66th EAAP ANNUAL MEETING

INNOVATION IN LIVESTOCK PRODUCTION: FROM IDEAS TO PRACTICE

31 AUGUST - 4 SEPTEMBER 2015
WARSAW, POLAND

PPTimer
20:00

University of Tabriz

Effect of selenium with vitamin E on metabolites, reproductive hormones and performance of *Ghezel* ewe

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1 Introduction

Flushing

Increasing weight

Increasing ovulation rate

Increasing lambing percentage

- Nutrition: Reproductive events from gametogenesis to puberty
- In sheep, follicle populations are very sensitive to nutritional input. Folliculogenesis and ovulation rate can be easily increased by nutritional manipulation.
- Minerals and vitamins

Journal of Animal Physiology and Animal Nutrition

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ORIGINAL ARTICLE

Effects of flushing and hormonal treatment on reproductive performance of Iranian Markhoz goats

H. Daghigh Kia[1], W. Mohamadi Chapdareh[1], A. Hossein Khani[1], G. Moghaddam[1], A. Rashidi[2], H. Sadri[3] and S. Alijani[1]

Small Ruminant Research 126 (2015) 1–8

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journal homepage: www.elsevier.com/locate/smallrumres

Effects of calcium salts of fatty acids (CSFA) with different profiles (ω3 and ω6) during the flushing period on reproductive performance of 'Afshari' ewes

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Effects of using different oil sources in flushing ration and their relationship with some reproductive traits of Markhoz goat

H Daghigh Kia[1], W Mohammadi Chapdareh[2] and A Hossein Khani[1]

Received: November 09, 2013 Accepted: April 05, 2014

The effect of flaxseed and soybean on the diet of flushing of reproductive performance of Moghani sheep out of the breeding season

H Daghigh Kia[1*], Gh Aslani Kordkandi[2], Gh Moghaddam[3], S Alijani[1] and A Hosseinkhani[1]

Received: February 20, 2012 Accepted: September 26, 2012

Effect of fat supplementation in flushing diets on reproductive performance, blood metabolites and hormones in Ghezel breed ewes

H Daghigh kia[1*] and B Rahbar[2]

Received: January 01, 2012 Accepted: April 04, 2012

Selenium

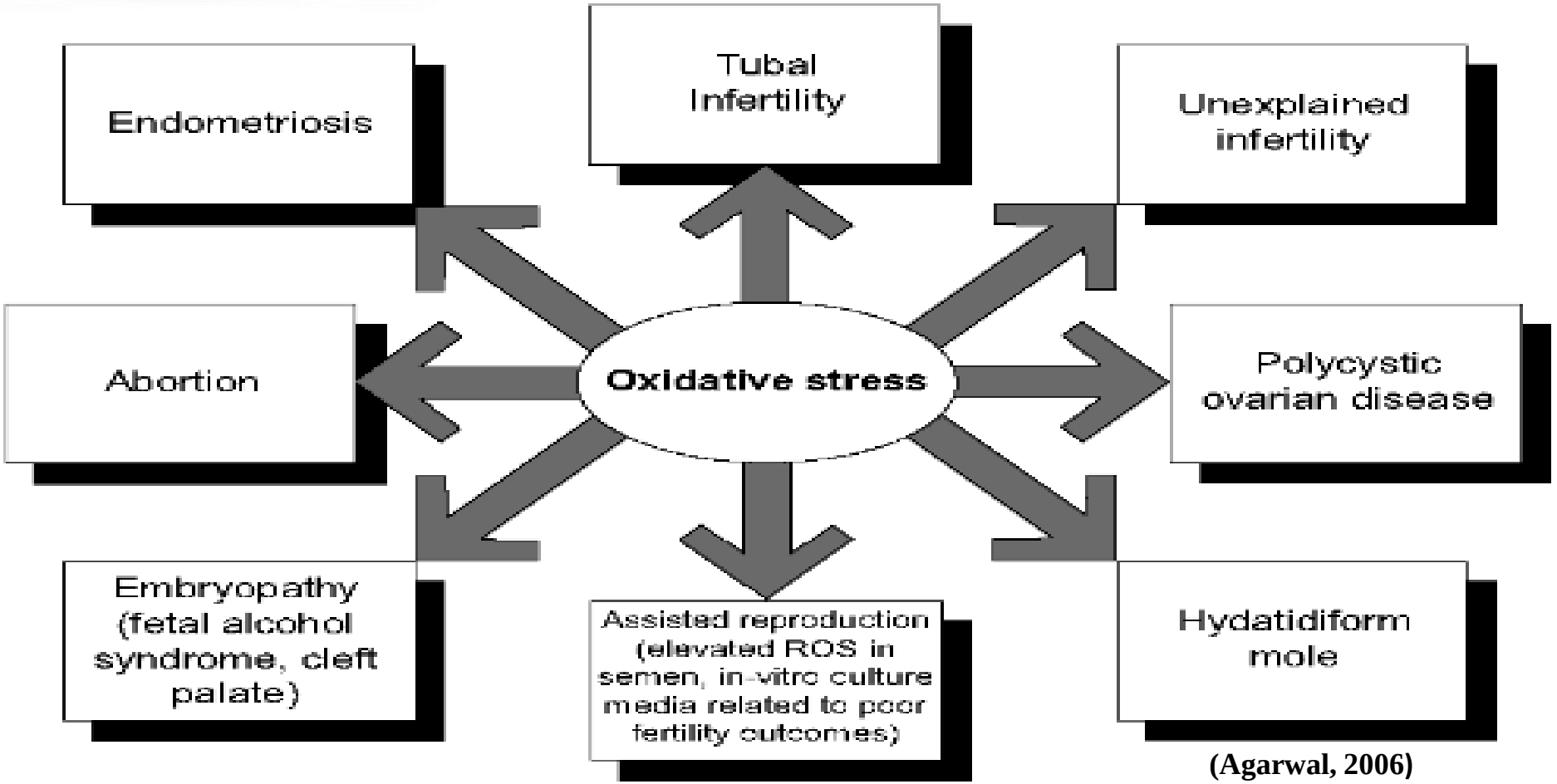
Selenium → Increase ovulation and the number of live embryos.

