

**The French choice**

# FERTILITY



**REVERDY**  
EQUINE NUTRITION

**MADE IN FRANCE, MADE FOR HORSES**

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# Supplementing for fertility in the mare and stallion

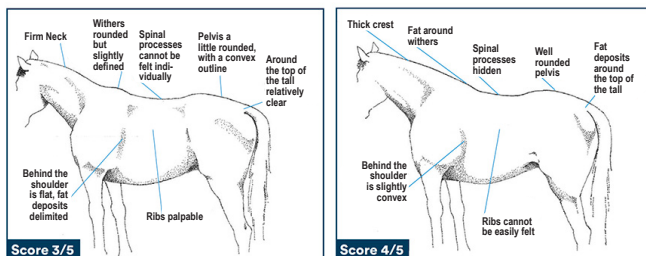
Reproduction only takes place if other needs, especially maintenance of vital functions, are covered and the animal is in good health. Thus, **reproduction is the first to be affected by any dietary error**, just as it is the last to benefit from adequate correction.

We can thus understand **the importance of providing a balanced diet**, correctly supplying sufficient energy and protein, as well as vitamins and trace elements.

## I. FERTILITY IN THE MARE

### Body condition score

Body condition is a good indicator of the animal's health. It must therefore be accurately assessed and optimally adjusted. Indeed it has been demonstrated that mares that are too fat or too thin are less fertile.



CHARACTERISTICS OF DESIRED BODY CONDITION SCORE  
(Source : Institut de l'élevage)

Scientific studies have shown that the **best fertility rates are observed in mares with a body condition score of between 3/5 and 4/5** (using the French scoring system).

The proper functioning of cycles can be impaired when mares are too fat or too thin. In both cases, **fertility problems are**

**linked to an upset in the secretion of insulin** (a hormone that regulates blood sugar levels, secreted by the pancreas), which is insufficient in underweight mares and excessive in those that are overweight.

Insulin directly stimulates the reproductive hormone producing cells in both the brain and the ovaries.

Thus:

- In the case of overweight mares, the high secretion of insulin caused by the ingestion of a concentrate ration with a high glycemic index, that is to say rich in carbohydrates (starch, simple sugars), notably could lead directly and/or indirectly to an exaggerated production of androgens in the ovaries, which would prevent the proper development of the cycle and inhibit ovulation.

- In mares with insufficient body condition, the ingestion of a low-energy ration with a low glycaemic index (low in cereals) leads to the secretion of insulin being limited. Now, in particular the latter stimulates the production of leptin, which favours the release of reproductive hormones in the brain. Consequently, low circulating leptin levels will hinder the sequence of events in the cycle up to ovulation.

### Omega-3

Diversifying energy sources by **replacing a part of the cereal ration with fats** has several interests.

Firstly, **since fats are very high in energy**, they make it possible to maintain sufficient body condition without overly stimulating the secretion of insulin. Secondly, **the choice of fats rich in essential fatty acids**, particularly in Omega-3s, is beneficial for maintaining good fertility in mares.

Metabolising essential fatty acids leads to the synthesis of various compounds, including prostaglandins, which are substances considered to be "local hormones" with a brief but very powerful action.

**Omega-3s carry the most interest because, unlike Omega-6s, they only produce prostaglandins that are beneficial to the body.** These prostaglandins increase the blood flow in the uterus and produce larger corpus luteum, both of which

are fundamental to **the establishment of gestation and the development of the foetus.**

Essential fatty acids cannot be produced by the body, so they therefore must be provided by the diet. As cereals are excessively high in Omega-6s and almost devoid of Omega-3s, it is important to restore a ratio of Omega-3s to Omega-6s (voluntary inversion) favourable to the organism in the concentrate ration, that is to say, greater than or equal to 1.

In order to do this, **all the feeds in the REVERDY range contain large quantities of extruded linseed rich in linolenic acid (natural Omega-3)**, and therefore complement cereals.

It should be noted that in addition to extruded linseed, our foods contain first-pressed linseed oil, which can also be incorporated separately (blended with maize germ oil) via the REVERDY OMEGA OIL supplement.

### Minerals

First of all, deficiencies in certain macro-elements could induce fertility problems.

For example, **phosphorus plays an important role** in the synthesis of reproductive hormones: a deficiency in this element could lead to problems ovulating.

**The diet should also provide sufficient trace elements**, including **copper, manganese and zinc**. A lack of zinc can lengthen the duration of cycles, resulting in ovulation taking

place less frequently.

**Selenium is a powerful antioxidant.** It plays an important role in the functioning of the immune system, which protects the body, including the reproductive system.

A drop in immunity is therefore likely to reduce fertility, and may even be the cause of abortions. Consequently, all nutrients that support the immune system can allow an improvement in mare fertility.

