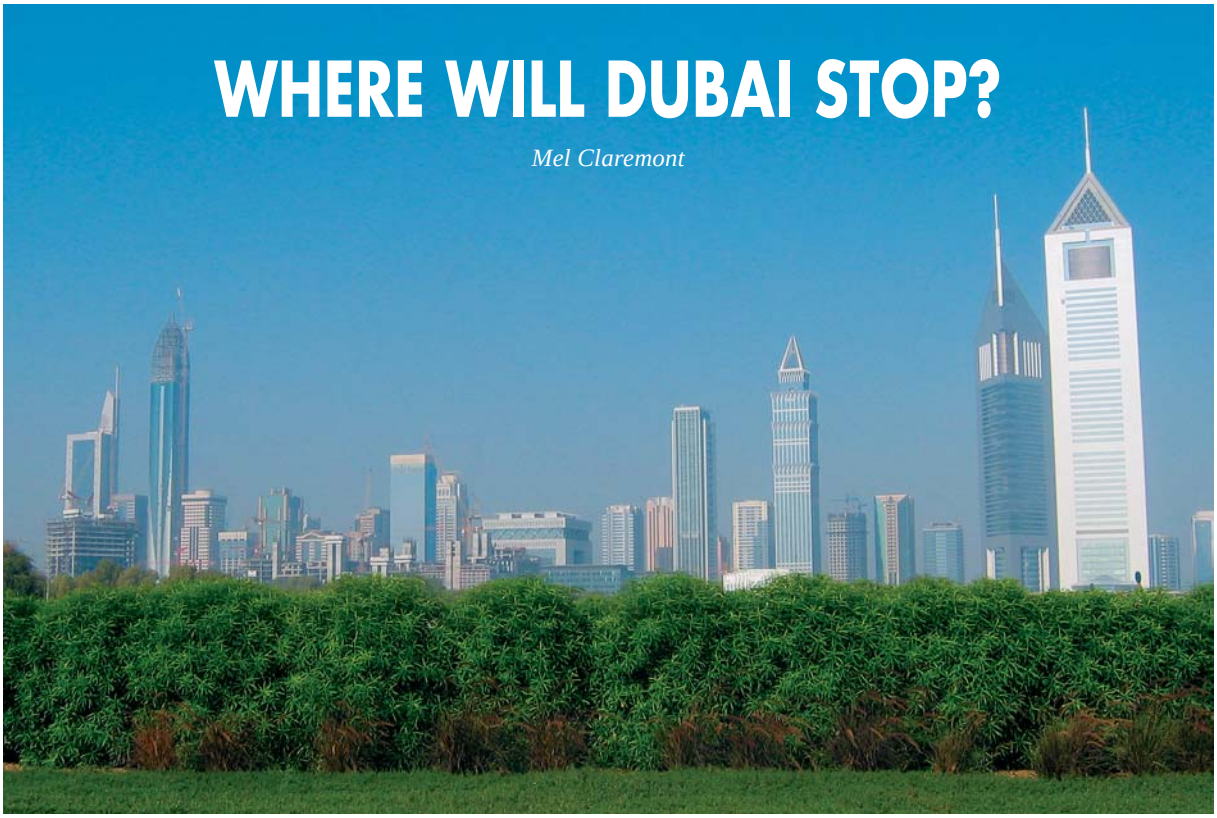
The collection comprising 6 40th anniversary stamps were put on all TWYDIL® mail.



The TWYDIL® management would like to thank their numerous clients throughout the world for their trust in the TWYDIL® products over the last 40 years.

WHERE WILL DUBAI STOP?

Mel Claremont



My first visit to Dubai was back in early 1985 as a young international business executive for what was then the largest animal health company in the world, namely Coopers Animal Health. I remember arriving late at night from London and being bussed from the plane to the relatively small terminal building and then taking a very quick taxi ride through a traffic-free Dubai to the Sheraton Hotel by the Creek; this was one of only a handful of five star hotels but at the time I, like many other people, were highly impressed by the futuristic design of the hotel both externally and internally.

The World Trade Centre building towered over everything else and could be seen for many miles around Dubai from all directions. Driving from Abu Dhabi one would spot the tower and know that the centre of Dubai was not too far off; very few buildings and no significant tower blocks were in existence on Sheikh Zayed Road. As the number of five star hotels grew, people would say "who is going to stay in all these hotels" - try getting a hotel room in one of the numerous five star hotels today and you will find it is not an easy task as demand seems to be outstripping supply even now!

The products marketed in UAE for the animal health industry at that time were predominantly for sheep, goats, cattle, camels and poultry, including falcons. Horses were more in the minority category along with other companion animals such as dogs and cats.

The changes in Dubai since my first visit started off slowly, the odd new office block, apartments and hotels and then the pace seemed to increase dramatically once the construction started in Sheikh Zayed Road. Now, as many of you will know as it is widely broadcasted, the construction going on in Dubai is unparalleled – perhaps with the exception of China. Everything new in Dubai seems to be exceptional one way or another, either the biggest, the first or, as is often the case, simply the best! Some of the architecture must be seen to be believed.

The Arab world has a long tradition with horses being engrained in their culture and history. Today, of course, the UAE, and Dubai in particular, is renowned around the world as a centre of excellence for racing. This is spearheaded by the ruling family's love of horses, which of course goes far beyond a hobby.

Dubai is one of the leading equine empires in the world and arguably the premier one, with internationally recognized names such as Godolphin – probably the most successful racing organization in the history of the sport for kings. Combined, the Maktoum family's studs; Shadwell, Darley and Gainsborough, are one of the most prestigious breeding empires the industry has ever seen.

Racing under rules in the United Arab Emirates began in November 1991 at Abu Dhabi Racecourse, with the first race at Nad Al Sheba taking place in February 1992. From that historic date Dubai racing never looked back and quickly became recognised by the world's racing authorities, but nobody could have fore-

seen how quickly it would grow.

The world first knew of Dubai racing in 1993 when Nad Al Sheba hosted the Dubai International Jockeys' Challenge which was won by the United States of America. Then in 1996 racing literally took off with the inaugural running of the US$4,000,000 Dubai World Cup, won by the awe inspiring champion Cigar.

In just two years the Dubai World Cup was granted Group One status and in that year it was won by the Kentucky Derby winner Silver Charm. The following year history was made yet again when winners of the Kentucky Derby, the Epsom Derby and the Italian Derby lined up for the first time in the same race. Beyond all shadow of a doubt, the Dubai World Cup had become a truly global event.

It did not take long before Dubai World Cup day became the sporting and social highlight of the Gulf region, and in 1999, at 5 million US dollars, it became the world's richest race ever run. In 2000 the prize was raised to US$ 6 million, and with total prize money on the day of more that US$ 15 million, it stood as the richest day of racing on the planet.

In 2004, racing in Dubai took another huge leap forward with the creation of the Dubai International Racing Carnival, and this year saw the fourth such event. Held at Nad al Sheba, the 2007 Carnival ran for 11 weeks, from January 18 until March 8. Worth a staggering $10 million in total, it saw the best horses and jockeys from around the world battle it out on the dirt and turf tracks.

The action always kicks off with the Group 3 Al Maktoum Challenge Round 1, worth $200,000. Run over 1600 metres on dirt, it is traditionally the first preparatory race for likely Dubai World Cup contenders and was won in fine style in 2006 by Princess Haya's Blatant.

The Carnival also features two 'double header' weekends, the first of which ran from February 8-9. Thursday's action centred on the Al Maktoum Challenge Round 2, over 1800 metres, and the Listed Cape Verdi, a 1600 metres contest for fillies and mares which was worth $150,000.

Friday, February 9 saw the first Classic of the season, the Group 3 UAE 2,000 Guineas, which is worth $250,000 and limited to three-year-old colts. The fillies had their turn the following week in the Listed UAE 1,000 Guineas, which was won in 2006 by UK raider Vague, trained by Jeremy Noseda.

March saw the action really heat up, as March 1 was 'Super Thursday,' an evening packed with trials for the Dubai World Cup meeting four weeks after. The Group 2 Maktoum Challenge Round III, run over the full Dubai World Cup course and distance, is an excellent trial for the world's richest race and was won in 2006 by Electrocutionist, who went on to World Cup glory for Godolphin.

The Purebred Arabians also have their opportunity in the Al Maktoum Challenge III (PA), before the action swings back to the Thoroughbreds in the Group 3 City of Gold, run over 2400 metres on the turf track, the trial for the Dubai Sheema Classic.

Blink and you miss it; the sprinters fly down the straight six furlong dirt

track in the Group 3 Mahab al Shimaal, while Godolphin Mile candidates trial in the Burj Nahaar. Dubai Duty Free hopefuls go through their paces on the Turf in the Group 2 Jebel Hatta, run over 1777 metres.

Thursday, March 8 saw the curtain come down on the Dubai Racing Carnival, which started in fine style with the $250,000 UAE Oaks, won in 2006 by Herman Brown's Imperial Ice.

Then it was all eyes on March 31 and the 12th running of the Dubai World Cup meeting. The 2007 entries on the seven race card included Breeders' Cup Classic winner Invasor, Epsom Derby winner Sir Percy, as well as Breeders' Cup Turf winner Red Rocks and Godolphin's new superstar Discreet Cat, it was a night to remember.

On the showjumping scene, the annual Dubai Showjumping Championships, held at the Emirates Riding Centre, have become the focal point of the season. This year's event ran from January 10-12 and incorporated a qualifying round of the Arab League. With the UAE team picking up an excellent bronze medal at the Asian Games in Qatar, showjumping is a sport which will continue to grow in the country.

The Qatar games also saw the UAE, spearheaded by Sheikh Rashid bin Mohammed Al Maktoum, who also claimed individual gold, take gold in Endurance. Excelling in this discipline for many years, the UAE has world-class Endurance facilities in both Dubai and Abu Dhabi, and is at the forefront of the push for it to be included in the Olympic Games.

Polo is the latest horse sport to really take off in Dubai. The sport in the Emirates does, however, date back over 30 years when the Dubai Polo Club was created at Abu Khadra. Now there are three well-established clubs in the UAE and more on the way, while the Dubai polo team is competing with the best in high goal tournaments all over the world.

In the UAE, the season runs during the cooler winter months from November through until April. It is in the last few months, however, that the action really starts to sizzle, with a number of high-goal tournaments, including the Cartier Cup, the Kinnarps Cup, the President's Cup and the annual spectacle of beach polo.

Clearly the vast majority of horses in UAE are in one form of competition or another. However, the leisure market, which was virtually non-existent a few years back, is now growing at a staggering pace. New facilities, such as the Dubai Polo Club at Arabian Ranches, as well as the forthcoming Plantation and Al Kaheel horse parks in the simply staggering Dubailand are being added to established venues such as Emirates Riding Centre & Desert Palm Polo Club. Interest in leisure riding reaches across the cosmopolitan community in UAE with the various clubs popular with both the local population and expatriates alike.

Without any doubt UAE is a horse lover's paradise covering everything including flat racing, endurance, show jumping, dressage and polo or just a hack in the desert or a trot along the beach at sunset.

Thanks to RaceWeek & Emirates Racing Authority for their contribution.

SPECIAL PRECAUTIONS FOR HOT AND HUMID COUNTRIES

Ruedi Bernet, Director of Production

QUESTION :

Do vitamins resist heat and humidity?

The question is important for users in hot and humid climates who are not able to store TWYDIL® products under optimal conditions.

STUDY :

TWYDIL® asked DSM to undertake a study by placing a pail of TWYDIL® RACING in an oven at 35° and 80% relative humidity for 7 months.

The concentrations of the more labile vitamins were then analysed after 38 days, 102 days and 226 days.

For comparison, another pail with TWYDIL® RACING vacuum-packed in an aluminium bag was placed under the same conditions.

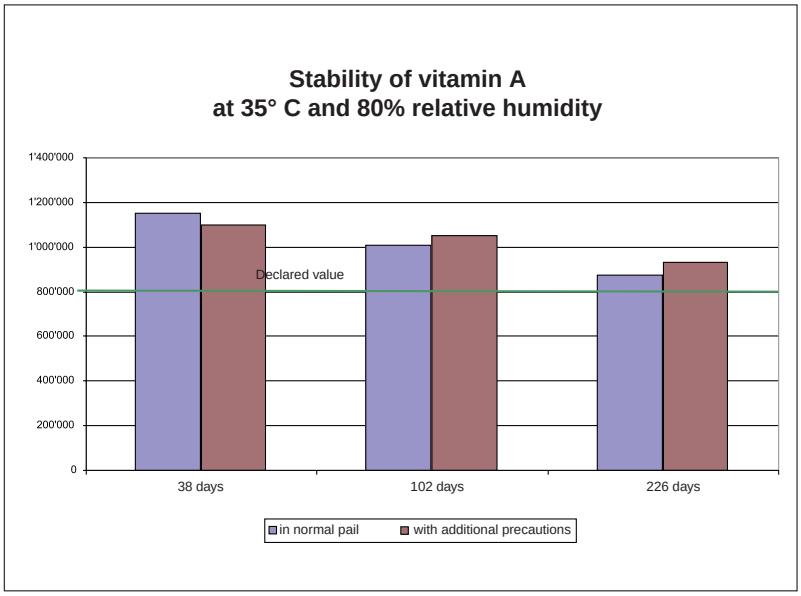
RESULTS :

VITAMIN A

Although such storage conditions are absolutely not recommended, the concentration of vitamin A in the standard pail was still above the declaration after more than 7 months in the oven. There was no significant difference with the vacuum-packed product.

VITAMIN C

Only vitamin C in the standard pail of TWYDIL® RACING was, after 226 days in the oven, 21% below the declaration whereas the vacuum-

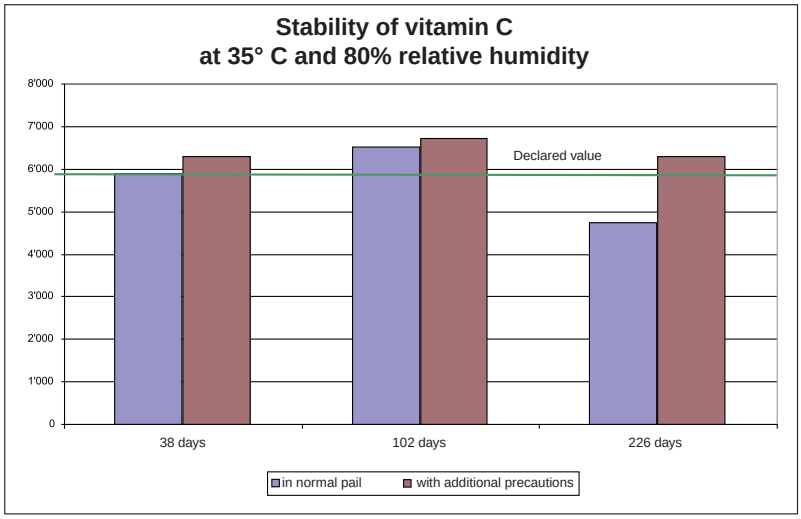


packed product still conformed to the declaration.

CONCLUSIONS :

As the standard pails allow good conservation of the product under normal storage conditions, they cannot prevent a small degradation of vitamin C after 7 months when exposed to heat and humidity.

Consequently, for clients in hot and humid countries, TWYDIL® RACING and TWYDIL® STUD will now be packed in polyester-aluminium bags before being put in the pails.



