

**Peroxidative protection of parenteral admixture by d- $\alpha$ -tocopherol and its effect on  
oxidative status of obese cats**

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(ABSTRACT)

High lipid : low dextrose (HL:LD) parenteral admixture (PA) is high in polyunsaturated fatty acids (PUFA) that are sensitive to peroxidation. This study evaluated the antioxidative effect of vitamin E in both HL:LD PA and in obese cats given HL:LD PA. Natural d- $\alpha$ -tocopherol (Vital E-300) was added to HL:LD PA at seven concentrations (8, 12, 16, 24, 32, 48, or 64 IU/g of lipid). PA were exposed to fluorescent light for 24 hours at room temperature. Hydroperoxides were measured at baseline and 24 hours hang time. Significantly lower hydroperoxide concentrations were found with > 24 IU/g of lipid at baseline ( $P < 0.01$ ). A higher d- $\alpha$ -tocopherol concentration was required (> 48 IU/g lipid) to lower hydroperoxides at 24 hours ( $P < 0.0001$ ). HL:LD PA with 40 IU/g lipid/day d- $\alpha$ -tocopherol was delivered intravenously to obese cats (PA Toc<sup>+</sup>) over 48 hours. Control cats (PA Toc<sup>-</sup>) received HL:LD PA without a d- $\alpha$ -tocopherol supplementation. Oxidative status of cats was evaluated at baseline and 24, 48, and 96 hours. Cats in both groups exhibited an increase in MDA concentration (time effect;  $P < 0.0001$ ). WBC-tGSH and WBC-GPx did not change in either group of cats. RBC-tGSH and RBC-GPx changed over time (time effects;  $P = 0.0005$ ;  $P = 0.0016$ , respectively) with the PA Toc<sup>+</sup> cats exhibiting a higher RBC-tGSH concentration (treatment x time interaction;  $P = 0.012$ ). Serum  $\alpha$ - and  $\gamma$ -tocopherol concentrations increased in PA Toc<sup>+</sup> cats (treatment effect;  $P < 0.0001$ ). These findings suggest that d- $\alpha$ -tocopherol significantly alters oxidative status *in vivo*.

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## LIST OF ABBREVIATIONS

PA	Parenteral admixture(s)
HL:LD	High lipid : low dextrose
LCT	Long chain triglycerides
MCT	Medium chain triglycerides
PUFA	Polyunsaturated fatty acids
OH <sup>•</sup>	Hydroxyl radical
RO <sup>•</sup>	Alcoxyl radical
ROO <sup>•</sup>	Peroxyl radical
LOO <sup>•</sup>	Lipid peroxyl radical
LOOH	Lipid hydroperoxide
R <sup>•</sup>	Free radical
H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide
O <sub>2</sub> <sup>•-</sup>	Superoxide radical
NO	Nitric oxide
HOCl	Hypochlorous acid
CLA	Conjugated linoleic acid
HPN	Home parenteral nutrition
TBAR	Thiobarbituric acid reactive substances
MDA	Malondialdehyde
SOD	Superoxide dismutase
GPx	Glutathione peroxidase
GSH	Reduced glutathione
tGSH	Total glutathione
GSSG	Oxidized glutathione
GR	Glutathione reductase
RBC	Red blood cell(s)
WBC	White blood cell(s)

ROS	Reactive oxygen species
RNS	Reactive nitrogen species
HNE	Hydroxynonenal
IL-6	Interleukin-6
TNF- $\alpha$	Tumor necrosis factor alpha
iNOS	Inducible nitric oxide synthase
BMI	Body mass index
AscH <sup>-</sup>	Ascorbate (vitamin C)
DHAsc	Dehydroascorbate
$\alpha$ -TOH	Alpha tocopherol
$\alpha$ -TO <sup>•</sup>	Tocopheroxyl radical
$\gamma$ -CEHC	2,7,8-trimethyl-2-( $\beta$ -carboxyethyl)-6-hydroxychroman
$\alpha$ -TTP	Alpha tocopherol transfer protein
TBH	Tert-butyl hydroperoxide
HBSS	Hanks Balanced Salt Solution
NMPI	N-methyl-2-phenylindole
DEXA	Dual energy x-ray absorptiometry
GSC	Gamma-glutamylcysteine synthetase
G6PD	Glucose-6-phosphate dehydrogenase
NADPH	Nicotinamide adenine dinucleotide phosphate