## Vitamins

Next, unlike vitamin K and the water-soluble vitamins of the B and C groups, **the fat-soluble vitamins A, D and E** are not synthesised by the digestive flora and **must be provided by the ration**. It has been shown that a deficiency in vitamin A or E leads to reproductive problems. As antioxidants, these vitamins play an important role in stimulating the immune system and thus in protecting cells, notably of the ova and spermatozoon. They are incorporated into the lipid part of the membranes, which they stabilise and protect from toxic components such as free radicals, heavy metals, etc.

In addition, **vitamin E** is involved in the synthesis of reproductive hormones and can allow an increase in the blood flow and the thickness of the uterine endometrium (mucous membrane).

As for **vitamin A**, it stimulates the onset of heat, participates in the production of progesterone (a steroid hormone involved in the ovarian cycle) and, since it preserves the integrity of the epithelium, it also facilitates ovulation and the implantation of the embryo. Vitamin A can be provided directly in the diet as well as through its precursor, **beta-carotene**.

However, its involvement in improving fertility is more complex. It is also an antioxidant that protects cells from attack by pro-oxidant free radicals and boosts the immune system.

In the mare, ingested beta-carotene penetrates the follicles (vesicle containing the ovum which it releases at the time of ovulation) where it participates in the synthesis of vitamin A

and oestrogens, hormones synthesised in significant quantities at the time of heat.

**Beta-carotene therefore improves the quality and maturation of the follicles.** Following ovulation, it ensures the proper functioning of the corpus luteum, in which it participates in the synthesis of progesterone. **It thus contributes to maintaining gestation. Beta-carotene is therefore beneficial to fertility.**

Among the positive effects we can mention: more visible heats, a reduction in the number of ovarian cysts, an improvement in the conception rate, a reduction in embryonic mortality, a reduction in placental retention (poor delivery), etc. In addition, we can also attribute to it some of the benefits of supplementation with this vitamin (mucosal protection, etc.).

Daily requirements vary from 500 to 1000 mg per day for mares depending on the type of forage being eaten. As grass is naturally very rich in beta-carotene (about 250 mg per kg DM), mares that consume enough beta-carotene will only receive minimal supplementation. However, **if you want to bring forward breeding, beta-carotene supplementation becomes essential.**

During the winter months, empty (barren) mares have little or no access to grass. They only consume hay, which contains considerably less (about 25 mg per kg DM), as the beta-carotene rapidly deteriorates during storage.

## Summary

The sufficient distribution of a REVERDY feed or of vitamin and mineral supplements ensures satisfactory coverage of the daily mineral and vitamin requirements in mares who are empty. However, if we wish to fortify the intake of these nutrients, this can be done by the distribution of nutritional supplements, such as:

- **REVERDY NATURAL E** which provides highly effective, natural vitamin E at an optimal dose.

- **REVERDY CAROTENE**, which contains chelated trace elements that are highly assimilable and easily stored in the body, vitamins A and E in addition to a high dose of beta-carotene.

- **REVERDY OMEGA OIL** is composed of first cold-pressed linseed oil, rich in Omega-3, and non-GMO maize germ oil (<0.1%), high in Omega-6. OMEGA OIL allows a well thought out supply of Omega-3s, -6s, and -9s, beneficial to health.

## II. FERTILITY IN THE STALLION

In general, it can be said that the relationship between feed management and stallion fertility has received little attention, compared to other health issues directly related to feeding. This can be explained by the fact that, in the main, most stallions have a so-called 'acceptable' fertility.

The live foal rates reported by the Jockey Club for Thoroughbred stallions average over 60% for the population, and

may even be over 80% for some individuals.

With 'normal' stallions, it seems likely that only very large studies would detect differences in fertility in response to nutritional modifications. **However, targeted nutritional changes may be beneficial to less fertile stallions.** More especially, when sub-fertility is related to a specific characteristic (sperm).

## Body condition score

Based on observations made in humans, it seems prudent and fairly obvious to feed stallions a diet that will maintain a satisfactory body condition score.

**A body condition score maintained at 3 (see diagram) during the breeding season is considered optimal.** Energy intake is the main nutritional variable affecting body condition. Once the stallion is of breeding age, it is imperative to

take into account factors such as breed, temperament, body condition, physical and breeding activity and the time of year in order to achieve a balanced ration.

Mature, inactive stallions with docile temperaments may have energy requirements that are similar to those required by any other mature horse. Or, conversely, very active breeding stallions have higher energy requirements

## Additional protein intake

Supplementing with essential amino-acids such as lysine and methionine (40% or more than 80% of the recommended intake) had no effect on the quality and quantity parameters of stallion semen, unlike those reported in other species.

Therefore it is more judicious to choose a ration / rationing

method composed of a quality source of amino-acids, and to reason its quantity respecting the requirements of the stallion according to the period and his activity.

Thus, we have chosen to incorporate in our feeds and supplements the very best protein sources on the market, stemming from non-GMO soybean meal (<0.1%).



## Omega-3

Supplementing with fatty acids to improve reproductive function in the stallion, and particularly with omega-3s, has also been studied. Semen contains large quantities of lipids, which play an important role in sperm motility and fertilisation capacity, as well as in their sensitivity to cold.