Oven in which TWYDIL® RACING was placed for more than 7 months.

The additional polyester-aluminium precaution for hot countries.

70 COUNTRIES ACROSS THE WORLD

The TWYDIL® range of products is available in 70 countries. Several countries have recently been added to the list where the Swiss products are locally distributed.

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If you wish to become a TWYDIL® distributor in any of the countries where the products are not yet available, contact info@twydil.com or +41 61 2722372.

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UPDATED SCIENTIFIC INFORMATION ON NUTRITIONAL MANAGEMENT OF ENDURANCE ARABIAN HORSES

Dr Brieuc de Moffarts (DVM, Ms, PhD)
Director R&D, PAVESCO-TWYDIL®

Numerous studies on endurance horses have been published in the last decade. These studies evaluated the different limitation points in this discipline such as:

a) Metabolic problems linked to energy use, fatigue and muscle tonicity.
b) Dehydration and electrolytic misbalance;
c) Locomotor problems.

It has been shown that these problems can be managed by an appropriate nutritional approach.

Forage remains the basis of nutrition of endurance horses. The ratio between forage and concentrate should be at least 70/30. The use of alfalfa can be worthwhile providing it does not exceed more than 20% of the total forage.

Forage acts as a:
– Gut transit regulator,
– Stomach lining protector,
– Drinking stimulator,
– Reserve of water and electrolytes for prolonged exercise,
– Slow release energy provider (so called: volatile fatty acids).

For all these reasons, the quantity and the quality of hay is one of the most important aspects of the nutritional management of Arabian endurance horses.

Practically the trainer must provide adequate amounts of hay until the morning of the race. During each stage of the race, hay or other type of fibres, such as moist sugar beet pulp, should be given. Finally, hay alone should be given during recovery after the race.

In order to diversify the ration, other sources of energy are also important. Popping or flaking cereals (oats, barley and corn) can be advantageous for maintaining the body weight during the training and allowing glycogen formation during training recovery.

Oil supplementation can also be an advantage for endurance horses. Effectively, progressive inclusion of oil in the ration, around 5% of the total ration during training and 8-10% during the weeks before the race helps to reduce the use of glycogen (a type of glucose store (energy)) and improve the use of fatty acids (another energy source).

Caution ! When a trainer gives oil, he has to increase the level of magnesium, vitamin E and L-carnitine in the ration in order to prevent oxidation processes and improve the ener-

Table I:
Indicative values for specific needs during training of Arabian endurance horses

Fat soluble vitamins		
Vitamin A	IU	30000
Vitamin D3	IU	2000
Vitamin E	IU	500
Vitamin K	mg	2.5
Trace elements		
Copper	mg	40
Iron	mg	375
Manganese	mg	150
Zinc	mg	150
Cobalt	mg	1.7
Iodine	mg	5
Selenium	mg	2.25

Watersoluble vitamins		
Thiamine	mg	20
Riboflavin	mg	7.5
Pyridoxine	mg	7
B_{12}	mg	0.07
Niacin	mg	30
Pantothenic acid	mg	12
Biotin (Vitamin H)	mg	0.5
Folic acid	mg	18
Choline	mg	280
Ascorbic acid	mg	750

getic fat metabolism specifically ß-oxidation (utilisation of the fatty acids as energy source).

Practically, a blend of different oils improves the energy utilisation for long-distance exercise.

In addition, the ration has to be balanced with an adequate level of vitamins and trace elements (Table I) in order to maintain the entire body metabolism during the training.

A trial has recently been conducted on the effect of an original endurance TWYDIL® programme by a team led by Professor Lekeux (ULg).

In this trial, supplemented and control (placebo) groups both received the normal recommended amounts of vitamins, macro-elements (electrolytes) and trace-elements. In addition, the supplemented group received TWYDIL® OMEGADIL and TWYDIL® PROTECT PLUS daily, for 28 days before an international race.

The TWYDIL® products were given in order to provide omega-3 fatty acids, dimethylglycine, L-carnitine, branched amino acids, chromium, orotic acid and additional supplementation of antioxidant vitamins such as, 5,000 IU vitamin E and 10 g of active vitamin C.

The results indicate that, more than maintaining all the physiological values (vitamins, trace elements and electrolytes levels) during the last part of the training, the TWYDIL® programme significantly improved the antioxidant blood capacity (figure 1) and the platelet aggregation factor (figure 2).

Practically, the TWYDIL® programme improves antioxidant defences of endurance horses and also allows a good microcirculation during the race.

One of the most studied and controversial aspect in endurance horses is the management of water and electrolytes.

During the training period, the trainer in association with his veterinarian should determine the adequate level of electrolytes depending on temperature, humidity and work load. Sweat loss can be scientifically measured and then compensated by an adequate level of electrolytes. Approximately, the amount of sweat produced, is around 0.5 – 1, 1-2, 2-5 and 7-8 L/hour of work for light, moderate, hard and very heavy exercise respectively Table II lists the most important elements contained in equine sweat and the appropriate amounts of electrolytes to give to horses to replace the loss. This calculation must be done for each day of the training for a week and then average supplementation per day can be determined.

Practically, give a good proportion of hay in the ration, electrolytes on a daily basis, not by week, and always with fresh water ad libitum.

During a race, endurance horses lose 3-7% of their body weight as sweat.

The highest priority is water replacement during the race. To be sure the water is appetizing, some trainers bring their own water. Electrolyte supplementation during the race cannot replace the total electrolyte loss but will stimulate drinking. It's essential to keep giving electrolyte for several days after the race, to allow the replenishment of the stock in the gut trough the forage.

Table II:
Indicative values for the sodium, potassium and chloride contents of equine sweat.

Electrolyte	Sweat concentration (g/L)	Amount to be ingested (g) to replace one litre of sweat
Sodium (Na)	3.1	3.45
Potassium (K)	1.6	2
Chlorine (Cl)	5.3	5.5

(P. Harris, ENUCO 2005)

Caution : don't use a too concentrated electrolyte paste as it is proved to increase the risk of gastric ulcers. Also, at each stage of the race, give free access to fresh water, with or without electrolytes or access to a mash with a high level of moist sugar beet pulp.

During a trial conducted by Professor Kirschvink (FUND), in which a standardised dehydration was created, TWYDIL® ELECTROLYTES was added to a known amount of water and given to horses in solution. In this way, 50% of the total water intake was given with TWYDIL® ELECTROLYTES.

Lameness during endurance races is still very frequent and is a major cause of disqualification. Lameness also induces artificial increase of heart rate frequency and indirect muscle stiffness.

In order to prevent these particular problems, the interrelation between veterinarians, trainers, farriers and breeders is very important. The expression "no foot no horse" makes sense at each stage of the selection, breeding, growing, training and racing.

Management of nutrition during growing, especially in terms of energy, of calcium-phosphor ratio and copper-zinc ratio, is critical.

During training, use of a chondroprotector can be beneficial as a long term treatment.

Conclusion: In such a competitive discipline with incremental pressure on horses, a professional nutritional approach is indispensable to help Arabian endurance horses reach and maintain their best physiological potential for a maximum length of time.

SOURCES:
Schott et al., 2006, ICEEP
Rose et al., 1986, Br Vet J
Harris , 2005, ENUCO
Goachet et al., 2006, AVEF
Forsyth et al., 2006, ICEEP

EVALUATION OF A SPECIFIC PROGRAMME FOR ENDURANCE HORSES

Drs Audrey Fraipont, Tatiana Art & Pierre Lekeux
Liège University, Faculty of Veterinary Medicine, Equine Sport Medicine Centre 20, Bld de Colonster, B-4000 Liège

The aim of this study was to assess the effects of dietary n-3 fatty acids, electrolytic and antioxidant supplementation in endurance horses performing at a high level.

Thanks to this study, we were able to demonstrate in these horses:

1) that the administration of the above-mentioned products increased the blood level of the different component, demonstrating that way the good biodisponibility of the endurance programme*;
2) that the supplement could reduce the oxidative stress potentially induced by intensive training.

Amongst all the equestrian disciplines, the endurance ride is probably the most demanding. The horses have to cover distances from 20 to 160 km in one day at a sustained and steady pace, and on an irregular terrain in sometimes extreme weather conditions.

These races are subdivided into runs of 20 to 40 km. Between these runs a break of pre-determined duration is imposed. During these breaks, as well as at the beginning and the end of the race, the horses have to be seen by veterinarians who assess their clinical state and recovery, allowing them to continue or not.

Performing a long lasting, low intensity exercise, the horse's system adopts a different strategy from the one seen during short intense exercise (such as sprint races).

* TWYDIL® RACING (37,5g/day) + TWYDIL® ELECTROLYTES (40g/day) + TWYDIL® PROTECT PLUS (60g/day) + TWYDIL® OMEGADIL (60ml/day)

The energy metabolism is almost entirely aerobic: after a short period of anaerobic metabolism observed at the very beginning of the muscular work, the muscles function only with cellular respiration (Art, et al. 2000). This cellular respiration is entirely dependent on a persistent and regular supply of oxygen and energetic substrate. The endurance horse has to establish a stable blood circulation and distribution to all the different parts of the body. The circulation cannot be directed only to the muscles at the expense of other organs because it might expose the horse to different pathologies such as colic, laminitis or hyperthermia. With a good general circulation, thermo-regulation, digestion and locomotion can occur without any domination. The body can fully control the exercise.

Knowing that a horse loses 2-8L of sweat every hour depending on workload, temperature and humidity, increasing to more than 15L in exceptional conditions (Carlson, et al. 1983), we must appreciate the importance of good rehydration during exercise to maintain blood volume and thus the correct cardiac output. The quantity of electrolytes (present in large concentration in the sweat) is also very important in this type of exercise because electrolytes are essential for the systemic (intra and extra cellular fluid balance) and efficient cellular (nervous conduction, muscle depolarisation) functions. The rapid oxygen supply from the lungs to the muscles depends on good blood volume and cardiac output, and the integrity of blood vessels and red blood cells. Red blood cells have to distort easily in order to enter the smallest blood vessels. Recent studies indicate that the administration of (n-3) fatty acids can modulate the distortion ability of the red blood cells.

Thanks to (n-3) fatty acids, red blood cell membranes develop better elasticity (Portier, et al. 2006). Exercise seems to decrease the fluidity of the membranes and potentially the cellular distortion (O'Connor, et al. 2004). These (n-3) fatty acids could reduce platelet aggregation (responsible for thrombus formation potentially induced by exercise or inflam-

mation) (Zamaria, 2004, Din, et al. 2004).

The red blood cells' distortion ability can also be altered by oxidative stress (Baskurt, 1999). This oxidative stress is described as the syndrome in which the pro-oxidant radicals overcome the anti oxidant capacities of the body (see HPH 2002-2003, p. 4-10). This imbalance results from the formation of reactive oxygen species (ROS) within the metabolism (this process is exacerbated by the increase of oxygen consumption during exercise, for example). ROS have deleterious effects on lipids, proteins and DNA. It had been shown earlier that exercise induces oxidative stress and the administration of antioxidants can help decrease the deleterious effects of this oxidative stress in sport horses (de Moffarts, et al. 2005, Deaton, et al. 2002, Kirschvink, et al. 2002b).

This study's aim is to assess the effects of an antioxidant supplement enriched with electrolytes and selected (n-3) fatty acids on oxidative stress and its consequences in high level endurance horses during a period of intensive training.

STUDY PROGRAMME

Nine national and international healthy endurance horses (CEI**, CEI*** and CEI****, 120 km and 160 km races) were selected in four endurance stables located in Belgium, Luxembourg and France. General examination was performed in CEMESPO (Faculty of Veterinary Medicine in Liège) by a veterinarian (respiratory system examination, cardiac examination…). Throughout the entire study the horses' diet was standardized (good quality hay and maintenance grain diet) in order to avoid any variances due to diet.

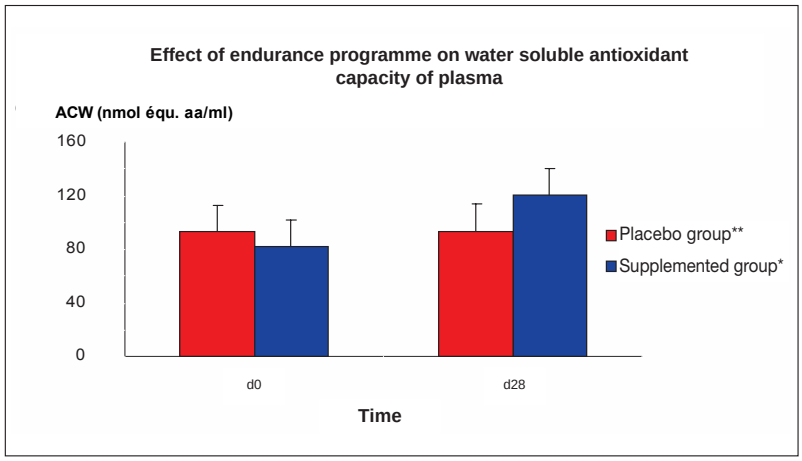
Horses were divided into two groups: the first group received a commercially available balanced supplement (placebo group**), the second group received, in addition to the placebo, an oral antioxidant supplement enriched in selected (n-3) fatty acids (endurance programme group*). Horses received the supplement during four weeks prior to an important race. After four weeks wash out period the supplements were switched and the same protocol was applied. Blood function analyses were performed. The following factors were investigated: cellular lesion markers, antioxidant blood capacity, haematology and fatty acids of the red blood cells' membranes. Samples were collected from each horse in each group, on the morning prior to the first supply of supplement (T0) and after four weeks of supplementation (T1).

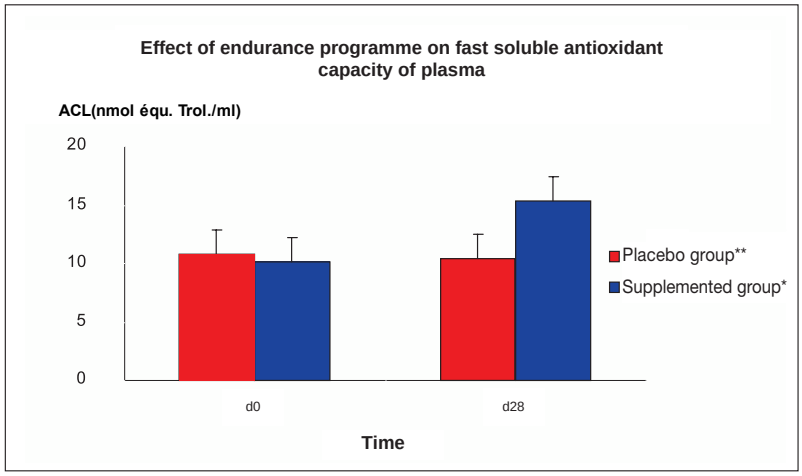
RESULTS

TWYDIL® SUPPLEMENT EFFECTS:

a) Electrolytes plasmatic concentration:

The additional TWYDIL® fatty acid and antioxidant supplement enabled supplemented horses to keep their





* TWYDIL® RACING (37,5g/day) + TWYDIL® ELECTROLYTES (40g/day) + TWYDIL® PROTECT PLUS (60g/day) + TWYDIL® OMEGADIL (60ml/day)
** TWYDIL® RACING (37,5g/day) + TWYDIL® ELECTROLYTES (40g/day) + placebo

plasma electrolytes concentration stable during the intensive training period (sodium, potassium, chloride, calcium). The maintenance of the hydrolytic and electrolytic balances is a priority for the endurance horse.

b) Antioxidant protection:
The lipophilic antioxidant ability of the plasma (plasma ACL, correlated to the vitamin E and to the bêtacarotene) was significantly increased after the endurance programme* supplementation period, as well as the hydrophilic antioxidant ability of the plasma (plasma ACW, correlated to the vitamin C) that increased even though ACW decreased slightly for the placebo group**. The endurance programme* seems to partially counterbalance the imbalances that can occur throughout a race season in horses that are submitted to intensive training (de Moffarts, et al. 2004).

