



NEWS TO USE

# Recommended Fat-soluble Vitamin Injection Programs for Feedlot Cattle

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- **Injected fat-soluble vitamin E is utilized approximately 8 times more efficiently utilized than feeding equal I.U. amounts.**
- **Vitamin E-deficient cattle have shown improved immunity, reduced morbidity and increased performance after a VITAL E or VITAL E-A+D injection.**
- **There are dramatic differences in bioavailability between VITAL E and private-labeled knock-offs.**

## Introduction

Fat-soluble vitamin status in cattle at arrival can vary dramatically depending upon age, breed, previous feeding programs, and season of the year. It is difficult to make one recommendation for all cattle types because of such variation.

In the past 20 years, most vitamin research on incoming calves and yearlings has been on vitamin E due to its role on optimizing animal's immune system. Unlike vitamin A that is stored in the liver, vitamin E has no tissue stores; thus serum vitamin E status goes down rapidly when dietary vitamin E intake is reduced. In general, cattle that have been removed from grazing longer than 30 days may benefit from vitamin injections at arrival.

## Available VITAL E Injectable Products

- **VITAL E<sup>®</sup>-A+D** - contains 100,000 I.U. vitamin A, 10,000 I.U. vitamin D<sub>3</sub>, and 300 I.U. vitamin E per mL.
- **VITAL E<sup>®</sup>-500** - contains 500 I.U. vitamin E per mL.

## Response of Incoming Cattle to VITAL E and VITAL E-A+D

In a Kansas feedlot demonstration, injecting 5 mL VITAL E-500 (2500 I.U.) at processing resulted in a 10% reduction in cost of gain during a 208-day feeding trial (Data on file, Stuart Products, Inc.)

In a Texas feedlot demonstration, injecting 5 mL VITAL E-A+D (1500 I.U. vitamin E, 500,000 I.U. vitamin A and 50,000 I.U. vitamin D) compared to an oral vitamin paste resulted in reduced morbidity and improved gain during the initial 28 days(Data on file, Stuart Products, Inc.).

## Subcutaneous or Intramuscular injections

Three studies were conducted showing that VITAL E or VITAL E-A+D may be injected via either route of administration (data on file, Stuart Products, Inc.). **Subcutaneous injections are recommended for VITAL E.** Some Vitamin A-D injectables have intramuscular injections only.

## Recommended VITAL E Products for Various Types of Cattle

Injectable vitamin products need to be tailored to the type of cattle being processed. The following factors can determine what fat-soluble vitamin(s) need to be injected. Research would indicate that under no circumstances would cattle require a vitamin A injection and not a vitamin E injection since vitamin E status diminishes much quicker than vitamin A status, therefore the following recommendations are given for various types of cattle:

### Cattle Type

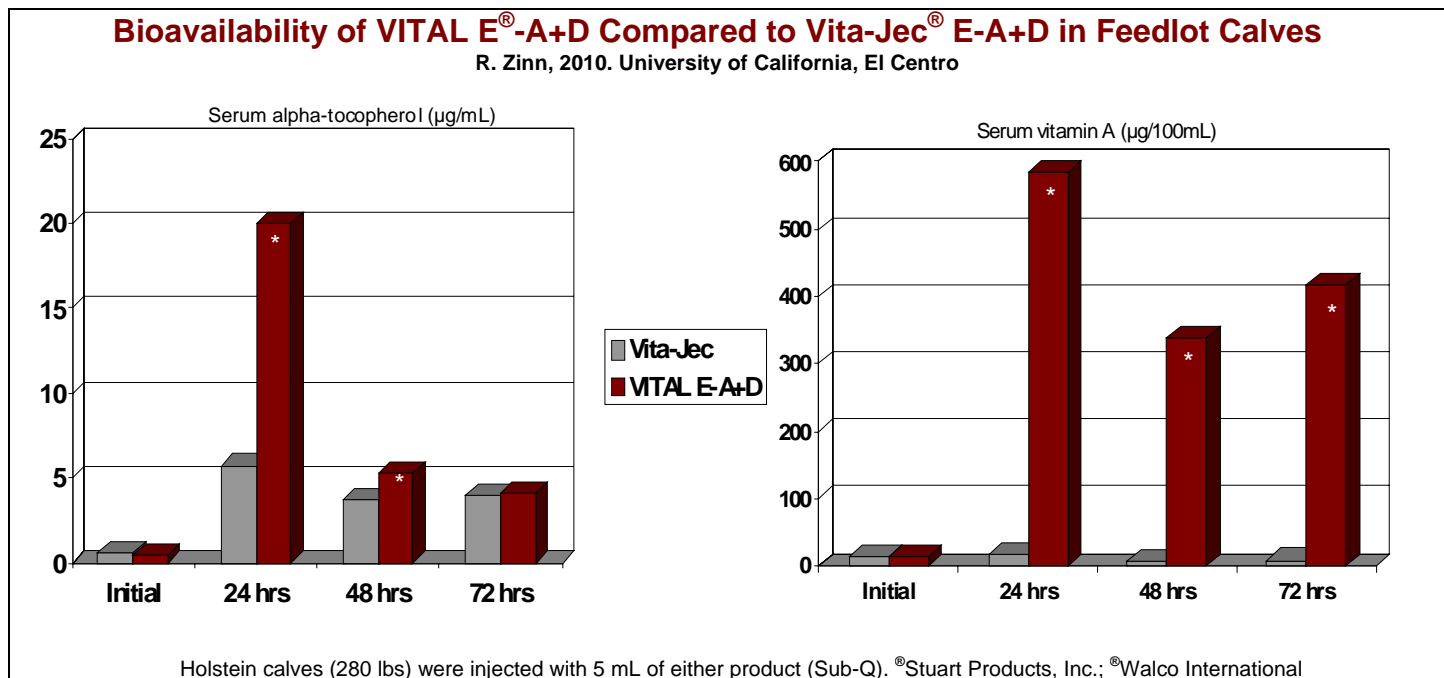
<u>Cattle Type</u>	<u>VITAL E-500</u>	<u>VITAL E-A+D</u>
Cattle previously grazing wheat or lush pasture	Not needed	Not needed
Backgrounded cattle		Yes
Cattle previously grazing plant residue or drought-stricken pastures		Yes
Cattle arriving during winter months from dormant pastures		Yes
Holstein calves	Yes	
Hospital cattle		Yes

