Effect of selenium source and dose rate on selenium content and speciation in blood, milk and cheese

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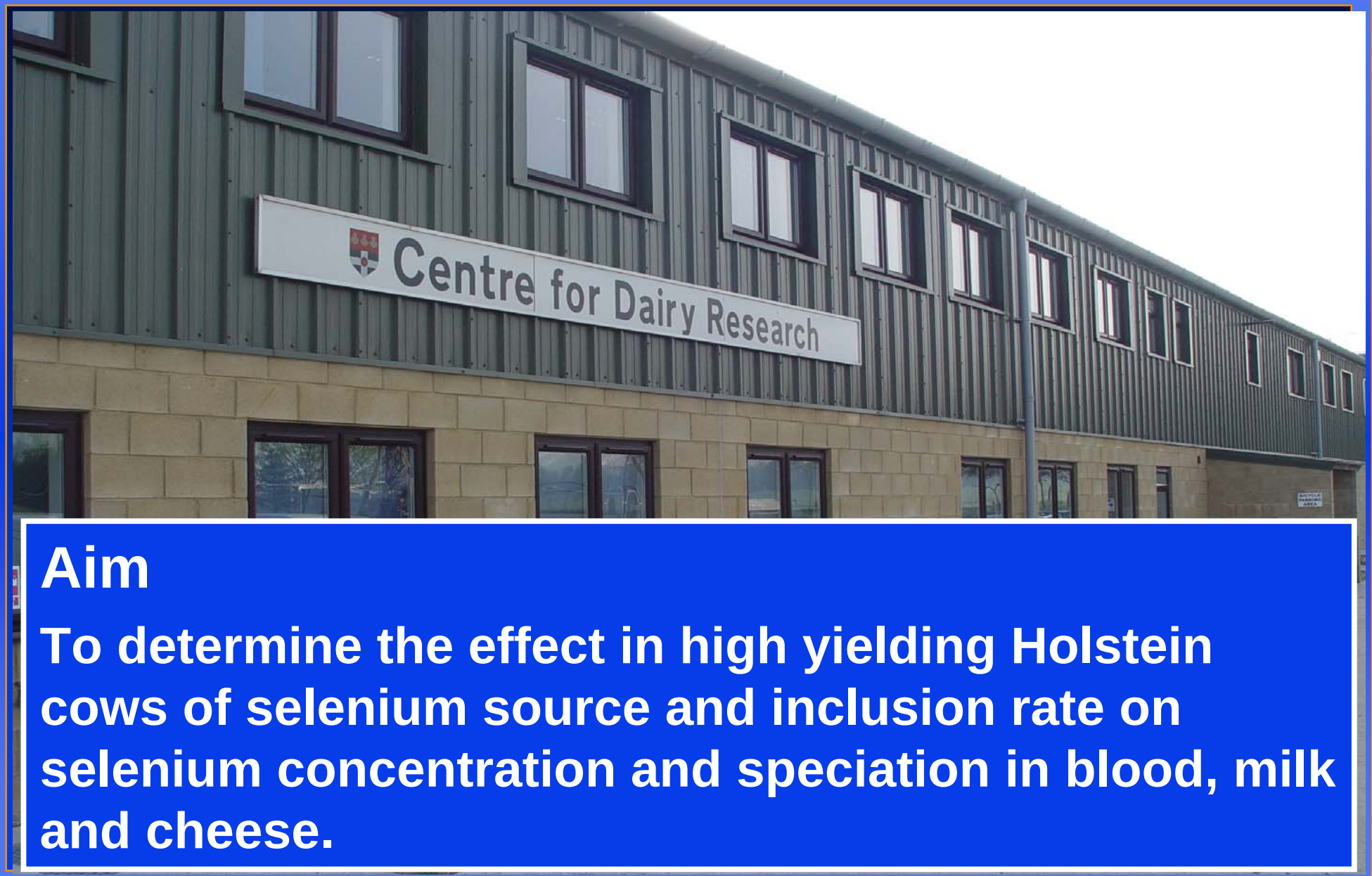
Background

- Selenium (Se) was discovered in 1817
- Associated with toxicity in cattle in the1930's
- Identified as essential nutrient in 1950's
  - Deficiencies linked to a range of health problems in both livestock and humans.
  - Se integral part of selenoproteins (Glutathione peroxidase)
  - Concern in EU that Se intake is half recommended level.
- $Na_2 SeO_3$ and selenized yeast (*S. cerevisiae* CNCM I-3060, Sel-Plex®) now approved for use in livestock in both USA and EU.



Aim

To determine the effect in high yielding Holstein cows of selenium source and inclusion rate on selenium concentration and speciation in blood, milk and cheese.