This observation confirms the good absorption and excellent bioavailability of the fatty acids and antioxidants contained in the endurance programme*.

c) Red blood membranes fatty acids profile:
In the supplemented group, a rise in omega-3 type membrane fatty acid is clearly noted, especially docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). The gain with this last fatty acid was statistically significant. DHA and EPA have considerable effects on the cardiovascular system and on the inflammatory phenomenon in horse species (decreased heart rate, effects on ratio LT4/LT5, on macrophages' functions,…) (0'Connor, et al. 2004).

The ratio of arachidonic acid (omega-6) to eicosapentaenoic acid is significantly reduced in the supplemented group, this ratio being correlated with the platelet aggregation ability. The additional omega-3 type fatty acids in cell membranes is correlated with the red blood cells membrane fluidity and to a lower blood viscosity, and helps to maintain lower heart rate (O'Connor et al. 2004).

It is important to underline that the addition of fatty acids to endurance horses' diets (as is frequently the case) has beneficial effects only if it is done with high quality products, associated with a high concentration of antioxidants. It was shown that opposite effects might be observed with low quality fatty acids (Song, JH. et al. 2000, Palozza, et al. 1996).

GENERAL CONCLUSIONS

The tested endurance programme* might prevent an oxidant/antioxidant imbalance potentially induced by training. It increases the proportion of omega-3 fatty acids in the red cell membranes which could improve their fluidity and thus their ability to circulate in the capillaries. It also helps to maintain correct plasma electrolytes concentration necessary for every single endurance exercise.

PERSPECTIVES

Knowing that intense exercise can induce thrombi in small vessels, it would be very interesting to study more specifically the effects of (n-3) fatty acids on platelet aggregation and its consequences on general blood circulation.

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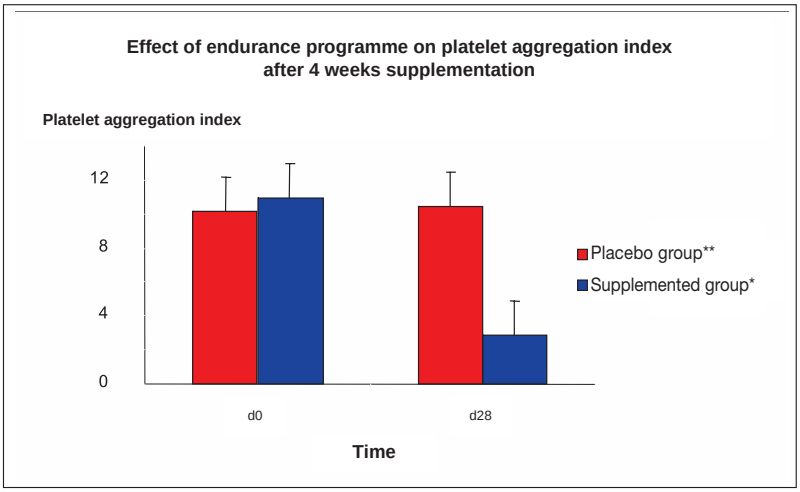

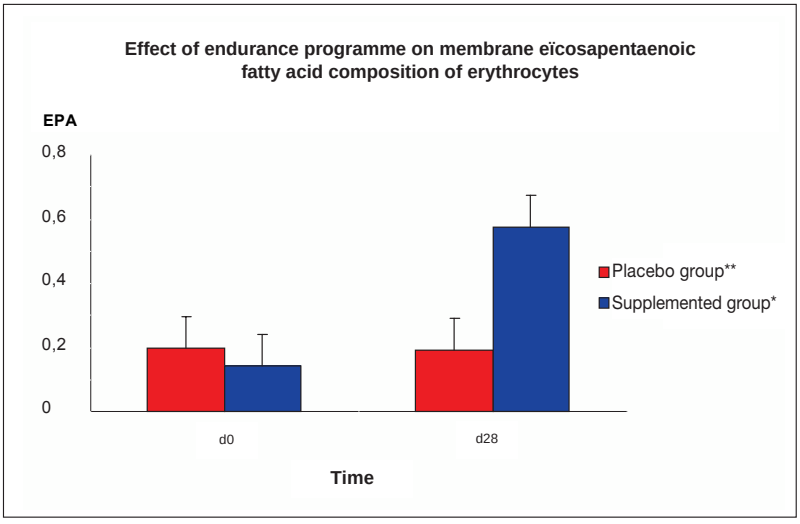

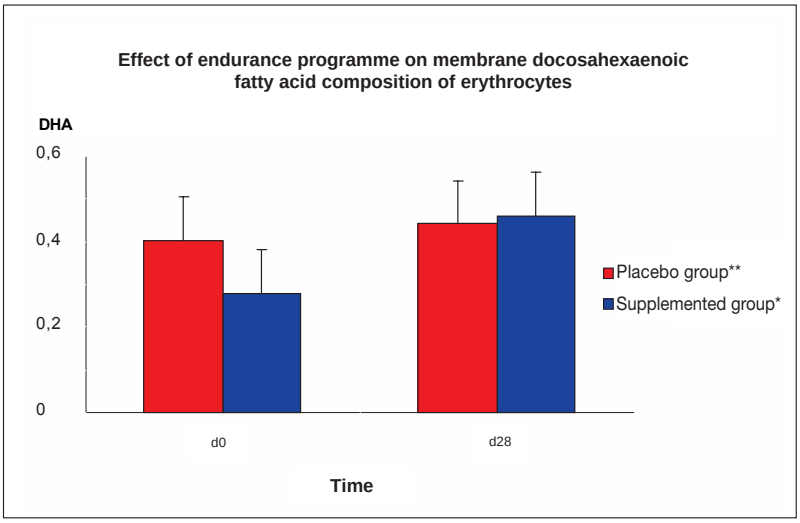

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THE SCIENTIFICALLY PROVEN ENDURANCE PROGRAMME

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AVAILABLE THROUGH YOUR VETERINARY SURGEON

A double blind study, in 3 countries, on horses of national and international level, showed that when this programme is started one month before the race it:

- maintains plasmatic electrolyte concentrations
- helps to maintain the body's antioxidant defences
- increases the level of omega-3 fatty acids in the membranes

- This programme is officially certified by LCH (after analysis on final products, urine and blood) can be used without risk up to the day of the competition.

Horses using this programme will have better chances on D-day.

Used by most of the successful trainers in the world.

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NEW ANTI-DOPING PRECAUTIONS

FOR US, YOUR SECURITY HAS NO PRICE

Philippe Henry, Marketing Director TWYDIL®

TWYDIL®'s objective has always been to develop a range of products which are both efficient and safe.

From the beginning TWYDIL® has been transparent in communicating to its clients the list of external anti-doping controls which each production batch of the whole range has to undergo.

As far as we know, up to now no other manufacturer of feed supplements for horses, systematically undertakes such external anti-doping controls (control of product, but also on urine and blood of a horse having received an overage).

The various certificates established by LCH (Central Laboratory of the International Equestrian Federation and official French laboratory of anti-doping control for animals) are available on our website: www.twydil.com.

In summary almost all TWYDIL® products* as certified by LCH can be used without risk up to the day of the competition.

This general principle has certain provisos:

1) Depending on the discipline and the country, it is the user's re-

* Exceptions: Recently a waiting time of 48 hours has been recommended for TWYDIL® ARTRIDIL and TWYDIL® HIPPACAN+C. TWYDIL® LIQUID BLISTER has to be stopped 5 days before any competition.

sponsibility to check that the product complies with local regulations: in some cases, the local regulations forbid the provision of supplements to horses during a certain period (generally 48 hours) before any competition.

2) The certificates of control for the TWYDIL® products issued by LCH are based on the most severe controls anywhere in the world. But neither LCH nor TWYDIL® can be held responsible in relation to any particular or original regulation valid in certain countries for a certain discipline. We remember an example of a laboratory declaring a horse positive for Vitamin E last year! It is the user's responsibility to assure that the formulation used conforms to the regulations of the specific competition involved.

REMINDER OF THE PRECAUTIONS

A) OFFICIALLY CERTIFIED PRODUCTS CAN BE USED WITHOUT RISK UP TO THE DAY OF COMPETITION

1) THE TWYDIL® FEED SUPPLEMENTS

TWYDIL® validates every batch of production after analysis by LCH of the final product but also of the urine of a horse having received an overage of the product.

2) TWYDIL® COSMETICS

Cosmetic products cannot be controlled by analysis of the product for technical reasons, LCH validates every batch of production after analysis of the urine and blood of a horse having received a large overage of the product.

B) TWYDIL® PRODUCTS REQUIRING A WITHDRAWAL PERIOD

1) TWYDIL® HIPPACAN+C AND TWYDIL® ARTRIDIL

Due to rapid scientific progress in control laboratories we must now introduce a withdrawal period for complementary feeding stuffs containing eleutherosides and harpagosides. To avoid all possible risks, we undertook a scientific trial with LCH to establish the persistence of the eleutherosides contained in TWYDIL® HIPPACAN+C and of harpagosides contained in TWYDIL® ARTRIDIL.

Based on the results of these trials, the withdrawal period for TWYDIL® HIPPACAN+C and TWYDIL® ARTRIDIL has been determined as 48 hours before any competition.

This delay is an official insurance that TWYDIL® HIPPACAN+C and TWYDIL® ARTRIDIL can be given in full safety at the recommended quantities until 48 hours before any competition.

Note: this official guarantee is not valid for other feed supplements containing the same substances unless their persistence has been established in a scientific study.

In France, France Galop, also guarantees that, even in case of control during a training session, active substances of TWYDIL® HIPPACAN+C and TWYDIL® ARTRIDIL would not be considered as a breach of the Racing Code, providing their use has been admitted. As with other feed supplements and vitamins, the French code does not require a veterinary prescription for feed additives containing extracts of harpagophytum and eleutherococcus. Consequently their use may be mentioned by the trainer and not necessarily by the veterinarian.

2) TWYDIL® LIQUID BLISTER

TWYDIL® LIQUID BLISTER is a product particularly containing camphor for horses with leg problems. A withdrawal period of 5 days before any competition must be respected.is a product particularly containing camphor for horses with leg problems. A withdrawal period of 5 days before any competition must be respected.

QUESTIONS TO DR YVES BONNAIRE, Director of LCH

HPH: Why are the eleutherosides and harpagosides now considered as prohibited substances?

YB: Eleutherosides and harpagosides substances with known therapeutic qualities, consequently they act on one or more body systems of the horse thus they naturally and by definition enter the category of prohibited substances as described in the corresponding articles of the international agreements (Trotting & Galop).

HPH: If the finding of a physiological effect is sufficient for them to be considered as doping substance, why not also consider water, oats and Vitamin C as doping substances?

YB: The problem does not arise for water and oats (even vitamin C) which are part of the normal feed of a horse, consequently, a "normal" daily supply is not a problem.

Practically, what do professionals risk when they supply supplements containing eleutherosides and harpagosides whose persistence has not been tested?

YB: They risk using a product with a higher concentration whose persistence may be greater.

HPH: And this is not the case for TWYDIL® HIPPACAN+C and TWYDIL® ARTRIDIL ?

YB: No, as we have used the same formulations during our trials which showed clearly (with an important security factor) that the molecules were not no longer found in the urine and blood of treated horses after 48 hours.

HPH: Many professionals fear to be exposed to a positive control because of the presence of a contaminant even if this substance is found in infinitesimal quantity not having any physiological effect on the horse?

YB: The sensitivity of our methods is generally adjusted according to the substances under investigation, an "infinitesimal" quantity of feed contaminants would not produce a positive result.

Only the substances exclusively "doping" are sought with the greatest possible sensitivity.

LIST OF CONTROLS REALISED BY LCH ON EACH BATCH OF PRODUCTION OF THE TWYDIL® PRODUCTS
(certificates available at www.twydil.com)

	Each batch of final product certified by LCH not to contain any natural contaminants [1]	Urine of a horse having received an overdose of the batch, certified by LCH to be free of any forbidden substances [2]	Blood of a horse having received an overdose of the batch, certified by LCH to be free of any forbidden substances [3]	Until when is the product certified to be used without any risk
FEED SUPPLEMENTS				
TWYDIL® ARTRIDIL	YES	YES (on urine collected 48 h after the last administration of ARTRIDIL) [6]	YES (on blood collected 48 h after the last administration of ARTRIDIL) [6]	Until 48 hours before competition or doping control
TWYDIL® CALMIN	YES	YES	YES	Day of the competition
TWYDIL® COMPETITION	YES	YES	YES	Day of the competition
TWYDIL® RACING	YES	YES	YES	Day of the competition
TWYDIL® STUD	YES	YES	YES	Day of the competition
TWYDIL® ELECTROLYTES Pails	YES	YES	YES	Day of the competition
TWYDIL® ELECTROLYTES Mouth syringes	YES	YES	YES	Day of the competition
TWYDIL® ELECTROLYTES+C	YES	YES	YES	Day of the competition
TWYDIL® HEMATINIC	YES	YES	YES	Day of the competition
TWYDIL® HEMOPAR	YES	YES	YES	Day of the competition
TWYDIL® HIPPACAN+C	YES	YES (on urine collected 48 h after the last administration of HIPP+C) [7]	YES (on blood collected 48 h after the last administration of HIPP+C) [7]	Until 48 hours before competition or doping control
TWYDIL® MINERAL COMPLEX	YES	YES	YES	Day of the competition
TWYDIL® OMEGADIL	YES	YES	YES	Day of the competition
TWYDIL® PMC	YES	YES	YES	Day of the competition
TWYDIL® PROTECT PLUS	YES	YES	YES	Day of the competition
TWYDIL® STOMACARE	YES	YES	YES	Day of the competition
TWYDIL® STUD CAROTENE	YES	YES	YES	Day of the competition
TWYDIL® TWYBLID	YES	YES	YES	Day of the competition
TWYDIL® VIGORADE	YES	YES	YES	Day of the competition
COSMETICS				
TWYDIL® 4LEGS	NO [4]	YES	YES	Day of the competition
TWYDIL® LEG GEL	NO [4]	YES	YES	Day of the competition
TWYDIL® HOOFCARE	NO [4]	YES	YES	Day of the competition
TWYDIL® LEG PAINT	NO [4]	YES	YES	Day of the competition
TWYDIL® LIQUID BLISTER	NO [5]	NO [5]	NO [5]	Until 5 days before competition or doping control

[1] LCH certifies that the final product does not contain any of the 9 natural contaminants (caffeine, theobromine, theophyline, atropine, scopolamine, morphine, methylbufotenine, dimethyltriptamine, bufotenine) even at the limits of detection.
[2] LCH certifies that the urine of a horse having received an overdose of the product does not contain any prohibited substances.
[3] LCH certifies that the blood of a horse having received an overdose of the product does not contain any prohibited substances.
[4] Due to the specific nature of the cosmetic products, LCH cannot control the product itself. However, LCH does control the urine and blood of a horse having been treated by these products during 3 days.
[5] TWYDIL® LIQUID BLISTER (which will be withdrawn within the next months from the range of TWYDIL® products) contains camphor which is a prohibited substance.
[6] *Harpagophytum procumbens* (one of TWYDIL® ARTRIDIL's ingredients) henceforth is considered as a prohibited substance. LCH certifies that 48 hours after the last intake of TWYDIL® ARTRIDIL (with an overdose), the blood and urine of the horse do not contain any forbidden substance.
[7] *Eleutherococcus senticosus,* Maxim. (one of TWYDIL® HIPPACAN+C's ingredients) henceforth is considered as a prohibited substance. LCH certifies that 48 hours after the last intake of TWYDIL® HIPPACAN+C (with an overdose), the blood and urine of the horse do not contain any forbidden substance.