**Rationale-** Animals consuming lush pasture prior to feedyard arrival have adequate vitamin status and need no injections. Backgrounded cattle or cattle consuming low-quality forages and grasses would benefit from E, A and D-vitamin injection due to limited vitamin intake. Maas, 2008, Univ. of CA-Davis reported that calves on irrigated pasture had 2.3 times higher serum vitamin E compared to calves on dry, non-irrigated pasture (4.19 vs 1.80). A survey of Holstein calves found that they were vitamin E deficient and vitamin A adequate, thus they only need an injection of vitamin E. Due to the roles of fat-soluble vitamins on immunity, it would be appropriate to inject sick cattle with VITAL E-A+D.

## Are There Differences in Bioavailability Among Products?

Prior to 1989, the injectable fat-soluble vitamin products contained only vitamins A and D. In 1989, Stuart Products launched injectable fat-soluble vitamins with either vitamin E alone or in combination with vitamins A and D (**VITAL E** and **VITAL E-A+D**). The VITAL E-products have been field and university tested in various types of cattle. In 1992, Stuart Products licensed the line to a major animal health company. In the mid-1990's the line was copied and sold under various private labels. The problem with those formulations was that there was **no animal testing** prior to marketing those products. They had identical labels as VITAL E and VITAL E-A+D with the same dosage recommendations as the pioneer products, but **no bioavailability data**.

Shortly after the introduction of the private-labeled products, bioavailability studies were conducted in cattle showing dramatic differences in bioavailability of vitamins E and vitamin A in favor of the **VITAL E** formulations. To confirm that the private-labeled products had not changed formulations over the years, a recent study was conducted showing the same dramatic differences in favor of **VITAL E-A+D** (See Figure). The private-labeled products are still not bioavailable. As can be seen in the figure, VITAL E-A+D dramatically increased vitamin E and vitamin A status compared to the private-labeled product.



## Benefit of Injection vs Dosing

Injecting biologically available sources of fat-soluble vitamins are dramatically better than an equal I.U. oral dose of the vitamin. Lactating cows injected with 4000 I.U. vitamin E (VITAL E-500) compared to an equal I.U. oral dose of synthetic vitamin E had 8.36 times more vitamin E in milk during a 21-day post-treatment collection period. **The 4000 I.U. injection was equivalent to dosing over 33,000 I.U. vitamin E** (Pumfrey et al., 1993 Univ. of Idaho).

Injection offers a quick and dramatic increase in serum tocopherol levels compared to oral supplementation. The  $C_{max}$  for serum alpha-tocopherol is approximately 24 hrs post-injection and the  $C_{max}$  for serum retinol is 48-72 hrs post-injection.

## Conclusion

Previous feeding programs determine whether or not to use injectable fat-soluble vitamins for incoming cattle. Cattle previously grazing lush pasture need no vitamin injections while cattle from other programs may benefit from injections of vitamins A, D and E. Holsteins are typically very low in vitamin E status and adequate in vitamin A status, therefore they only need to be injected with vitamin E.

Just because the label of a private-labeled injectable vitamin product is identical to the original product does not mean that bioavailability is equivalent. Generic pharmaceuticals have similar bioavailability to the pioneer products; however, that is not the case with injectable fat-soluble vitamins.