



# Comparison of chlortetracycline (CTC) concentrations in feed, plasma, and oral fluids with pathogen MICs in treated commercial swine sites

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## Relevance to Practitioners

- CTC was detected in oral fluids after the medication was no longer present in feeders. In light of the high correlations between oral fluids and plasma levels, oral fluids could be used to monitor treatment and antibiotic residues..
- Cumulative diagnostic laboratory data shows only 44.52% of *Actinobacillus suis* isolates and 3.51% of *Streptococcus suis* had an MIC of  $\leq 1 \mu\text{g/mL}$  for CTC. Among sampled pigs, no plasma values were greater than  $1 \mu\text{g/mL}$ . Feed medication for treatment of certain pathogens is of questionable value.

## Objectives

- Determine drug concentrations of plasma and oral fluids after being on CTC medicated feed
- Determine if correlation exists between feed and plasma CTC concentrations
- Compare drug concentrations in plasma with database of pathogen minimum inhibitory concentrations (MICs) to achieve a general understanding

## Conclusions and Discussion

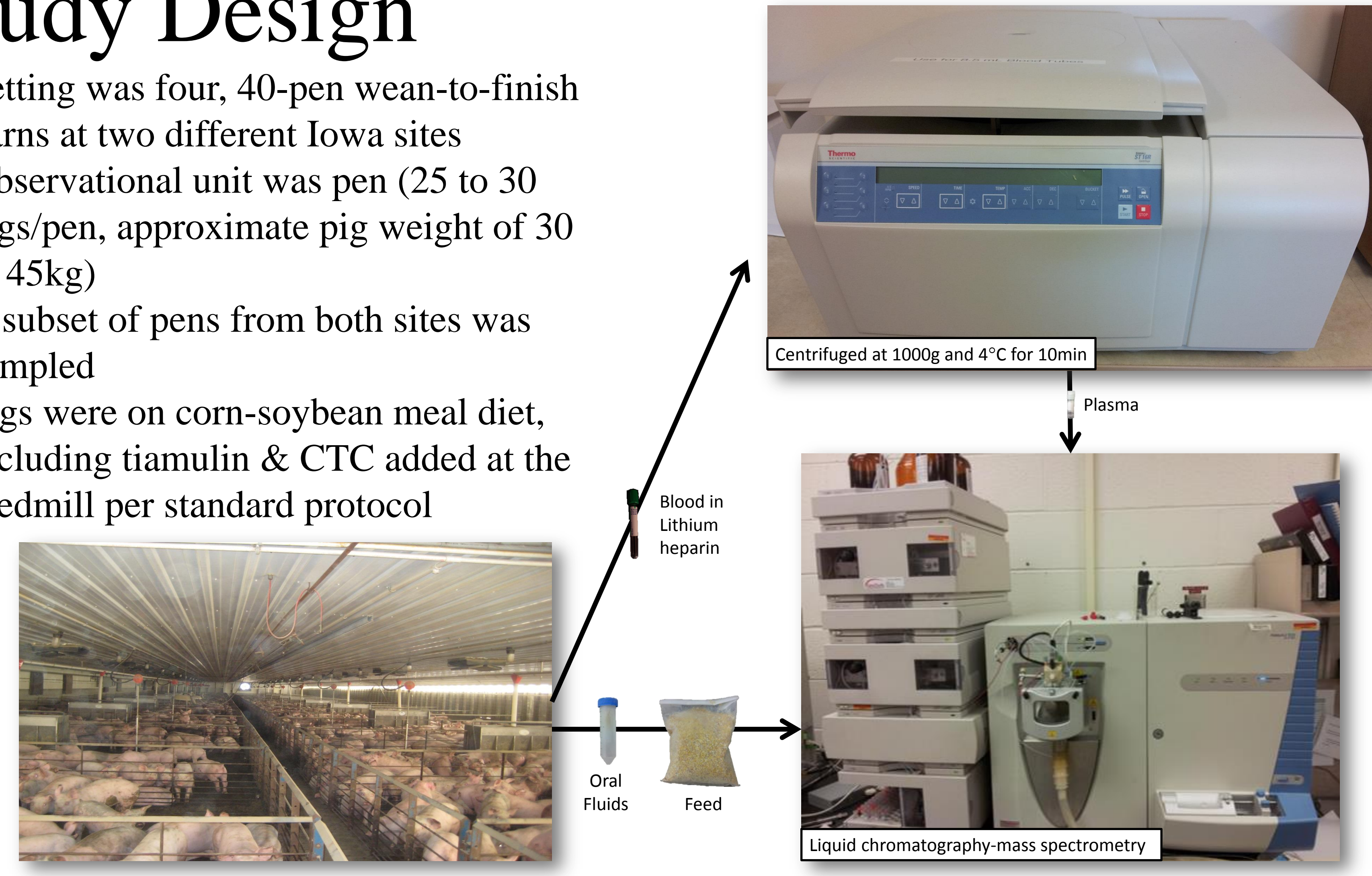
- Descriptive values show great range and difference between and within sample type exists. Consistency of drug levels in feed seems questionable. With plasma levels not exceeding  $1 \mu\text{g/mL}$ , some therapeutic strategies of feed-grade CTC might be questionable.
- A meaningful correlation was observed between plasma and feed CTC concentrations. Though correlated, disparity between feed CTC levels and plasma levels was also evident in regression analysis.
- Comparison of cumulative diagnostic laboratory data show that meaningful percentages of pathogens have MICs above a plausible CTC plasma concentration of  $1 \mu\text{g/mL}$ . This includes 44.52% of *Actinobacillus suis* isolates and 3.51% of *Streptococcus suis* with an MIC of  $\leq 1 \mu\text{g/mL}$  for CTC.