NEW TWYDIL® DIRECTOR OF PRODUCTION

On the left: Ruedi Bernet, new TWYDIL® Director of Production.

Ruedi Bernet joined TWYDIL® on 1 April 2006 to take responsibility for the following departments:

- purchasing manager of raw materials and packaging
- production manager of the entire TWYDIL® product range
- central stock and warehouse control
- sales in Germany, Switzerland and Austria

Professional career

Ruedi Bernet grew up on a farm in Central Switzerland. He studied agriculture, specialising in animal nutrition, at the Federal Technical University in Zurich where he obtained his degree in 1979. Following his studies he managed the parental farm for three years, working at the same time as a part time teacher at an agricultural college.

In 1982 he was appointed as technical director for the cooperative VLGZ (third biggest cooperative in Switzerland), where he was responsible for the production of 50,000 tons of feedstuffs, minerals and special products. Alongside his responsibilities he established the company Agrotronic Ltd, a firm specialising in computer feeding systems for calves, cows and pigs. Very soon this firm became the Swiss leader.

In 1992, Ruedi Bernet continued his career as a sales representative for F.Hoffmann-La Roche Ltd in Basel, selling vitamins, amino acids, trace elements, enzymes and carotenoids in Switzerland and Austria. In this position he came across TWYDIL® a devoted customer of ROCHE's high quality products for years. Through constant dialogue with TWYDIL® he got to understand their needs and so could help them to constantly improve their products.

In 2005 Ruedi Bernet went to Pancosma Ltd, Geneva. where he enlarged his knowledge of flavours and organic trace elements in animal nutrition. He has been able to utilize this knowledge for the benefit of TWYDIL®.

When, in 2006, TWYDIL® was looking for a new production and sales manager responsible for German speaking countries Ruedi Bernet didn't hesitate to apply for the position since he had known the firm since 1992 as the market leader for high quality horse products.

Private life

Ruedi Bernet and his family live near Lucerne in Central Switzerland. The two adult children will complete their studies in 2 years time. In 1993 he took over his parents' farm which he now maintains as an organic farm with suckler cows. His hobbies are skiing in winter and climbing in summer; the latter he enjoys together with his daughter. With his wife he likes travelling to foreign countries.

Climbing tour in his daughter's company

Age	53
Civil status	Married
Nationality	Swiss
Residence	Buttisholz /Switzerland
Diploma	Degree in Agricultural Engineering / Animal Nutrition
Languages	German, French, English
Hobbies	Skiing, climbing, travelling

RESPIRATORY TROUBLES

Dr Brieuc de Moffarts (DVM, Ms, PhD)
TWYDIL® Research and Development Director

The main factors limiting the performance of sport horses are articulation difficulties (latest studies are demonstrated in this HPH pages 4 to 8) and respiratory problems.

The output of maximum effort creates a huge need for oxygen which puts the respiratory system under heavy stress.

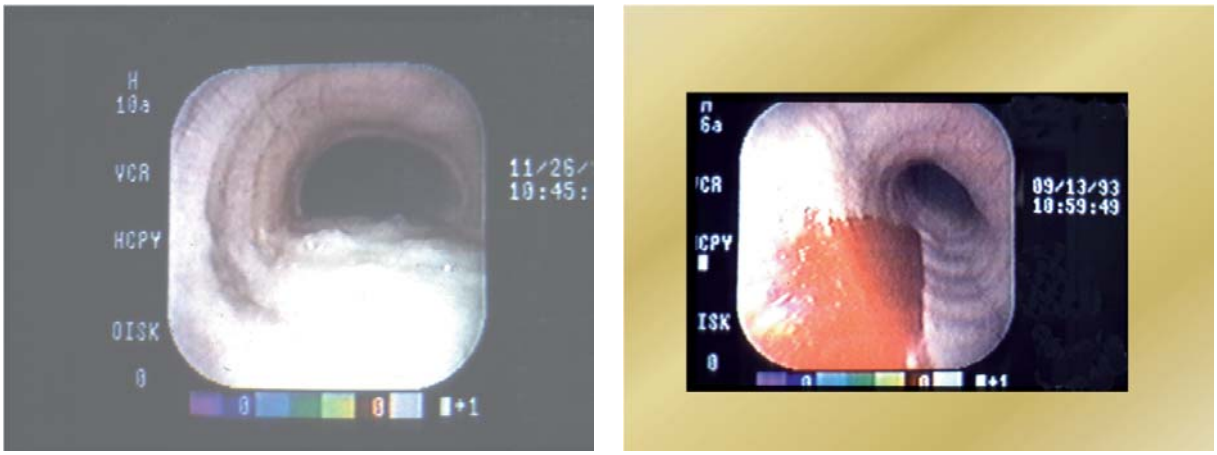
Even the air flow is capable by itself of creating inflammation of the trachea.

Only a small imbalance may be enough to harm the horse's capacity to breathe efficiently. So, for instance, the variation of only one millimetre in the superior air passages can influence the necessary respiratory pressure to a considerable extent.

The cause of respiratory pathologies with racing and competition horses is often multifactorial. These factors include:

- particles floating in the air (dust, pollution, fungal spores….)
- physical qualities of the air (temperature, humidity)
- presence or absence of clinical viral infections
- latent inflammation related to problems with the immune system
- anti-oxidant imbalance
- genetic and selection factors

When considering these factors it is essential to differentiate between affecting the superior and the interior air passages. It is necessary to recognise that the damage at one level can negatively influence the other. For in-



Endoscopic pictures of the trachea. Left : accumulation of pus in trachea, right: accumulation of blood trachea.

stance, the reduction of the diameter of the superior air passages can induce an increase in frequency and intensity of pulmonary bleeding.

Here are two examples of problems at each level found in active horses,

1) superior air passage :
   - swollen dorsal soft palate
   - haematogenous hemiplegia
2) lower air passage:
   - inflammation of small air passages
   - bleeding due to exercise

Preventive measures are first the selection of horses with no identifiable potential genetic troubles (haematogenous hemiplegia, ……)

Then all possible hygienic measures must be taken to limit the creation of dust and ensure forage feed of premium quality.

ANOTHER CONSIDERATION OF THE TWYDIL® TWYBLID FORMULA

TWYDIL® has developed TWYDIL® TWYBLID which helps to reduce the risk factors associated with inflammation of the inferior and superior air passages.

The original formula of TWYDIL® TWYBLID, now recently improved, contains vitamins, anti-oxidants and several bioflavonoids. TWYDIL® TWYBLID helps to ensure the integrity of capillary blood vessels, maintain a good biochemical balance and reinforce the anti-viral defences.

TWYDIL® TWYBLID is a complementary feed supplement which helps to control certain risk factors related to problems of the respiratory system.

TWYDIL® TWYBLID can be beneficially combined with TWYDIL® OMEGADIL whose beneficial action on the capillary blood circulation and on the general inflammatory balance may prove synergistic and beneficial.

THE WORLD'S BEST FOUR-IN-HAND DRIVER FELIX-MARIE BRASSEUR, TRIPLE WORLD CHAMPION

Philippe Henry, Marketing Director TWYDIL®

At 55 years old, Felix-Marie Brasseur has an impressive charisma.

Meeting him, one understands how tough this man is, winning the last world championship in Aachen in spite of 8,000 hostile German spectators. *"During the presentation of the medals, I thanked the spectators as if nothing had happened and I was gratified to receive a standing ovation."*

For almost 15 years, this extraordinary champion has dominated the four-in-hand obstacle competitions, the supreme discipline. *"I think that there is a current that passes between the horses and me. Maybe it is some kind of magnetism?"*

Prince Philip, Duke of Edinburgh, meeting him many years ago, spoke to him quietly at a meeting of Gentlemen Riders in Windsor Park in 1990.

"Monsieur Brasseur, I follow all your competitions with great interest. May I kindly ask you to pass in front of me so that I can watch you at work". Half an hour later, the prince spoke again to the Belgian champion. *"Thank you, Monsieur Brasseur, for the best lesson of my life"*.

Given so many compliments, Felix-Marie Brasseur reacts with modesty: *"The skill of my discipline consists simply in utilizing the horses' equilibrium to ensure that they are in the best possible place"*.

Son of a medical doctor, Felix-Marie Brasseur started riding at 3 years old. After completing agricultural studies and his military service in the cavalry, he returned to his passion in the most demanding way: the horseman training school of Forêt de Rambouillet. *"A school harder than the Foreign Legion"*.

Felix-Marie Brasseur emerged as major, and the Saumur Cavalry School awarded him with the title of the best horseman in France. Joining the Belgian, François Mathy, as a rider, Felix-Marie Brasseur broke in *"Gai Luron"*, who, in 1976, won two gold medals at the Olympic Games in Montreal.

In the meantime, the super talented Brasseur, tried many other sports, such as skiing instructor or motocross rider even athletics and racing driver. *"I participated in the 24 hours of Le Mans at the wheel of an old Porsche and I even passed the start/finish point of the Boucles de Spa on the roof, having rolled several times"*.

Rider in jumping, eventing and in dressage, this daredevil collected many fractures before moving to harnessed teams, first as a judge and then, for the first time in 1983, the Belgian Champion driver. A career is made of important encounters and Brasseur is no exception. In 1987, the businessman, Jan de Clerck, asked

Brasseur to prepare four Lipizzaner for the World Championship the following year.

But the crucial move occurred in 1993 when Portuguese businessman, Manuel de Mello, persuaded Felix-Marie Brasseur to prepare a team of Lusitanian horses for the World Championship 8 months later. *"A doubly foolish challenge as the Lusitanian's were considered up to then as simple corrida horses and anyway, normally you need four years of training to get a team to competition level. However, I said to Mr de Mello - you are completely crazy but me too!"*

After his father and Maître Coulland of Rambouillet, de Mello was the third key figure in Brasseur's life. *"A crucial encounter from the human as well as from the equine point of view"*.

Working with de Mello, the Belgian rider fell in love with Lusitanian horses, and all their many attributes. *"For me it is the best horse in the world. I am fascinated by the beauty of its looks, its airiness and its artistic side which is not always appreciated at its real value by the judges"*. And their faults? *"A tendency sometimes to be too vertical but this can be changed through good training"* admits Felix-Marie Brasseur.

The four-in-hand turnout, the ancient prerogative of kings, lives today only thanks to some rich patrons *"To prepare a competitive team of four, you need about 300,000 Euros a year, maintenance fees and a million Euros to buy the right horses"*. What is the best criterion for selection? *"I select nice looking horses a minimum 4 years old, who are receptive and find pleasure in teamwork."*

Driving a pair is more a matter of speed with a direct influence by the driver on the horses, whereas a team of four is a scientist's task requiring hard work and perception. *"In a team of four, the horses in front are 10 metres away from me. If I pull the reins by 10 cm, this would have no effect. The only way to pass a message is the driving whip or an order. If on the day of competition they do not obey, I am lost"*.

There is no other way to avoid this issue than hard work. *"I always rise at 5 am and work 365 days a year. If you see me at work, you would think I am doing nothing. You have to know that working with a team of four is very long, slow and calm process. To be successful it is necessary to show calmness, logic and fairness. During training hours, it is essential to be absolutely consistent and always make the same gestures"*.

Psychology is also essential. *"Even if I was almost killed by a horse, I would always show them I am very happy with them, because I never lose sight of the fact that they are in charge"*.

A good four-in-hand horse must be capable of doing a lot of things by itself.

"The best of all compliments is when I am told that my horses go all by themselves, without thinking that to arrive at that, thousands of hours of work are needed".

Intelligent and unconventional, Brasseur, has brought new insights into the discipline. *"Though everybody struggles to work every horse for a specific place in the team, I, on the contrary, want all horses of the team to be interchangeable. This makes them psychologically more adaptable and this approach saved me at the last World Games because, at the last minute, I had to replace the rear left horse with a small mare who fulfilled its mission with perfection"*.

In 1996, in his native Belgium, Brasseur realised his first great achievement by winning the Grand Slam with the double title of World Champion and also by winning the World Cup.

"The discipline has evolved very much. In the past, you had to pass through a river on the straight. Today, they make you pass obstacles in the water with four horses trailing almost a ton".

The competitions take place during several days with an obstacle course asking for technique and speed, a test of driven dressage, and of mobility. *"In fact, having been a racing car driver certainly helps in noticing the changes of track, and how to balance the centre of gravity. I had also learnt that if you pass a turn at the limit, you have to raise the accelerator foot at the approach of the next"*. In this competition, the leader is helped by a groom, who is a bit like the co-pilot in a sidecar, leaning into the turns to maintain the balance of the team. The groom may –

1952 : born in Belgium.

1955 : started riding.

1987 : started driving four-in-hand.

1993 : starts working with Lusitanian horses.

1996 : Grand slam: double world champion in Waregem and world cup winner.

2000 : Individual bronze medal at Wolfsburg.

2006 : Individual gold medal at Aachen World Equestrian Games.

within certain limits – intervene with certain technical problems.

"I have such a relation of love and confidence with my horses that sometimes I have the impression that I can ask anything from them. I had a stallion that cut his leg and could not be anesthetized due to a coming competition. Believe it or not, I explained the situation to the horse. I told him, look old chap, the vet will come and he will hurt you a bit. You have to be brave. I took his head in my arms and he did not wince even when the vet stitched him up. The veterinary surgeon has not yet recovered!".

Felix-Marie Brasseur classifies the professionals in two categories *"Those who use a horse to show-off themselves or on the contrary, those who present the horse"*.

Because he is inflexible in his approach to his art, Felix-Marie Brasseur has refused to allow his team of four, who won the World Championship in 2006, to be run as pairs in the 2007 World Championship. In his opinion, this decision would affect the chances of the team in the World Games in Kentucky in 2010. Consequently, he cancelled his contract but did not stay long without a job. After Portugal, he moved to Spain where he has been employed by Juan Andres Kifes, a petrol refinery constructor and a great aficionado of horses. A collector of carriages at Huelva near Seville, Juan Andres Kifes dreamt for years of entering a team of four at the World Championship. This is a new challenge for Brasseur who has to start all over again, this time with Andalusian geldings. *"This is very exciting but also intimidating"* he confesses.

At 55, Felix-Marie Brasseur, has known all the joys of world championship but still dreams of a challenge: to try a four-in-hand with Arabian horses.

"I am also fascinated by Arabian horses and would like to try them in a four-in-hand. For this I would need to find horses capable of walking at 7 km/hour drawing a load, to trot in harness between 22 and 24 km/h, to have good airs and to have the strength to pull the coach".