Materials and Methods

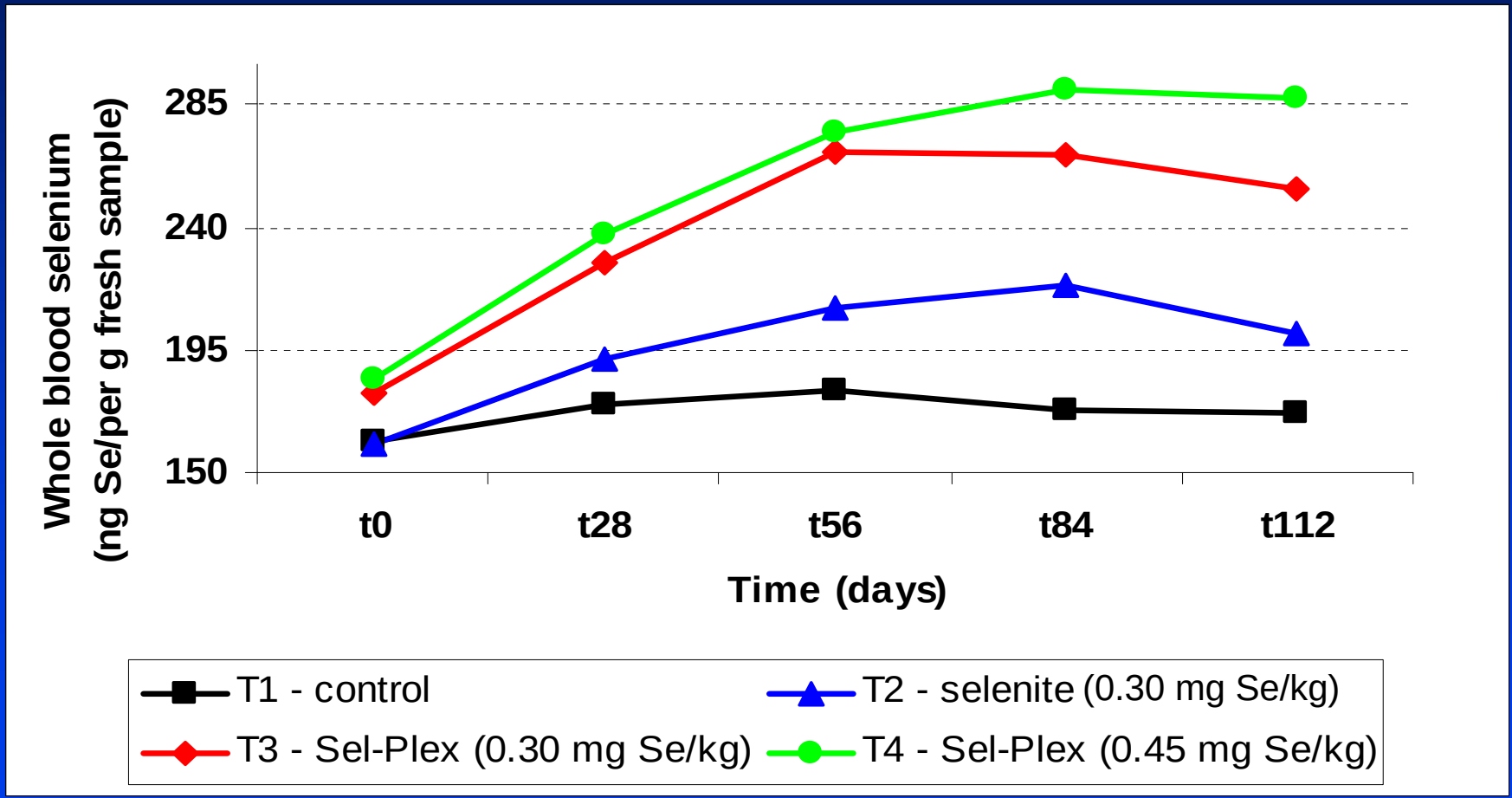
- Cows: 40 multiparous, high-yielding cows
  - Days in milk 77
  - Milk yield averaged 43.6 kg/d.
- Study design: 16-wk continuous design.
- Diet: All cows received the same TMR with the exception of dietary selenium (Se)