## Continuing Research

- Further work could be done to confirm the observed values from this study. It would be advantageous and judicious to gain a better understanding of antibiotic approaches to treating clinical and subclinical diseases.
- Analogous work with other feed grade medication could be done to determine if similar trends would be observed
- Oral fluid concentrations seemed to persist once CTC was no longer included in feed. Oral fluids might serve as a resource to monitor treatments and drug residues.

## Study Design

- Setting was four, 40-pen wean-to-finish barns at two different Iowa sites
- Observational unit was pen (25 to 30 pigs/pen, approximate pig weight of 30 to 45kg)
- A subset of pens from both sites was sampled
- Pigs were on corn-soybean meal diet, including tiamulin & CTC added at the feedmill per standard protocol



1. Samples collected from each pen included 1) feed samples from the feeder tray, 2) blood from  $\approx 5$  pigs per pen, which was processed for plasma 3) oral fluids from hanging a cotton rope exposed to the whole pen for  $\approx 5$  minutes
2. Samples (feed, plasma, oral fluids) were stored at  $-70^\circ\text{C}$
3. Samples (feed, plasma, oral fluids) were evaluated for concentrations of CTC, tiamulin, and related metabolites using validated liquid chromatography-mass spectrometry (LC-MS)
4. LC-MS outputs were reviewed for descriptive statistics and regression