If you think you have Arabian horses for sale answering these criteria and if you would like to develop the image of Arabian thoroughbreds in a new discipline, you know who to call….

"This would be a terribly exciting challenge" he whispers as a farewell, this champion who has been appointed *"Officier de l'Ordre de la Couronne"* by the King of Belgium.

NEW PRESENTATIONS

TWYDIL® RACING and **TWYDIL® STUD** are now despatched in buckets with a tamper-proof, reinforced cover.

Already available in 2 kg, **TWYDIL® 4LEGS** is now also presented in 7,5 kg.

TWYDIL® STOMACARE mouth syringes now have a large nozzle.

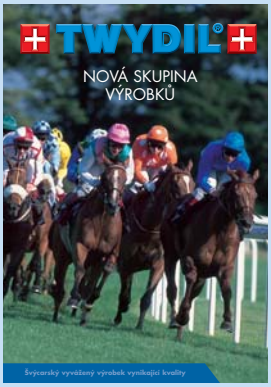
TWYDIL® MINERAL COMPLEX
exists now both in 3 and 10 kg buckets..

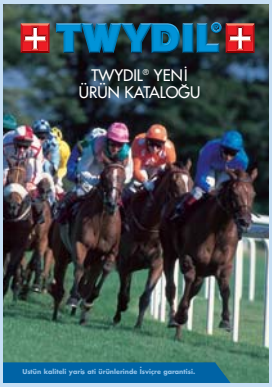
TWYDIL® HEMATINIC is now also available in liquid form in one litre bottle.
The **TWYDIL® HEMATINIC** syringes now have a larger nozzle.

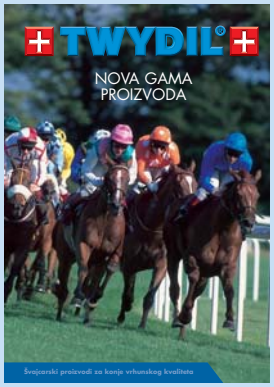
TWYDIL®, THE POLYGLOT

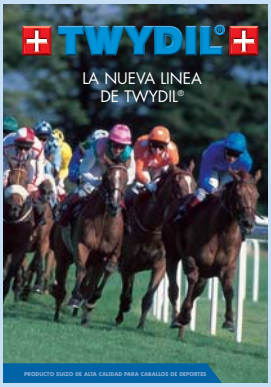
TWYDIL® DOCUMENTATION IS NOW TRANSLATED INTO 13 LANGUAGES.

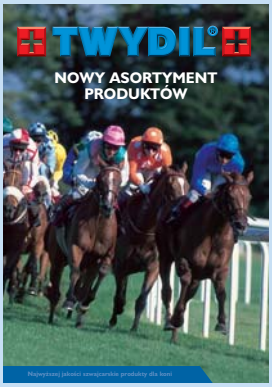
These catalogues are available at www.twydil.com or at request











Other translations are under development.

NEW

HUNGRY FOR SUCCESS !

NEW FORMULA WITH SILYMARIN

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TWYDIL®

AVAILABLE THROUGH YOUR VETERINARY SURGEON

TWYDIL® HEMOPAR

Horses' livers perform more than 100 different important functions and so they are therefore vital in the maintenance and activity of top performance horses. TWYDIL® HEMOPAR promotes appetite and helps to maintain good digestive function, which may be depressed in training and competition.

- *Officially certified (following tests on the product, urine and blood) : can be used without risk up to the day of the competition. (Certificates available on www.twydil.com)*
- *Vitamin stability: 100 % guaranteed for shelf-life.*

Used by most of the successful trainers in the world.

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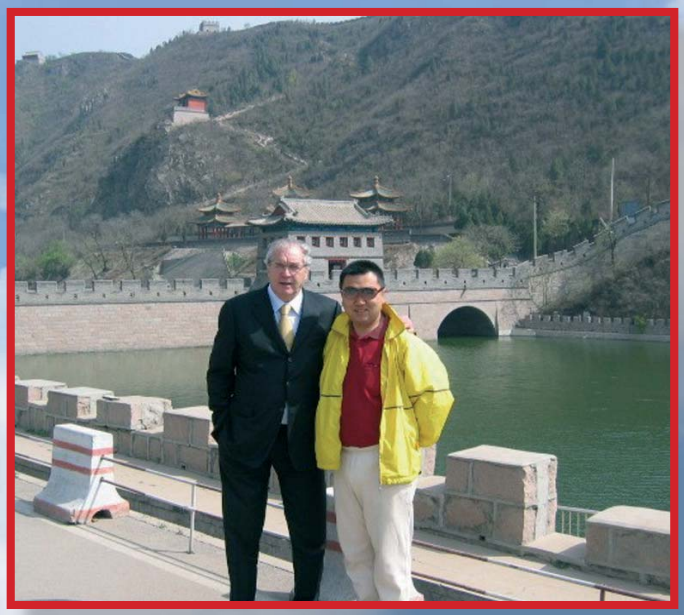
TWYDIL®

Trainer Mike de Kock with Valère Henry.

Dr Mubarak, TWYDIL® distributor in Saudi Arabia, sealing an agreement for TWYDIL® distribution throughout an important pharmacy network.

Dr Weinberger (Germany) besides Ruedi Bernet, (responsible of TWYDIL® sales in German speaking countries).

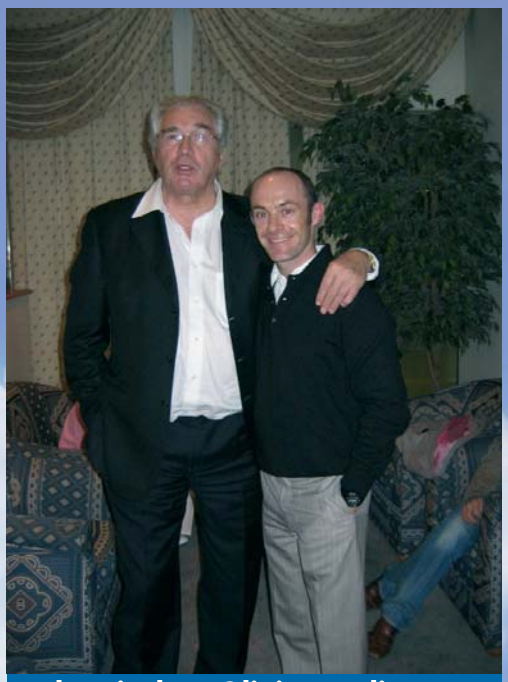


Valère HENRY visiting a TWYDIL® client in China.

British trainer, Clive Brittain and his champion horse KANDIDATE, with Philippe Henry.

AROUND THE WORLD

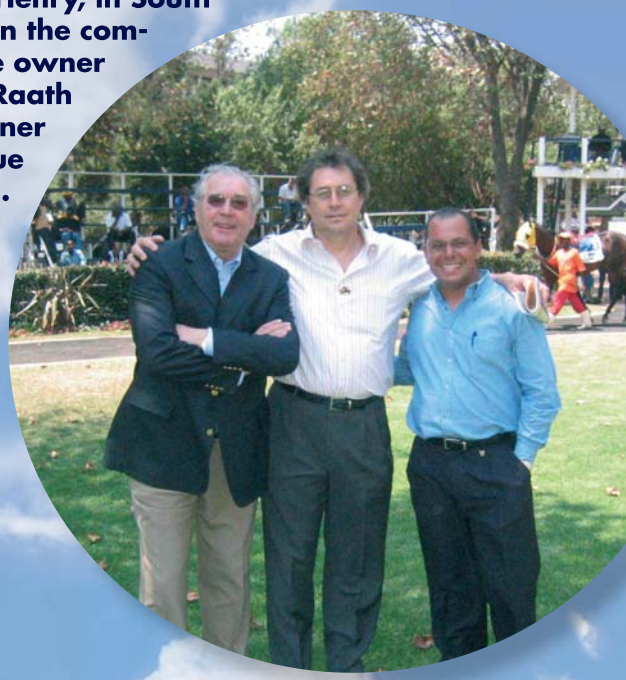
Bénédicte Maemoto, TWYDIL® Japan, in the company of the young and promising trainer, Yasukiro Ikee.



When jockey Olivier Peslier meets Valère Henry, TWYDIL® President, in an airport lounge.

Aidan O'Brien, the many Group 1 winner, besides Michael Ferris from Clovelly Ltd, TWYDIL® distributor in Ireland.

Valère Henry, in South Africa, in the company of the owner Trevor Raath and the trainer Dominique Zaki.



Dr Struchen and Dr de Moffarts attending the Geneva congress.

TWYDIL®

INVESTIGATION OF THE SPECIFIC NEEDS OF GROWING HORSES

Dr. Brieuc de Moffarts (DVM, MS, PhD)

NEW : TWYDIL® GROWING

This article aims at describing the specific needs of foals between weaning and breaking. We shall not therefore consider either the foetal period or suckling which relates more to the nutrition of the mare. Good nutrition of the foal during growth is essential in order to guarantee optimal growth and preparation for its future career by protecting its health and wellbeing.

Although the real needs of the foal are not completely understood, the major principles of feed supply remain valid for these young horses, namely:

1) An optimal energy supply based on the foal's growth curve. Knowing that the locomotor system of the young horse depends on specific strength lines related to its morphology and its movement, it is essential to ensure that it is fit rather than fat. If allowed to become fat the foal's development will be less favourable. The theoretical growth pattern is shown in Table No. 1.

2) An optimal supply of fibre generally in the form of good quality hay. After weaning, alfalfa associate with a good grass hay and access to a meadow are essential. The nutritional requirements are shown in the Table No. 1. Varying the type of fibres can be an advantage for the foal's development. Cellulose is the main type of fibre; it regulates the intestinal flow by its structure, as well as the fermentation in the large intestine. However, other "fibres" are also important for the health of the young horse since they help to strengthen the stability of the gastro-intestinal flora and help to control the pH of the digestive tract, mainly through the production of volatile fatty acids. These other fibres include, for example, the oligo-fructo-saccharides, well known pre-biotics, which are able to reduce the risk of diarrhoea.

3) The regulation of the amount of protein supplied by the ration is also important (see table No. 1). From 6 to 18 months, it is also essential to ensure the quality of protein and the available amino acids and, in particular, the concentration of lysine. Certain data suggest that varying the sources of amino acids can improve muscular growth.

4) The basic ration generally contains sufficient macro-minerals. Nevertheless, it is important to keep a check on the calcium: phosphorus ratio (it should be between 1.5 and 2.2) as well as supplies of magnesium. The growth of the foal requires a regular supply of micro-nutrients (see table No. 2).

TWYDIL® GROWING provides a "new" balancer adapted to the needs of young growing horses by supplying all the vitamins and the essential trace elements for their growth. It also offers an optimal range of amino acids to supplement the protein supply. The formula, which is enriched with pre- and pro-biotics, allows the young horse to diversify its intestinal flora and helps to resist against digestive disorders.

TWYDIL® has prepared a supplementation programme for growing horses taking all these important factors into account.

The association of TWYDIL® PMC and the new TWYDIL® GROWING allows the foal to develop normally with good muscles, tendons, bones, ligaments and cartilage. This programme also aims to ensure the digestive well-being of the foal by giving better protection against certain digestive disorders.

The combination of TWYDIL® PMC and TWYDIL® RACING, when it is introduced during the growing phase, can help to ensure that the young horse arrives at the training centre ready to begin its work in perfect physiological condition and is able to continue growing in an optimal way.

Table No. 1
Indicative values associated to a growing horse.

Age (in months)	Ratios forage concentrate (%)	% protein	Theoretical weight (kg) (adult horse weighing 500 kg)
6	30/70	16	230
12	40/60	14	325
18	55/45	12-14	350
24	65/35	< 12	450

Table No. 2
Average daily needs of the foal in growth from weaning to breaking.

Fat-soluble Vitamins			Water-soluble Vitamins		
Vitamin A	IU	30000	Thiamine	mg	20
Vitamin D3	IU	2000	Riboflavin	mg	7.5
Vitamin E	IU	500	Pyridoxine	mg	7
Vitamin K	mg	2.5	B_{12}	mg	0.07
			Niacin	mg	30
			Pantothenic acid	mg	12
			Biotin (vitamin H)	mg	0.5
			Folic acid	mg	18
Trace Elements			Choline	mg	280
			Ascorbic acid	mg	–
Copper	mg	25			
Iron	mg	375			
Manganese	mg	150	Macro-minerals		
Zinc	mg	300			
Cobalt	mg	3.75	Salt (NaCl)	g	10 to 20
Iodine	mg	1.5	Magnesium	g	12
Selenium	mg	1.25	Potassium	g	50

	YOUNG FOAL	WEANED FOAL	YEARLING UNTIL BREAKING	2 YEARS OR MORE NOT YET BROKEN	AFTER BREAKING
					
TWYDIL® GROWING 	A few grams asap (max. 20 g)	40 g	60 g	80 g	------
TWYDIL® PMC 	A few grams asap (max. 20 g)	20 g	40 g	40 g	50 g
TWYDIL® RACING 	------	------	------	------	75 g

TWYDIL® programme during growth:

1) Progressive adaptation of the young foal to ingest the supplement of TWYDIL® GROWING and TWYDIL® PMC.
2) By weaning it should be receiving daily supplies of 40g TWYDIL® GROWING and 20g TWYDIL® PMC.
3) The supply of TWYDIL® GROWING should be increased gradually to 60g and TWYDIL® PMC to 40g during the period up to the age of 12 months.
4) This daily supply should be increased to 80g for horses not yet broken at 2 years.
5) TWYDIL® GROWING should then be gradually replaced by TWYDIL® RACING during breaking.

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TWYDIL®

AVAILABLE THROUGH YOUR VETERINARY SURGEON

TWYDIL® GROWING

Very sophisticated complementary feedingstuff, bringing to growing horses, vitamins, trace elements, diversified amino acids, pro- and pre-biotics, necessary for optimal development and for the diversification of the intestinal flora.
This original formulation, particularly recommended from weaning to breaking, contributes to the harmonious development of the young horse.

- *Officially certified (on final product, urine and blood) can be used without risk up to the day of the competition.*
- *Declared content guaranteed until expiry date*

TWYDIL® is used by most of the successful breeders in the world.

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NEW TWYDIL® WAREHOUSE

To meet all the requirements due to the geographic sales expansion and the increasing volume of products TWYDIL® moved its entire warehouse in December 2006 between Christmas and New Year to a new building near Basel.

Perfectly situated a few kilometres from the French and German borders, the warehouse has several truck loading points.

The manager of the new TWYDIL® warehouse is Mr Rudolf Gubler (first row on the left).

TWYDIL® SUPPORTS RESEARCH

If TWYDIL® has become synonymous with the highest quality of equine feed supplements all around the world, it is because it bases its development only on scientific criteria and the perpetual adoption of very high quality standards.

COLLABORATION WITH UNIVERSITIES

For several years TWYDIL® has collaborated with different universities and veterinary medicine faculties.

TWYDIL® has recently worked with the University of Liège, Clermont-Ferrand, Rennes, Lyon and the Notre-Dame Faculty of Namur to develop and expand product knowledge.

TWYDIL® philosophy is only to market a product if it satisfies all of the following tests:

– Test undertaken in a reference laboratory showing that the product does not have any contra indication or toxic effect at the recommended daily intakes.
– Efficacy tests undertaken by an equine practitioner with a scientific trial usually with a placebo group.

