

Se(e) HOW THEY RUN

INTRODUCTION

It is well known that both selenium (Se) and vitamin E are essential nutrients that should be in all horses's food. Vitamin E is a fat-soluble vitamin that is important to a large number of metabolic processes within the body such as regulating heart function, improving immune function, dealing with high fat diets, it is vital to normal reproduction function plus the regulation of hormone metabolism in the brain, it plays an essential part in control of carbohydrate and creatine metabolism, plus muscle metabolism and glycogen balance.

Selenium's principal function is to inhibit the oxidation of lipids (fats) in whatever metabolic processes in the body while it is a component of the enzyme glutathione peroxidase (which can be tested in the blood). When Se is available and combines with vitamin E, it protects the immune system by preventing the formation of free radicals that can damage the body and together their synergistic effect aids the body to produce anti-bodies and maintain a healthy heart and liver. This combination is essential for efficient tissue respiration. Selenium is also needed for pancreatic function and tissue elasticity.

In man, the supplementation of Se has shown promise in the treatment of arthritis, cardiovascular disease, male infertility, cataracts, AIDS and high blood pressure. However, the main benefits recognised in horses - from the use of this combination – are to improve muscle function and help delay tying up plus the scavenging of free radicals produced in abundance during exercise. This particularly helps reduce tissue damage and improves recovery after exercise.

LIVESTOCK SELENIUM REQUIREMENT

Selenium is an essential mineral but the requirement is very specific because an excess of Se will result in toxicity. The requirements for Se have been determined by an international organisation (NRC) that has specified them as per the table below.

LIVESTOCK SELENIUM REQUIREMENTS				
SPECIES	PHASE OF PRODUCTION	Se REQUIREMENT	BASIS	
Diary	All	0.30	mg/kg DM	
Beef	All	0.10	mg/kg DM	
Horse	All	0.10	mg/kg DM	
Poultry	Broilers	0.15	mg/kg	
	Layers	0.05 – 0.15	mg/kg	
	Turkeys	0.20	mg/kg	
	Ducks	0.20	mg/kg	
	Japanese quail	0.20	mg/kg	
Swine	3 – 10kg body weight	0.30	mg/kg	
	10 – 20kg body weight	0.25	mg/kg	
	20 – 120kg body weight	0.15	mg/kg	
	Gestating and lactating sows,			
	and sexually active boars	0.15	mg/kg	

The normal content of Se in foods is usually very low, but it is also variable. An example of this is shown in the following table:

SELENIUM CONCENTRATION IN VARIOUS FEED INGREDIENTS*

INGREDIENT	SELENIUM, ppm	
	UNITED STATES	CANADA
Alfalfa	0,01 to 2,00	0,02 to 0,27
Barley	0,05 to 0,50	0,02 to 0,99
Bentonite	1,00 to 20,00	-
Blood meal	-	0,50 to 1,20
Brewers' grains	0,15 to 1,00	0,29 to 1,10
Corn	0,01 to 1,00	0,01 to 0,33
Fish meal	1,00 to 5,00	1,30 to 3,40
Gluten meal	0,10 to 1,50	0,20 to 0,57
Oats	0,01 to 1,00	0,01 to 1,10
Rapeseed meal	-	0,46 to 1,90
Soybean meal	0,06 to 1,00	0,04 to 0,78
Wheat	0,01 to 3,00	0,02 to 1,50
Wheat middlings	0,15 to 1,00	0,41 to 0,89

*Selenium from Nutrition (Revised Edition), National Academy Press.

Food manufacturers, when they produce complete feeds or supplements have various sources of Se available to them, but the most commonly used in animal feeds are sodium selenite or sodium selenate. It is also known that the various salts of Se are readily absorbed from the digestive tract - immaterial of the particular salt of Se that is used. (Se as a mineral alone is not absorbed).

Once Se has been absorbed from the digestive tract, the main depot in the body of Se is considered to be where it is incorporated in an enzyme system glutathione peroxidase (GSH). Most of the Se that is incorporated into GSH is in the form of selenocysteine. Cysteine is an amino acid which is one of the building blocks of protein. Se is also bound to other amino acids and proteins in the body.

LIQUID SEEVITE

Liquid SeeVitE is a design formulation which combines Se (bound to the amino acid methionine that makes it an organic form of selenium) together with (in the correct ratio) vitamin E in a liquid formulation. The liquid formulation is water-based, which dissolves the organic selenomethionine and into which is emulsified the vitamin E (– because it is a fat-soluble vitamin). In this liquid form – when this reaches the small intestine of the digestive tract, both the selenomethionine and vitamin E can be rapidly absorbed. Where there is a requirement in the body for Se as such, the selenium : methionine bond will be split and the Se can be used e.g. to produce glutathione peroxidase. If however there is not an immediate requirement, the Se remains bound to methionine and it is held in the free methionine pool within the body. This means that this particular formulation of Se provides a source to two depots in the body for supply of Se - wherever it is

needed inside the body. These two depots ensure that the requirements for selenium will be met.

Excess Se is eliminated predominantly in the urine, but small amounts are also excreted through the bile in faeces, and expired through the lungs.

Trials have been conducted with the organic selenomethionine in poultry and pigs to determine the level of Se in the muscle tissue of both poultry and pigs, so that a comparison would show which source of Se ensured higher levels deposited inside the muscles. Se, when bound to methionine is found to be present at levels up to 3 times more than when selenium is provided in the form of sodium selenite or sodium selenate. It has also been proven that the toxicity of selenium (e.g. through an over dosage) is reduced when it is present in the presence of methionine.

POTENTIAL BENEFITS AND DEFICIENCY SYMPTOMS

The benefits of supplementing an organic form of Se are that there are higher levels of antioxidants in the body, there is an anti-carcinogenic effect, there are **improved immune responses**, improved fertility and improved performance.

Young animals which have a Se deficiency show a specific disease called 'nutritional muscular dystrophy' or 'white muscle disease' (vlekspiersiekte) plus a reduced immune response to e.g. vaccination or disease challenges. Since the most commonly seen disease symptom is white muscle disease, this highlights the importance of ensuring sufficient selenium deposits inside the muscles.

There are a number of similar disease conditions that result in damaged tissues, that respond to treatment with either Se or VitE, or both. Most conditions are not absolutely cured or prevented by either Se or VitE alone.

The only oral liquid organic form of Se together with vitamin E (in South Africa) is Liquid SeeVitE.



Courtesy of Dr. Rick Last, Vetdiagnostix - Veterinary Pathology Services