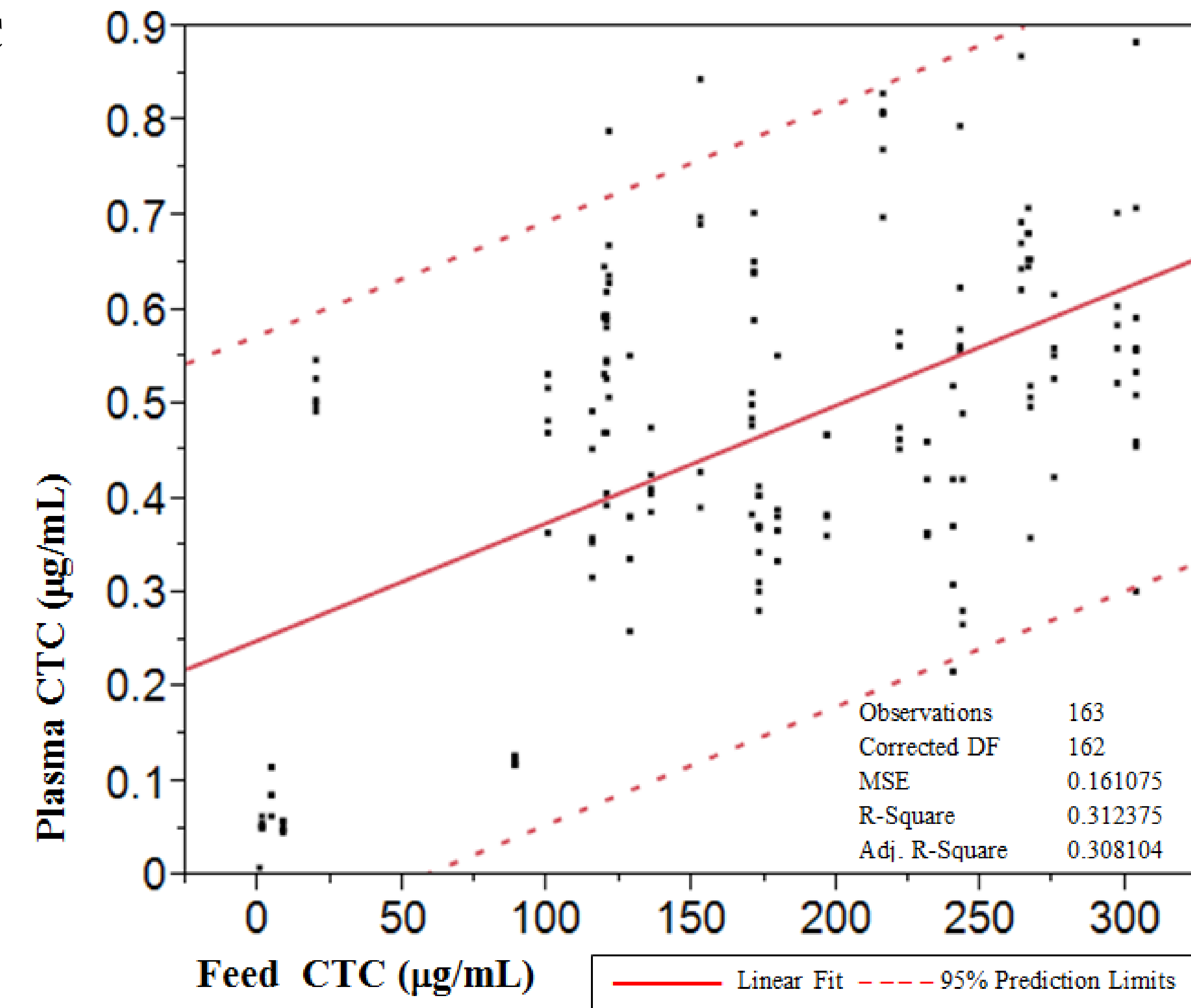
## Results

- Descriptive statistics (Table 1) show the range, mean and standard deviation for CTC concentration ( $\mu\text{g/mL}$ ). Information is provided for all three sample types – feed, plasma, oral fluids. Some pens had rations with CTC no longer included. There were no plasma CTC concentrations  $> 1 \mu\text{g/mL}$ .
- Regression (Figure 1) shows correlation between plasma and feed concentrations.

Table 1. Descriptive statistics for CTC concentrations ( $\mu\text{g/mL}$ )

		Range	Mean concentration	Standard deviation
Pens that had CTC in feed for >5d (n <sub>pens</sub> =29)	<b>Feed</b>	19.8 to 303.4	191.7	90.2
	<b>Plasma</b>	0.27 to 0.83	0.51	0.24
	<b>Oral fluids</b>	3.9 to 16.3	9.1	4.9
Pens where CTC was included but had ended (n <sub>pens</sub> =30)	<b>Feed</b>	0.0 to 88.2	3.4	16.1
	<b>Plasma</b>	<0.01 to 0.02	<0.01	<0.01
	<b>Oral fluids</b>	2.5 to 18.0	7.5	4.5

Figure 1. Bivariate Fit of Plasma CTC by Feed CTC  
Solid regression line defined as PlasmaCTC ( $\mu\text{g/mL}$ ) =  $0.2496989 + 0.0012451 \cdot \text{FeedCTC}$



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