For example, the recent investigation study of the management of gastric ulcers in sport horses using feed materials.

This protocol, designed in order to test TWYDIL® STOMACARE (Van Erck, et al., 2005), was undertaken on standardbreds and show jumpers in full training. This study was particularly welcomed by veterinarians during its presentation to the Equine Practitioner Congress in Geneva, 2005.

Conclusions of this study were "this study opens the perspective of the use of an adapted feed supplement in the management of stomach ulcers in horses, both for preventing their occurrence as well as for avoiding their recurrence".

SPONSORING A RACETRACK STUDY CENTRE

Recognising the necessity for practical experimentation, TWYDIL® supports the Mons-Ghlin (B) racetrack where the veterinary satellite of the University of Liège can undertake several tests. Thoroughbred, standardbred and event horses undergo TWYDIL® experimentations on this well located European racetrack on a regular basis.

CONGRESS PARTICIPATION

All these scientific achievements are nothing without the information being shared with the professionals.

TWYDIL® has supported and participated at several congresses such as the annual congress of the French Equine Veterinary Association (AVEF), the congress of the British Equine Veterinary Association (BEVA), the Belgian Equine Practioners' Society (BEPS), the International Conference on Equine Exercise Physiology (ICEEP), the World Equine Veterinary Association (WEVA), the congress of equine surgery and medicine in Geneva and, more recently, the congress of equine practice at Liège (HIPPOS).

TWYDIL® also helps veterinary students and notably supports the Junior AVEF-BEPS.

Over recent years, TWYDIL® has organised several scientific symposia around the world (Turkey, UK, Germany, Belgium, etc).

TOP SCIENTIFIC PUBLICATIONS

TWYDIL® invests in scientific research using placebo groups as control and working with identical groups in double-blind studies.

These protocols ensure the publication of several studies supported by TWYDIL® in prestigious international reviews.

This is shown by the following bibliography of scientific studies supported by TWYDIL® :

DE MOFFARTS B., KIRSCHVINK N., ART T., PINCEMAIL J., LEKEUX P. : Effet d'un complément antioxydant sur les marqueurs sanguins du stress oxydant chez des galopeurs entraînés. In Proceedings : Congrès de l'Association Vétérinaire Equine Française (AVEF), Montpellier, France, 2003, pp 538-539.

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PRIZES AND AWARDS

Several studies supported by TWYDIL® were given awards by the scientific world:

a) Junior Scientist prize by the Veterinary Journal (2004), for the study entitled "Effect of oral antioxidant supplementation on blood antioxidant status in trained thoroughbred horses."
This study was undertaken on thoroughbreds using TWYDIL® RACING and TWYDIL® PROTECT PLUS (de Moffarts et al., 2005). Conclusions were : "During the season, thoroughbred horses undergo a significant oxidant/antioxidant imbalance – A high quality antioxidant blend could partly prevent this oxidative stress." Pierre Lekeux (ULg) HPH 2002/2003.

b) Prize from the Thomas Lermusiaux Foundation
Awarded for the best third year Masters degree thesis entitled: "Effect of exercise on markers of oxidative stress in standardbred horses".

c) Prize from the AVEF scientific staff in 2004 and prize from the Geneva Congress in 2005, for the study entitled "Effect of exercise and oral antioxidant supplement enriched in omega-3 fatty acid on the oxidative stress markers, the erythrocyte membrane fluidity and the integration of the fatty acids in the cellular membrane". This study was undertaken on event horses given TWYDIL® OMEGADIL (Portier, et al. 2006 ; de Moffarts, et al. 2007). Conclusions were: "Exercise in horses induces oxidative stress, associated with erythrocyte membrane fluidity modification. These phenomena can be partially controlled by using a sophisticated mix of omega-3 fatty acids and antioxidants", Karine Portier (ENV-Lyon) HPH 2004/ 2005.

CONCLUSIONS

By its research activities, TWYDIL® has became the friend and supporter of students in veterinary medicine, researchers, and also equine practitioners and horse professionals due to our up-to-date scientific studies and range of Swiss products.

WINNERS OF THE TWYDIL® QUIZ AT FRENCH NATIONAL EQUINE CONGRESSES 2005 AND 2006

Each year, at the French National Equine Congress (AVEF) a practitioner or a veterinary student wins a deluxe stay of 4 days for 2 persons in a famous Swiss ski resort during the horse races on snow.

AVEF 2005 at Angers

Aurélie Vaultier, student at Saint-Hyacinthe in Canada won 4 days in Arosa in the magnificent 5 star-Hotel Kulm.

Dr Gauchot (President of AVEF) and Dr Pechayre (Vice President of AVEF) with Barbara Borer (Financial Director of TWYDIL®) at the presentation of the 2006 prize in Versailles.

Aurélie Vaultier (picture above), receiving her prize in the presence of Dr Richard Corde (President of the World Equine Veterinary Association).

Alpenhotel Quadratscha, Samedan/ St. Moritz.

AVEF 2006 at Versailles

Anne-Juliette Gouze, veterinary student, won 4 days stay at Hotel Quadratscha in St. Moritz

TWYDIL® RACING
THE INDISPENSABLE PRODUCT FOR PROFESSIONALS THROUGHOUT THE WORLD.

FOR 40 YEARS, A PRODUCT ALWAYS AHEAD OF ITS TIME:

For 4 decades, the famous 'blue pails' that can be seen in all the best yards have been considered the undisputed standard in terms of daily supplementation for competition horses. This magazine offers the opportunity to be reminded about the contents of TWYDIL® RACING and why it is seen by professionals as an absolute 'must'

SCIENTIFIC APPROACH

TWYDIL® RACING is based on, and constantly updated according to, the very latest scientific researches on competition horses. Even if the name of the product never changes, its formulation is regularly adapted taking into account the most recent scientific evidence.

NEEDS OF RACING HORSES (allowances)

TWYDIL® RACING is formulated to meet the needs of top performance horses. While many products are formulated to bring horses what they need to be healthy (requirement), TWYDIL® RACING is more ambitious as it contains all that horses need to fully express their physiological potential (allowances).

This is a different objective!

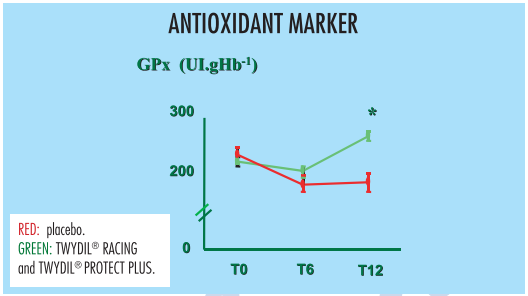
For instance, some nutritionists consider that a horse does not need vitamin C as it produces sufficient for itself. However, scientific studies show that when a horse is under the stress of competition, it produces less vitamin C while its needs considerably increase. This is why the formulation of TWYDIL® RACING provides, in the right concentration and proportions, vitamin C together with 3 amino acids, 7 trace elements, 13 other vitamins and magnesium.

A FEW IMPORTANT DATES FOR TWYDIL® RACING:

1965: TWYDIL® launches a complementary feedingstuff for competition horses, containing at that time 13 vitamins, 5 trace elements, magnesium and lysine.
1974: This formulation is called TWYDIL® RACING.
1977: Addition of methionine
1989: Concentration of selenium is increased.
1990: Addition of threonine and vitamin C, concentrations of selenium increased again and revision of all vitamins levels.
1995: Ascorbic acid powder replaced by encapsulated vitamin C. New design of the pails.
1997: Use of vitamin C in the 'Stay C' form.
2000: Selenium concentration increased again to 4 or 5 mg per daily supply in a programme for racing horses.
2002: TWYDIL® RACING is associated with TWYDIL® PROTECT PLUS in a double blind scientific trial on 40 racing horses followed for 3 months during racing season in Chantilly.
2003: As an additional anti-doping precaution, all natural ingredients used as carriers are replaced by 'food grade' cereals.
2004: Diversification of trace elements and magnesium sources, through the use of chelates. Roche/DSM tests TWYDIL® RACING stability under exceptional conditions by placing the product for 7 months in an oven.
2006: Test to evaluate the flavour preferred by horses. Use of a new flavour, palatibility of TWYDIL® RACING significantly improved.
2007: New buckets with a tamper-proof, reinforced cover. For very hot and humid countries, TWYDIL® RACING is packed in aluminium sachets within the buckets

HOW ARE THESE NEEDS DEFINED WITH CERTAINTY?

TTWYDIL® considers many peer-reviewed scientific publications (see HPH 90/91 and 92/93). TWYDIL® never relaxes its researches in the different equine disciplines.



Studies show that if, during the competition season, a horse's diet is not supplemented properly, its natural reserves of many micronutrients (as vitamins and trace elements) will decrease rapidly.

If these reserves are not renewed, the horse will be slow to recuperate following effort and might also be inclined to develop problems associated with the locomotor system, respiratory system, vascular system or nervous system (see HPH 2002/2003).

TWYDIL® RACING helps to maintain the horse's micronutrient reserves at a stable level even during the competition period.

FORMULATION OF TWYDIL® RACING

The TWYDIL® RACING formulation takes into consideration what horses receive through their traditional feed and also the interrelationships (synergy/antagonism) between vitamins and trace elements.

It evaluates how much horses really obtain from their feed after digestion. Indeed, there is no guarantee that if a vitamin is in the feed it will be 100 % absorbed by the horse. There is, for each micronutrient, an assimilation percentage.
For instance, 6 kg hay and oats contain approximately, depending on their quality, between 0 and 440 mg vitamin E; however, as only 25 % will be absorbed, even at best the horse will only receive 110 mg vitamin E per day when it needs 2,000 mg. This is why, in order to cover the shortfalls, a daily supply of TWYDIL® RACING provides 2,000 mg vitamin E (in a 100 % absorbable form).

Antioxidant capacity

VITAMINS	UNITS	Optimum daily ALLOWANCE (what a top performance horse needs to express its full potential)	Provision made by a classic ration consisting of 6 kg of oats + 6 kg of hay taking in account the bioavailability of each vitamin	BALANCE + = excess – = deficiency	VITAMIN SUPPLY BY A DAILY SUPPLY OF 75 g OF TWYDIL® RACING
A. FAT-SOLUBLE VITAMINS					
1. Vitamin A	I.U.	60 000	0	– 60 000	60 000
2. Vitamin D_3	I.U.	6 000	0<X<1 000	5000<X< – 6000	6 000
3. Vitamin E	I.U. (mg)	2 000	0<X< 110	– 1890<X< – 2000	2 000
4. Vitamin K	mg	10	?	–10	10
B. WATER SOLUBLE VITAMINS					
1. Thiamine (B_1)	mg	120	36	–84	84
2. Riboflavin (B_2)	mg	120	85	–35	35
3. Pyridoxine (B_6)	mg	75	45<X<75	0<X< – 30	30
4. Niacin	mg	200	<150	– 50	100
5. Pantothenic acid	mg	75	150	+ 75	45*
6. Biotin (H)	mg	2	0,65	–1,35	1,5
7. Folic acid	mg	150	5	–145	145
8. Vitamin B_{12}	mg	1,5	0	–1,5	1,5
9. Choline	mg	3 000	1155<X<2310	– 690<X< – 1845	800
10. Ascorbic acid (Vitamin C)	mg	1 500	0	–1 500	1 500

* as a precautionary measure we provide also a supplement of 45 mg of pantothenic acid

ORIGINALITY OF TWYDIL® RACING

TWYDIL® RACING contains, in the right proportions, 25 ingredients (14 vitamins, 7 trace elements, 3 amino acids and magnesium) indispensable for competition horses, including choline, vitamin B1 and folic acid which are highly important micronutrients that many supplement producers 'forget' due to their high price.

Also, TWYDIL® RACING contains a high proportion of the 3 potentially limiting amino acids which have to be provided in the feed because they are not synthesized by the horse: 10 g lysine, 5 g methionine, and 5 g threonine per day.

It is important to remember that amino acids are the block building factors for proteins. They favour natural muscle anabolism and maintain, in the right proportions, the optimal growth of hooves and hair.

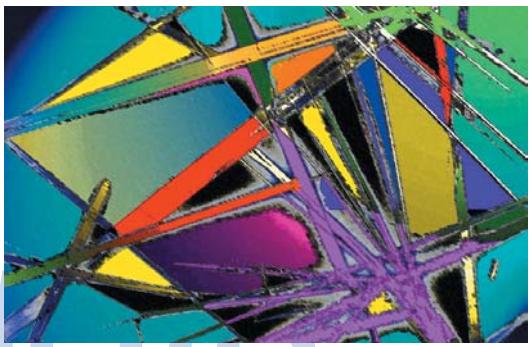
BIO-AVAILABILITY

To ensure the best possible absorption, TWYDIL® chooses each ingredient in its best bio-available form and also diversifies the sources.

Scientific research, undertaken in double blind studies on many horses, has demonstrated the bio-availability of TWYDIL® products.

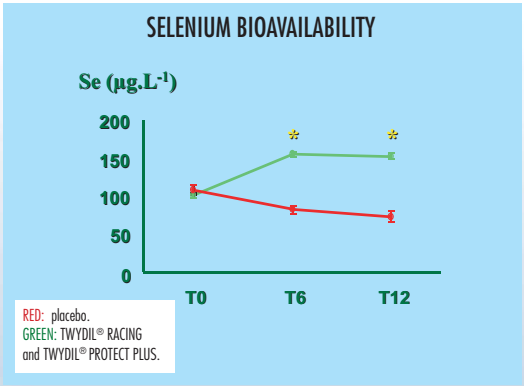
These trials have also demonstrated how rapidly the ingredients given orally with TWYDIL® reach a stable level in the blood.

After only 3 weeks of TWYDIL® RACING supplementation, plasma levels of vitamins and trace elements are significantly increased.



Vitamin C

25 Adapted ingredients



ARE ALL THE PRODUCTS OF EQUAL QUALITY ?

In 2003, the University of Liège compared horses given a placebo with others having received TWYDIL® RACING and others having been fed with another vitamin supplement.

It appeared that the competing product only contained between 15 to 74 % of its nutrient declarations (with an analytical margin of error of 20 %) and that with the exception of selenium, it did not produce any difference in the plasma levels of horses having received it.

On the other hand, TWYDIL® RACING contained between 91 and 129 % of its nutrient declarations (with an analytical margin of error of 20 %) and compared to the placebo group, resulted in a significant plasma level increase for each ingredient.

TWYDIL® has never developed a complete feed because we believe that, with such a product, it would be extremely difficult to conform to our objectives:

- It would be very difficult to provide 25 ingredients daily in the concentration contained in TWYDIL® RACING
- In the manufacturing process, complete feeds are exposed to the two major vitamin enemies which are heat and humidity that it is almost impossible to avoid. Consequently, it reinforces the destruction process of some trace elements on vitamins.
- To give a vitamin guarantee until the expiry date would be very hazardous as is suggested by the Australian study.
- To give maximum insurance against doping substances is also more complicated with a complete feed because of the problem of obtaining representative samples.
- For cost reasons, it would be difficult to provide each ingredient in its best bio-available form.