→ Improves reproduction efficiency

Selenium deficiency
- Placental retention
- Abortion
- ↑ free radicals → Disturb ovulation rate

Free radicals

OH^-, H_2O_2, O_2^-

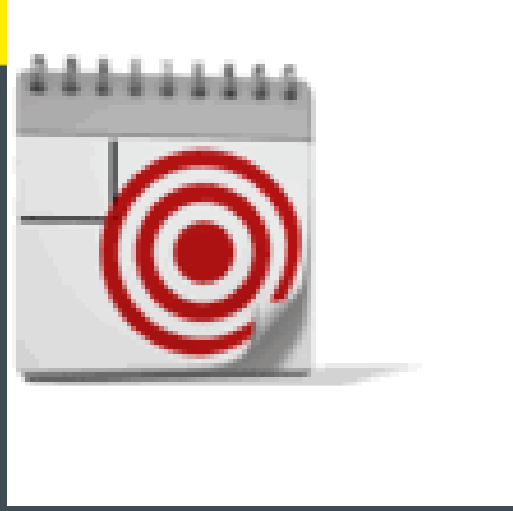


(Agarwal, 2006)

It has been shown that selenium influences granulosa cells and stimulates estradiol-*17β* synthesis and finally increases ovulation and the number of live embryos (Basini & Tamanini, 2000).

As oxidative stress results in luteolysis, antioxidant supplementation, for example vitamin C and vitamin E, has been shown to have beneficial effects in preventing luteal phase deficiency and resultant increased pregnancy rate (Henmi et al. 2003)

OBJECTIVE



- **Organic & inorganic selenium & vitamin E**
- **Reproductive hormones (Estrogen, Progesterone, Insulin) and metabolites**
- ***Ghezel* ewes**

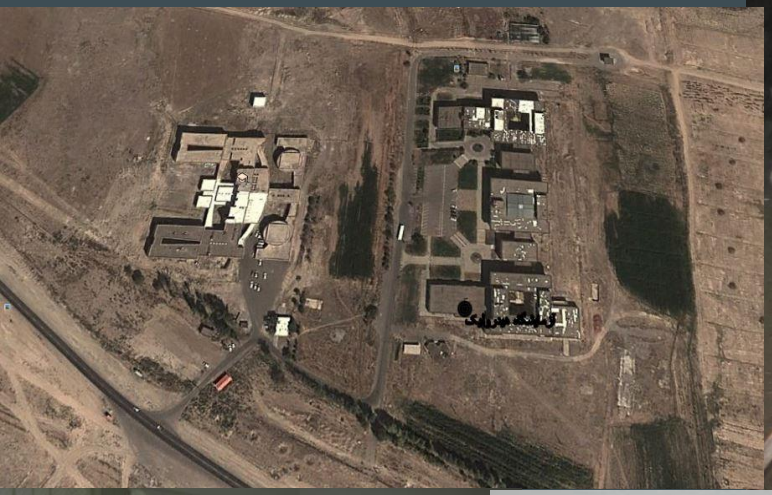
2 Material & methods

CIDR (EAZI-BREED; Pfizer New Zealand Ltd, Auckland,)