Two of the most common lipids in semen are docosahexaenoic acid (DHA), an omega-3 fatty acid, and docosapentaenoic acid (DPA), an omega-6 fatty acid. Studies have shown that a high DHA to DPA ratio would be desirable, and that the opposite would not. There would seem to be an association with reduced sperm quality and fertility in the latter.

Certain rations (maize and soya based) would favour the production of DPA to the detriment of DHA. Some researchers suggest that one way to reverse the situation is to supplement a stallion's diet with DHA and/or change the level of fat in the diet in order to favour the production of DHA over DPA. This approach can triple the levels of DHA in semen, increasing the motility, concentration and percentage of live spermatozoon. On the other hand, it is important to note

that these improvements were most noticeable in stallions that initially had very poor semen quality. For example, the response to supplementing with Omega-3 fatty acids also appeared to be more pronounced in stallions with low spermatozoon motility in 'cooled' semen. These results suggest that the relationship between dietary lipids and antioxidants and semen quality in sub-fertile stallions should be further investigated.

**The efficacy of supplementing with Omega-3 fatty acids and antioxidants in the stallion must be considered within the context of his basic diet.**

In the research undertaken above that found benefits from supplementing, the basal diets consisted mainly of stored foods that would have been low in natural sources of vitamin E, vitamin A, beta-carotene and omega-3 fatty acids. The effects of supplementing with Omega-3s or antioxidants can be expected to be less pronounced in stallions that have access to good quality pasture, which is an excellent source of these nutrients.

## Trace elements

**Selenium:** a deficiency in selenium harms the development of spermatozoon. To ensure the development and correct functioning of the spermatozoon, and for reproductive success, it is therefore important to have sufficient selenium available.

REVERDY's products contain organic selenium. The organic form of selenium is more easily absorbed than the inorganic

form and ensures optimal selenium intake, thus contributing to the proper development of sperm cells.

**Zinc:** zinc may play a role in reproduction as an essential activator of sexual hormone producing enzymes, but also through its role in vitamin A transportation. Zinc deficiency may interfere with spermatogenesis.

## Vitamins

Fertility and health are closely linked to vitamins A and E. **Vitamin A supports cell growth and the integrity of the epidermal layers of all tissues, immunity and many reproductive functions in the stallion.** Notably, vitamin A contributes to the synthesis of testosterone. Green forage is an excellent source of beta-carotene, a precursor to vitamin A, as previously mentioned.

It has been demonstrated that beta-carotene enhances immunity and favours fertility in horses (see paragraph above concerning mares) and is also thought to be beneficial to stallion fertility.

However, it is worth remembering that beta-carotene deficiency is common at the end of winter because, in addition to the reserves in the liver being depleted, the levels in stored forage drop significantly. For example, after two years of storage the beta-carotene content of hay has fallen to less than 10% of its original level.

Scientific research suggests that breeding horses, which do not have access to green pasture, or which are on poor winter grazing and fed on stored forage, may benefit from supplementing with beta-carotene. International recommendations indicate that breeding stallions should be supplemented with a minimum of 500mg of beta-carotene daily.

As for vitamin E, it is a powerful antioxidant, repairing cells that have been damaged by oxidative stress caused by inflammation and muscular activity. Vitamin E is also necessary for optimal functioning of the immune system. All REVERDY feeds are formulated with quality vitamins, permitting optimal coverage of requirements.

The supplement REVERDY CAROTENE particularly helps to fulfil daily requirements in beta-carotene, vitamins A, E and B3. Then, in order to reinforce vitamin E intake, REVERDY NATURAL E provides a highly assimilable form of natural vitamin E.

## Other

**Carnitine** is an amino acid and is thought to be directly related to spermatozoon motility. Oral administration of L-carnitine to stallions with inferior sperm may be beneficial. However, L-carnitine administration appears to be ineffective in stallions with satisfactory semen quality.

**Maca** (*Lepidium meyenii*), a plant that originates from the Andes, is used for its antioxidant properties and may contribute to improved fertility. A study was conducted in which stallions were supplemented and the effects on fresh and

chilled semen were evaluated. In this study, supplementing with maca revealed a rise in sperm production and stabilised its quality during chilled storage.

**Co-enzyme Q10** is an important co-factor in supplying spermatozoon with energy. Improvements in several parameters were observed in stallions with lower sperm motility in a study undertaken on 7 stallions who were supplemented with co-enzyme Q10. For the time being, this additive is not authorised in animal feeds on the European market.

## Summary

In order to approach the breeding season serenely it is necessary to ensure the good health of the stallion throughout the year.

It should not be forgotten that for the well-being and health of the stallion, the base ration must be composed of good quality hay, and a quality concentrate feed will

ensure complete coverage of nutritional and energy requirements.

In case of particular requirements, suitable nutritional supplements can be provided: **REVERDY NATURAL E, REVERDY CAROTENE and REVERDY OMEGA OIL** (see the summary of part 1).