COMPLETE FEED

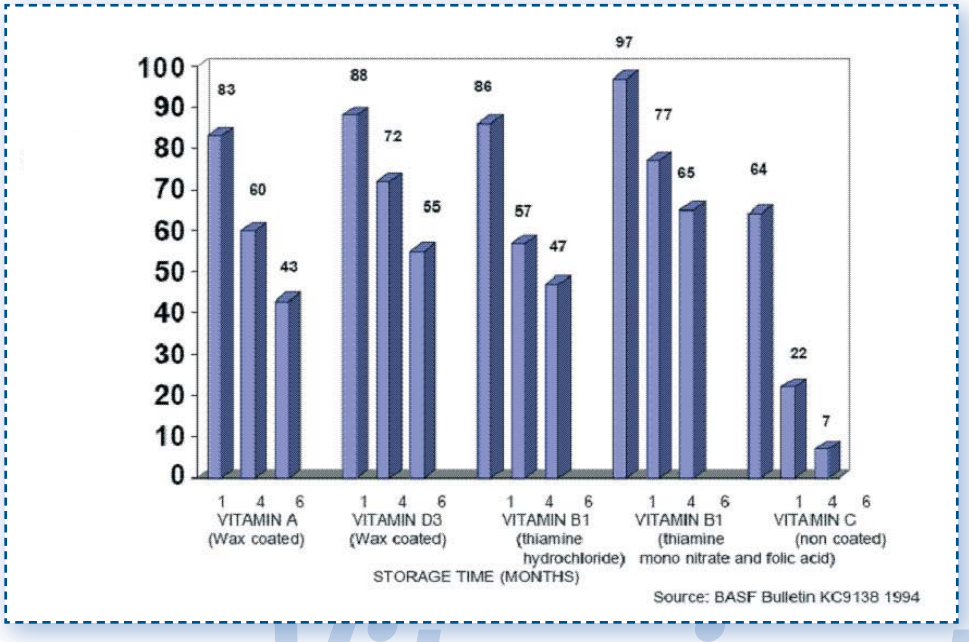
Do professionals who give complete feed have to incorporate TWYDIL® RACING in addition?

An Australian study analysed the vitamin levels contained in the complete feed of several major companies who guaranteed the stability and the protection of the vitamins used.

According to this study there were, after some time, important differences between the declaration and the real contents.

For all these reasons, we recommend continuing to give TWYDIL® RACING in addition to a complete feed.
The daily supply must be determined taking into account the real micronutrient contents of the complete feed and the instability of ingredients (in most cases half the regular supply of TWYDIL® RACING will be appropriate).

POURCENTAGE REMAINING OF VITAMINS ADDED TO PREPARED FEEDS AFTER 1, 4, AND 6 MONTHS STORAGE.



Vitamin stability

MANUFACTURING PROCESS

To avoid vitamin degradation during the manufacturing process, TWYDIL® RACING is produced at low temperatures (below 65°C) and at low moisture content (below 12%).

QUALITY CONTROL

Before being released onto the market, each production batch is systematically quality controlled. Some of the more unstable vitamins are controlled to check if the batch conforms to the label claim.

DECLARED CONTENT GUARANTEED UNTIL EXPIRY DATE

Thanks to the exceptional quality of the vitamins used and to the high technology of the manufacturing process, TWYDIL® guarantees (under normal conditions of storage and use), the declared content for the shelf life of the product.

SPECIAL PACKING FOR VERY HOT COUNTRIES

When it has to be sent to very hot and humid countries, such as South Asia, TWYDIL® RACING is sealed in aluminium sachets which are then placed into traditional pails. This additional precaution allows better protection even when the product is stored under unfavourable conditions

PALATABILITY

After scientific trials during which different recipes were offered to horses on a tray, the palatability of TWYDIL® RACING has been further improved by the addition of new appetizers chosen by horses themselves. On this occasion, the consistency of the pellets has also been studied.

CALCIUM

Why does TWYDIL® RACING only contain 0.55% calcium?
Because to add more calcium while maintaining vitamin concentration is illusive. Indeed, during pelleting, calcium induces heating which destroys vitamins' stability. Separate 'calcium pellets' in the same pail is not a solution as it is never perfectly mixed with the vitamin pellets and may cause an unbalanced daily intake.
For adequate phosphor-calcic supplementation, TWYDIL® has developed a very cheap solution consisting of TWYDIL® MINERAL COMPLEX that provides 17 g calcium in 3 different forms so that the total ration tends towards an ideal phospho-calcic ratio.

COMPARATIVE PRICES

Before buying, it is necessary to make a comparative study of prices taking into account :

- the ingredients contained in the product
- the concentration of these ingredients
- the quality and the form of these ingredients
- guarantee given by the producer until the expiry date
- evidence of the bio-availibility of the product
- evidence of the product's efficiency
- official doping controls on each batch of production knowing that a control on the final batch is not a sufficient guarantee

The TWYDIL® RACING ratio of quality/price is incomparable.

For less than 1.5 EUR per day, TWYDIL® RACING covers all likely shortfalls in traditional feeding.

For approximately 0.66 EUR more, TWYDIL® MINERAL COMPLEX will ideally balance the phosphor-calcic ratio and only 0.39 EUR will be sufficient to cover the electrolyte needs thanks to TWYDIL® ELECTROLYTES.

For a monthly investment of 76.50 EUR, a horse can receive a top class programme consisting in TWYDIL® RACING, TWYDIL® MINERAL COMPLEX and TWYDIL® ELECTROLYTES, with each batch guaranteed by LCH (following controls on final product, urine and blood) can be used without risk up to the day of the competition.

Doping control

RECOMMENDED DAILY INTAKE

Depending on the discipline and/or the type of horse and period of the year, supplementation with TWYDIL® RACING should be as follows :

These are indicative values which can be adapted taking in account the temperament of the horse and the existing nutritional balance.

	THOROUGHBRED	STANDARDBRED	SHOWJUMPER	DRESSAGE	ENDURANCE	PONY
						
Preparation	75 g	75 g	50 g	50 g	37.5 g	37.5 g
Competition	75 g	75 g	50 g	50 g	37.5 g*	37.5 g
Rest	37.5 g	37.5 g	37.5 g	37.5 g	37.5 g	20 g

* during competition period, endurance horses must receive additional antioxidant supplementation to cover their particular needs (see page 17 to 25).

VARENNE AND A REVIEW OF OTHER FAMOUS ITALIAN HORSES

Rita Montalbano

Varenne, one of the greatest trotters ever.

Every trotter enthusiast and every lover of horses in general has a great respect for the horse nicknamed "The Captain" - the magnificent VARENNE - without doubt the greatest trotter ever.

VARENNE was born on 19 May 1995 at the ZENZALINO breeding farm at Copparo (FE). The name Varenne was chosen; it is the same as the street where the Italian Embassy is situated in Paris. What a choice for the one who was going to carry the colours of Italy so well on the international scene for years.

VARENNE is the offspring of the American stallion WAIKIKI BEACH and of the native broodmare IALMAZ, who recently disappeared, whose co-owner was J.P. Dubois.

J.P. Dubois paid 10 million liras (approximately 5,000 EUROS) for 50 % of VARENNE and other foals and took him to his stud in Normandy, the HARAS DE LA BROSSE, at Nonant-le-Pin.

After a year Dubois brought him back to Italy, to Bolgheri in Tuscany, where the horse successfully qualified in a "normal" time (1.19.7).

During his first race VARENNE, driven by the Swede Roger Grundin, was wrongly placed in the first alignment but nevertheless finished the race.

Many trainers were interested in him but a cartilaginous chip in his right posterior fetlock interrupted all negotiations. Other negotiations followed but Dubois would not sell.

Finally, the horse was bought by Enzo Giordano from Naples, an impassioned lover of horses. VARENNE was treated by Pio Iannarelli, a young veterinarian who was persuaded to operate. And how successful he was! At 3 years of age, VARENNE won the Derby and was second in the National Grand Prix in Milan. At 4 years old he collected 14 consecutive victories of major races in Italy.

At 5 years, Varenne won the Lottery Grand Prix, considered to be one of the most illustrious international trotting races. He finished third in the Grand Prix d'Amerique and, in spite of a fault, finished fifth at Elitloppet in Stockholm. Then, he easily won the Grand Prix of Göteborg, Paris, Treviso, Milan and Rome. There were even more triumphs that year because he also won the Grand Prix of Jubile and the Grand Prix of Turrilli at the hippodrome of Tor de Valle.

In 2001, Varenne entered the record books by winning the Encat at San Siro before raising the Italian flag on the first step of the podium at the Prix d'Amerique at Vincennes;

Varenne

prior to that, the last Italian horse to win the Prix d'Amerique was Mistero in 1946!

But Varenne did not remain there and continued his list of successes, winning the Lottery Grand Prix at Agnano for the second time. After taking a Swedish licence, he became World Champion before going overseas where he is no longer trotting but flying!

There, effectively, he wrote a new page of history by winning the Breeders Crown at an unbelievable time of 1.51.1 over 1,609 metres, beating the world record for the mile previously held by SELF POSSESSED who finished in 1.51.3 at Hambletorian in 1999. In September, in front of a excited crowd, the "Captain" won the Trotting Mondial of Montreal. Then in 2002, he triumphed a second time at the Grand Prix d'Amerique.

VARENNE became one of the greatest trotters or maybe even the greatest. An unbelievable phenomenon who will undoubtedly not have an equal for a long time.

55 victories including 45 Grand Prix and more prizes exceeding 5 million Euros during his career. VARENNE also created new World records for 1,600 metres as well as for 2,000 metres, won the Prix d'Amerique in two consecutive years and all this has made him a legend in his lifetime before earning his well deserved retirement to breeding.

VARENNE is not forgotten in Italy where there are 25 racetracks across the country and high quality training centres. Many Italian owners dream that some day they will share the same emotions as Dr Giordano, the owner of Varenne, ….. who fainted after the victory of his champion at the Lottery Grand Prix in Naples!

In another discipline, the Italian Horse Show in May 2007 included the show jumping event, the 75th Grand Prix of Piazza di Siena in Rome.

The British rider, **John Whitaker,** 52, was given a standing ovation for his victory in this illustrious competition, with an impeccable and rapid double clear round (0/0, 41/42).

John and his horse PEPPERMILL, a 10 year old Dutch half-blood, son of BURGGRAAF, presented an unforgettable lesson of style and competitive spirit. Out of 56 pairs starting in this Grand Prix, the American Richard Spooner has been the only other double clear in 1970 "Loro Piana" (0/0, 43, 89).

To Italy's great satisfaction, the Italian lady rider Jonella Ligresti Bonomelli finished third with an extraordinary performance from her bay mare NANTA, two rounds with only over-time (1/1, 52/46).

Five Italian show jumpers qualified for the second run and there was amongst others a 6th place for Emmanuelle Fiorelli: with her horse WESTERN UNION JUMPING DU ROZEL (4/0, 46/70).

Show jumping in Italy is one of the disciplines which attracts the most impassioned audiences.

This is a great contest which produces good results on the international scene thanks to young talents such as Chiara Arrighetti trained by the valuable veterans Jerry Smith and Garcia.

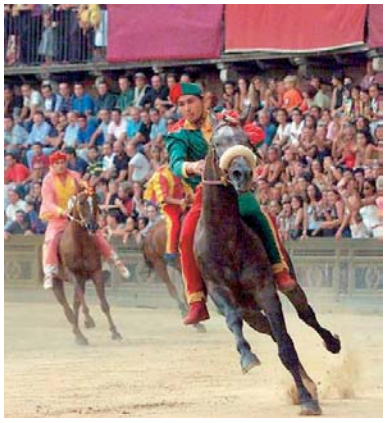
Thoroughbred races take place on no less than 21 race tracks in Italy.

The year 2006 was the highpoint of a career rich of success for **RAMONTI** - a bay thoroughbred ridden by Endo BOTTI and raised by SIBA Sprl - winning a third place in Hong Kong. In February 2007, RAMONTI was voted the best three years old at the evening of the Galop Oscars.

Another Italian horse of high value is **FALBRAV,** thoroughbred stallion of 1998, offspring of Fairy King and Gift the Night, raised by the agrarian company Francesca (Italia). This thoroughbred has won races such as the Grand Prix of Milan (I), the Japan Cup (JPN), the Prix of President of the Republic (I), Eclipse S. (GB), Juddmonte International S. (GB), Prix d'Ispahan (F), Queen Elizabeth S. (GB) and also the Hong Kong Cup (HK). Now, FALBRAV is living in Japan where his owner, Luciano Salice, has transferred the co-ownership and his stallion career to the Japanese breeder, Teruya Yoshida.

Then there is another thoroughbred champion, **ELECTROCUTIONIST,** a horse born in Italy and raised by "Compagnia Generale".

Trained by Valfredo Valiani, ELECTROCUTIONIST was bought



«Palio di Siena»

for 4,5 million dollars by H.H. Sheikh Mohammed Bin Rashid al Maktum's Godolphin Stables. In 2006, ELECTROCUTIONIST, ridden by the Italian jockey Frankie Dettori, was the brilliant winner of the Dubai World Cup, the race with the highest prize amount in the world. Unfortunately ELECTROCUTIONIST died of a heart attack prematurely at 5 years of age during his training for the Emirates Airline Champion Stakes at Newmarket. Italy lost a great horse and nobody ever knew his limits.

Among the Italian horses that have carried the Italian colours with honour in the world and have given happy dreams to many millions, we have to acknowledge the incredible phenomenon, **RIBOT,** who ran 16 races and won them all. Born of Italian parents (Tenerani and Romanella), owned by an Italian (Razza Dormello Olgiata), raised by Federico Tesio and trained by Enrico Camici, both Italians, Ribot won the Arc de Triomphe in 1955, by three lengths, confirming him as the best European horse.

In addition to the Arc de Triomphe, the King George and Queen Elizabeth Stakes as well as the GP of Milan appear in his victory list.

After an unbelievable second victory in the Arc de Triomphe by 6 lengths "Paris Turf" head-lines read "The best thoroughbred of the world. 84,700 fans and punters had the exclusive opportunity to watch the Italian RIBOT, the most formidable running machine ever seen on a race track"!

More recently, the Italian public witnessed on 20 May 2007 the extraordinary finish of **AWELMARDUK** and Endo Botti (I) who won the 124th prestigious Italian Derby having been at the back of the pack to start.

Endurance events are another very popular discipline in Italy in which the thoroughbred Arab horses are celebrated for their swiftness, appearance and persistence.

At the end of May 2007, the celebrated Gubbio (I) events took place.

The veteran Gaetano Ambrosio, already winner with Città di Castello, won this time with Hassant the King in the superior category. The 120 km race was won by Fausto Fiorucci, who had previously won the "Farmacia Roma Endurance Cup" in the same category in Abruzzi.

In the160 km event at Gubbio the Italian Melania Serioli with Faid el Fa, 9 year-old Arab thoroughbred, finished at ninth.

Running under Italian colours, the new Italian champion Chiara Rosi, is leaving for Africa where she will participate in the Christiana Ride, an international FEI*** competition, between 6 nations.

In this 120 km event through savannah, Chiara will start beside riders coming from England, New Zealand, Qatar, South Africa, Botswana and from Brazil.

But don't forget the importance of the American horses, like Quarter Horses, Paint or Appaloosa in Italy.

Italy has a famous reputation for the quality of its horses and the excellent results in the principal competitions (reining – western pleasure – cutting).

"Reining" has about 2000 competitors in Italy, and is the most followed and the oldest discipline.

Italy draws its passion for reining from a horse which was instrumental in the rise of this discipline. We are talking about MASTER SNAPPER, a Quarter horse ridden by Kelly Zweifel and owned by Cuoghi Quarter Horses (I), who are also the breeders.