Treatment Structure

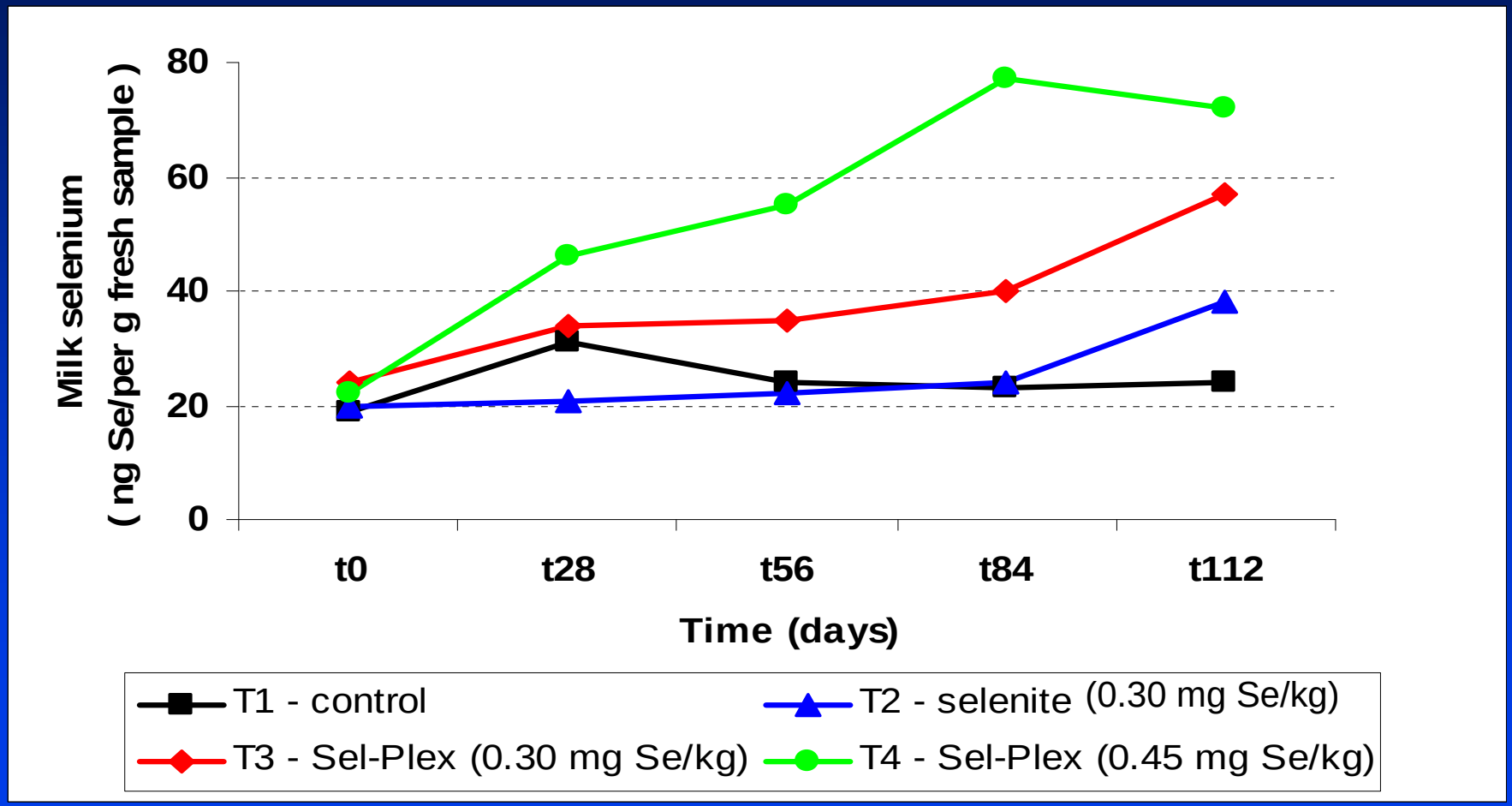
Treatment	Se Supplement	Total dietary Se (mg/kg DM)
T1	No Added Selenium	Background (0.16)
T2	Sodium selenite	0.30
T3	Selenized yeast*	0.30
T4	Selenized yeast*	0.45

Saccharomyces cerevisiae CNCM I-3060: Sel-Plex®

Whole blood total Se (ng/g fresh sample)



Milk total Se (ng/g fresh sample)