This horse is now at Green Valley Ranch (USA) for the 2007 mating season.

Some of its stunningly performances:

- 2004 Italian Snaffle Bit Futurity Open Champion
- 2004 Italian Snaffle Bit Futurity Open Go Round Champion
- 2004 Italian Breeders Open Futurity Champion
- 2005 Italian Open Derby Champion
- 2005 Italian Open Maturity Champion
- 2005 Italian Triple Crown Champion
- 2005 Italian Horse of The Year
- 2006 Americana Top Honor Award
- 2006 NRHA Open Derby First Go Champion
- 2006 NRHA Open Derby Champion
- 2006 NRHA Intermediate Open Derby Champion
- 2006 NRHA Limited Open Derby Champion
- NRHA LTE: $ 135,000

In 2006, Kelly Zweifel (American by birth and Italian by adoption) won the NRHA Derby with Master Snapper, one of the most important events of the National Reining Horse Association (NRHA).

Due to this historic success, Kelly has established a series of records: she was the first lady rider to win the most difficult contest of the American circuit; also for the first time the same rider/horse pair has won a Derby and, again for the first time, a horse born and raised in Europe has dominated the American circuit.

The American victories of Master Snapper also indicate the level reached by the Italian breeding farms in this sector. Iinvigorated by this success, the 20,000 Quarter Horses in Italy, are mostly destined for the foreign market, especially for the USA.

Among the American Federations, the biggest equestrian Federation of the world is the American Quarter Horse Association (AQHA), with 300,000 members and 4 million registered horses.

Last but not least in our short Italian review, the fantastic world of the Arab thoroughbreds involved in concours d'elegance.

Some define these horses as simply like beautiful small statues, undoubtedly forgetting, that to reach this aesthetic perfection, they must develop their physical condition, without slackening, in specialized training Centres.

Remember that this ancient breed which has been selectively bred, results today in a horse which may at the same time be very fast in racing, very persistent, sound and easy to adapt to endurance eventing.

Many Arab horses, born and raised in Europe, have achieved results at the highest levels, by winning notably the European Championship or the Nations Cup in Aachen, Germany, and even the world Championship taking place every year in Paris during the Salon du Cheval.

Almost all these horses have been sold afterwards to the Arab Emirates or to Qatar, to join the incredible collection of these wonderful and noble animals, owned by the Sheiks.

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COMPARISON OF THE HAEMATOLOGICAL PARAMETERS OF 500 HORSES FROM DIFFERENT DISCIPLINES

This article is a summary of the study presented by Professor Nathalie Kirschvink during the 2006 ICEEP congress.

This work was done by students of the University of Liège and Namur and was partially supported by TWYDIL®.

Hypothesis

Is it true that the blood profiles of thoroughbred horses are very different from similar standardbred or show jumpers?

The aim of the present study was to evaluate whether significant differences could be detected between blood samples from horses from different disciplines. The relationships between haematological markers were also investigated in order to establish correlation.

In order to test the hypothesis, the study consisted of the statistical analysis of 500 blood profiles of horses from different disciplines: flat, trotting and jumping.

This study revealed the following:

1) Big differences exist between the blood profiles of thoroughbred horses and other sport horses.
2) Interesting interrelationships between blood markers were confirmed.

INTRODUCTION

As was previously described in the HPH magazine (HPH 2002/2003 and HPH 2004/2005), it is now well documented that intense exercise induces oxidative stress in sport horses (Deaton and Marlin 2005) .

Oxidative stress was defined by Sies in 1991 as imbalance between endogenous oxidants and antioxidants in favour of oxidants.

Although it remains to be proved that antioxidant supplementation improves performance, it has been shown that antioxidant depletion and deficiency decreases endurance, disturbs the immune system and potentially promotes inflammation in humans, and most of the epidemiological studies indicate a link between oxidative stress management and health and well-being.

In equine medicine and physiology,

antioxidant supplementation trials suggest that vitamins, trace elements and other natural antioxidants might have beneficial effects on the oxidant/antioxidant equilibrium (HPH 2002/2003 and HPH 2004/2005).

Nevertheless, the antioxidant requirements of specific horses, taking into account the ages, the sex and the discipline remain partially unknown.

INVESTIGATION OF 500 HORSES

The aim of the study was to statistically analyse a database of blood profiles established in sport horses in

competition by a single laboratory (TWYDIL®-PROBIOX) and according to standardised procedures.

A . PRESENTATION

The present study was based on a collection of around 500 blood samples of horses from different disciplines: flat race, trotting and jumping.

These horses were performing at the top levels of their respective disciplines. Horses were housed at different stables in several countries (France, Ireland, Belgium, Netherlands, UK). All the horses were sampled during full training and were clinically healthy. Oxidative stress markers and haematological parameters were investigated in the same way for each horse.

B. RESULTS

1. DIFFERENCES WITH THOROUGHBRED HORSES

The results illustrate big differences between thoroughbreds and other horse categories.

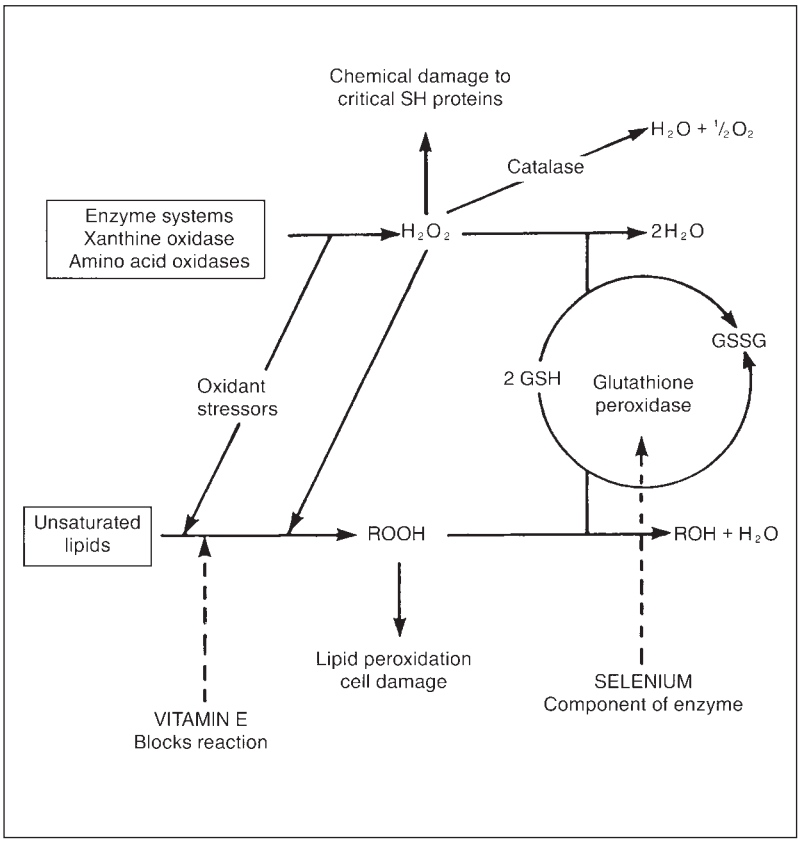


Fig. 1
Intracellular antioxidant activities of vitamin E and selenium.

Striking differences relating to training and exercise were found in thoroughbreds, which had higher plasma antioxidant capacity and vitamin E concentration than jumpers or standardbreds, as well as increased GPx activity (antioxidant enzyme allowing regeneration of the glutathione); also the basic haematological parameters were higher in thoroughbreds.

It might be postulated that these differences reflect both genetic selection and, the training management of very young horses; since these influence antioxidant defences (HPH 2002/2003).

However, other blood values were found lower in thoroughbreds than in the others disciplines.

Oxidised proteins and magnesium concentration were lower in thoroughbreds. These results may be due to the specific exercising and feed management of these horses. (see graph).

These results indicate that the basal blood values applicable to thoroughbreds are different from the other equine sport disciplines.

2. LINKS BETWEEN MARKERS

Theoretical links between oxidative stress markers were originally published in the HPH 94/95 (fig. 1).

The present study confirms these links.

Indeed, significant and positive correlations were found in this study between GPx, selenium (as a marker for glutathione), and vitamin E. These results provide strong support for the synergistic actions between these antioxidants.

Another interesting finding was the positive correlation between lipid peroxides and copper as well as the negative correlation between vitamin E, antioxidant capacity and lipid peroxides (see graphical correlation).

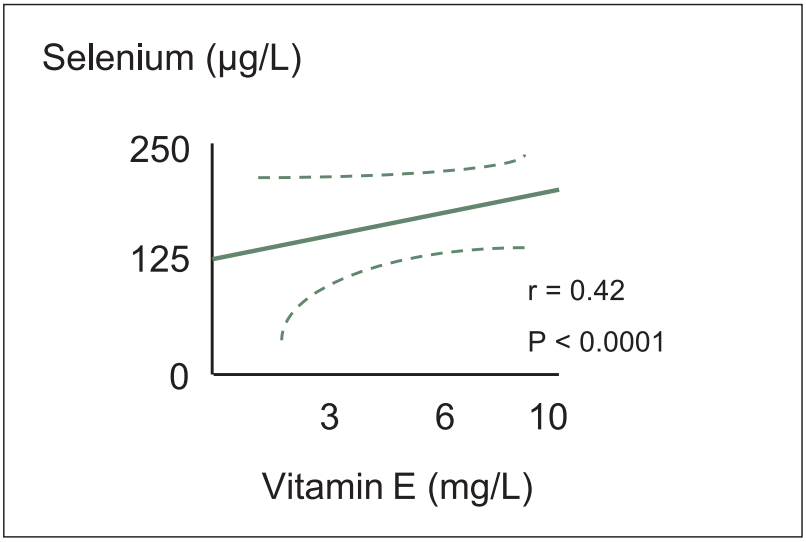
These results confirm that a high level of copper could favour lipid oxidation and lipophilic antioxidants might exert a protective effect against lipid peroxidation.

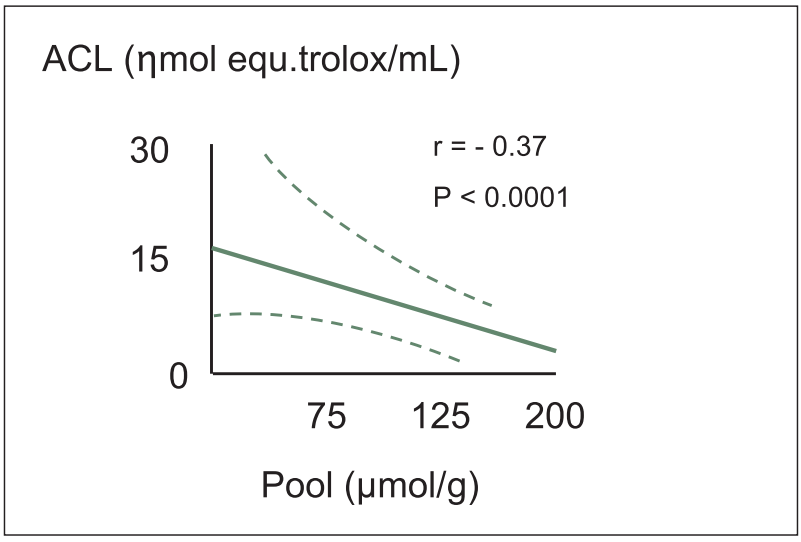
Results obtained in healthy horses indicate the strong links between the different antioxidant systems (vitamins, enzymes, trace-elements). It is now easier to understand the important ratios to respect between the different nutrients in the feed and notably relationships with copper.

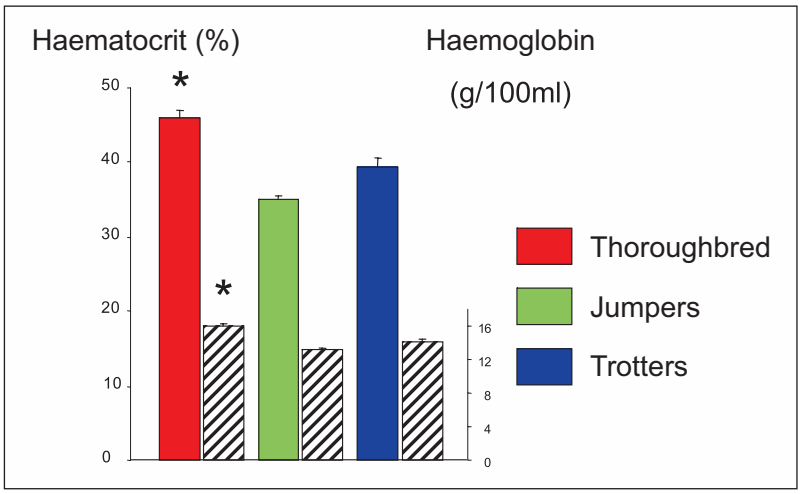
GENERAL CONCLUSIONS

This study has shown the importance of the specification of reference ranges produced by the laboratory for each discipline (flat, trot, jumping) in the interpretation of blood samples .

Due to the positive or negative synergy between each nutrient it is important to take this into account in individual feed specifications.







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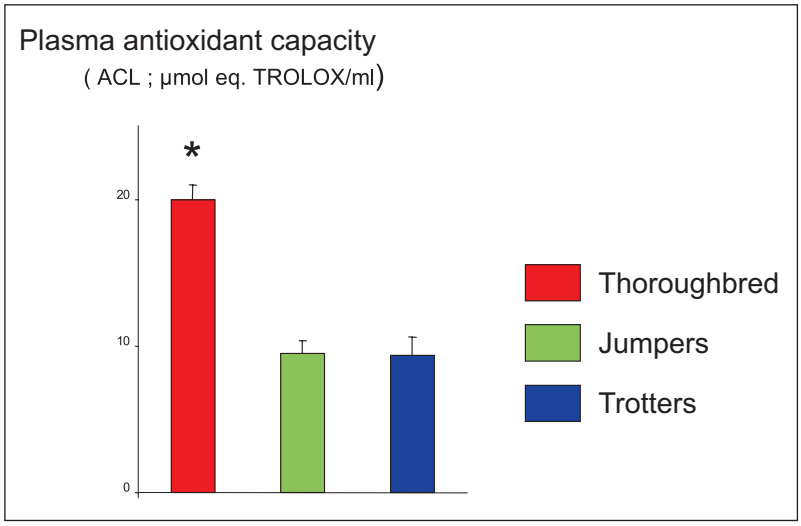

QUESTIONS TO DR BRIEUC de MOFFARTS

(TWYDIL® Research and Development Director)

HPH : What practical information suggested this study for the improvement of the TWYDIL ® range?

BdM : This study of an unprecedented scale (500 horses) scientifically demonstrated that, before considering any nutritional programme, the horse discipline (galloper, trotter, showjumper) must be taken into account. Correlations between certain blood parameters show how precarious it is to supplement a horse with an addition of ingredients that do not have the right balance.

HPH : You hint that supplements should contain copper, vitamin E and selenium for example ? What do you think about single product formulas?

BdM : Such single product supplements should only be considered in the rare cases of specific deficiencies; otherwise, for the great majority of horses, they are not recommended because they can upset the optimal balance necessary for the body defence system. In other words, in most cases, giving selenium or some copper alone to a horse can be deleterious. This is why TWYDIL® prefers sophisticated and complex formulations taking into account the discipline of the horse and the physiological balance.

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