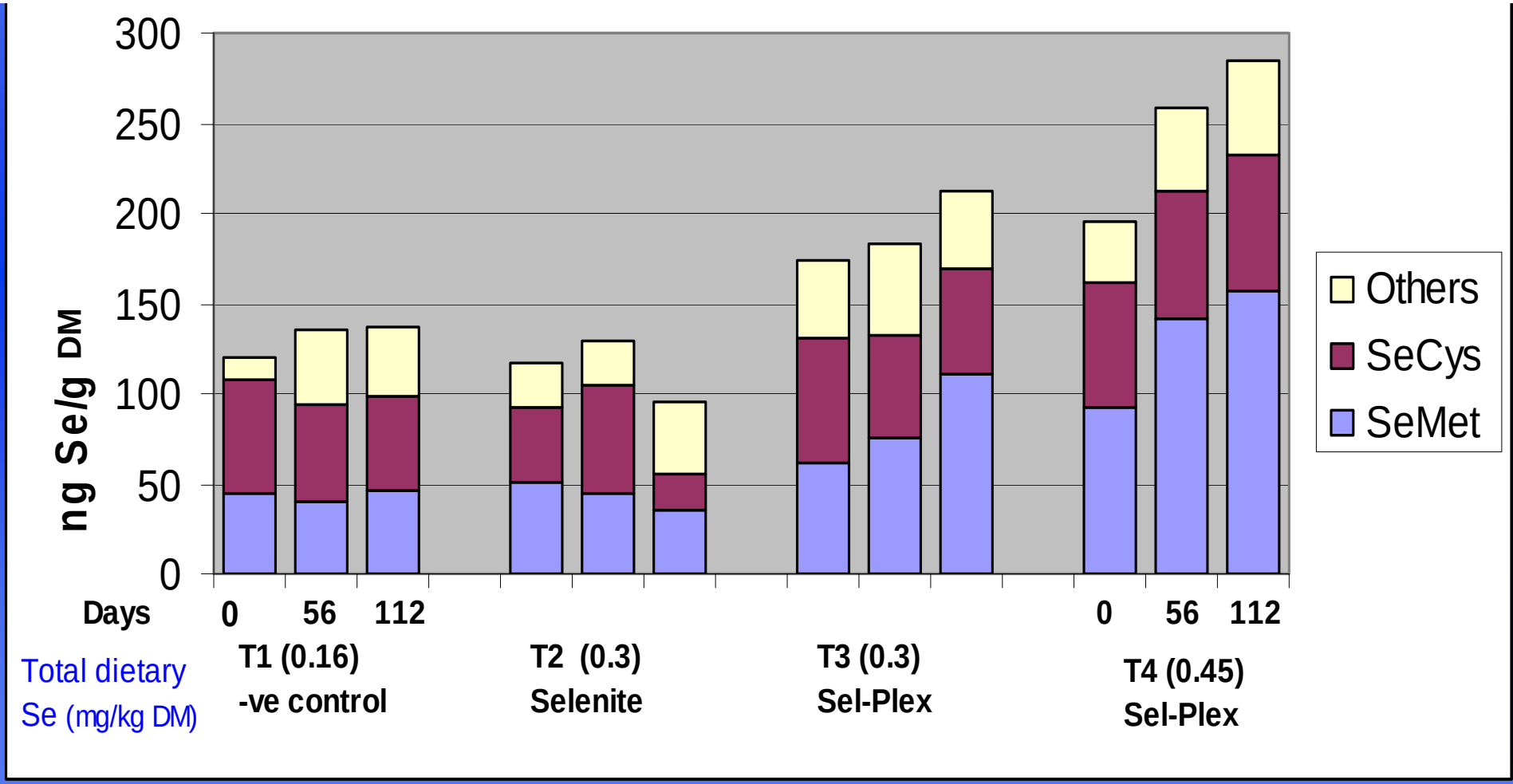


Total Se content in whole blood and milk (ng/g fresh sample) at day 112

mg Se/kg DM	Whole blood	Milk
T1 (0.16)	177	24
T2 (0.30)*	**208**	**38**
T3 (0.30)#	248	57
T4 (0.45) #	279	72
SED	9.4	3.7
Linear effect Sel-Plex (per mg/kg DM)	349*** ± 33.6	165*** ± 13.3

*** Sodium selenite** #Selenized yeast: Sel-Plex®

Selenium Speciation in Milk



Selenium Speciation in Cheese§

Selenium concentration (ng Se/g dry sample)					
mg Se/kg DM	SeMet	SeCys	Other Se	Total Se	Rec %
T1 (0.16)	52	46	59	190	83
T2 (0.30)*	**57**	**52**	**50**	**180**	**88**
T3 (0.30)#	153	92	63	340	91

***Sodium selenite** #Selenized yeast: Sel-Plex®

§ Made from milk at day 112

Conclusions (1)

Replacing Na_2SeO_3 with selenized yeast (Sel-Plex®):

- Increased total Se content in whole blood and milk, and indicates increased bioavailability of Se. All cows remained in excellent health throughout the study.
- Se speciation in milk showed that there were no marked treatment effects on SeCys content but Se source had a marked positive effect on SeMet.
- Increased the total Se, SeMet and SeCys content of cheese from 180 to 340 ng Se/g DM, 57 to 153 ng Se/g and 52 to 92 ng Se/g, respectively.

Conclusions (2)

- The current study has shown that replacing Na_2SeO_3 with Sel-Plex® has markedly improved the quality of both milk and cheese by significantly increasing the total selenium concentration of both foods.

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