44 Iranian *Ghezel* ewes
(55 ± 2 kg),
2 to 3 years old
BCS of 2.5

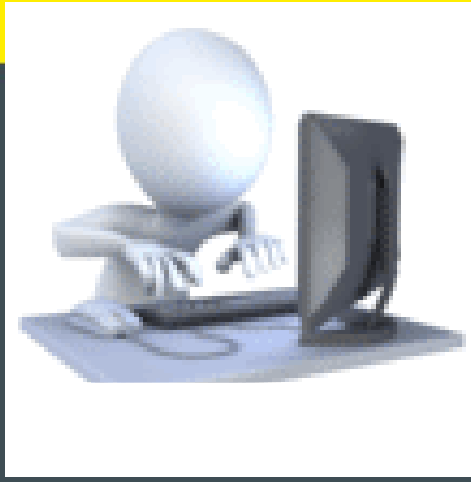
A- Control
B- Barley grain
C- Barley grain + vitamin E + organic selenium
D- Barley grain + vitamin E + inorganic selenium

	Treatment A	Treatment B	Treatment C	Treatment D
Ingredient				
Barley straw (%)	-	**11**	**11**	**11**
Soybean meal (%)	-	**8**	**8**	**8**
Mineral supplements (%)	-	**1**	**1**	**1**
Protein supplements (%)	-	**0.5**	**0.5**	**0.5**
Barley grain (%)	-	**73**	**73**	**73**
Salt (%)	-	**0.5**	**0.5**	**0.5**
Molasses (%)	-	**6**	**6**	**6**
Dietary supplements of vitamin E and selenium per head per day (g)				
Inorganic selenium	-	-	-	**0.0135**
Organic selenium	-	-	**0.135**	-
Vitamin E	-	-	**0.048**	**0.048**
Chemical component				
Total digestible nutrients (%)	-	**78**	**78**	**78**
Crude protein (%)	-	**13.2**	**13.2**	**13.2**
Digestible energy (Mcal/kg)	-	**3.41**	**3.41**	**3.41**
Metabolisable energy (Mcal/kg)	-	**3.01**	**3.01**	**3.01**






Data analysis



- All statistical analyses were conducted using Mixed Proc using SAS software

$$Y_{ijkl} = \mu + treat_i + time_j + (treat * time)_{ij} + type_k + animal_l + e_{ijkl}$$

- GLM → continuous dependent variables
- Logistic → discrete dependent variables.
- Mean comparison of treatments was done by Tukey-Kramer test.

3 Results & Discussion

Estrogen Hormone

Treatment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy	Total estrogen
A	8.09 ± 0.45^{b}	28.98 ± 1.45^{c}	8.63 ± 0.43^{b}	15.24 ± 0.23^{b}
B	7.6 ± 0.49^{b}	33.2 ± 1.59^{b}	8.46 ± 0.47^{b}	16.42 ± 0.61^{b}
C	10.51 ± 0.45^{a}	37.66 ± 1.45^{a}	8.35 ± 0.43^{b}	18.84 ± 0.56^{a}
D	11.33 ± 0.45^{a}	37.43 ± 1.45^{a}	10.2 ± 0.43^{a}	19.66 ± 0.56^{a}

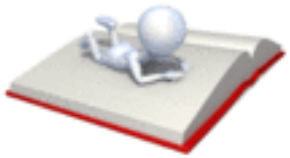
A: control group
B: flushing with barley grain,
C: flushing with barley + Vitamin E + organic selenium
D:flushing with barley + Vitamin E +inorganic selenium

Sen et al, (2011):
Inorganic selenium + vitamin E in Suffolk sheep before ovulation increased estrogen compared to control group.

makkawi et al, (2009):
Selenium and vitamin E → ↑ estrogen secretion because of protecting of gonadotropins receptors against antioxidants and significantly improves fertility

Selenium under in vitro condition improves follicular development in ewes & increases estrogen secretion from cow granulosa cells (Basina and Tamanini, 2000).

Progesterone Hormone



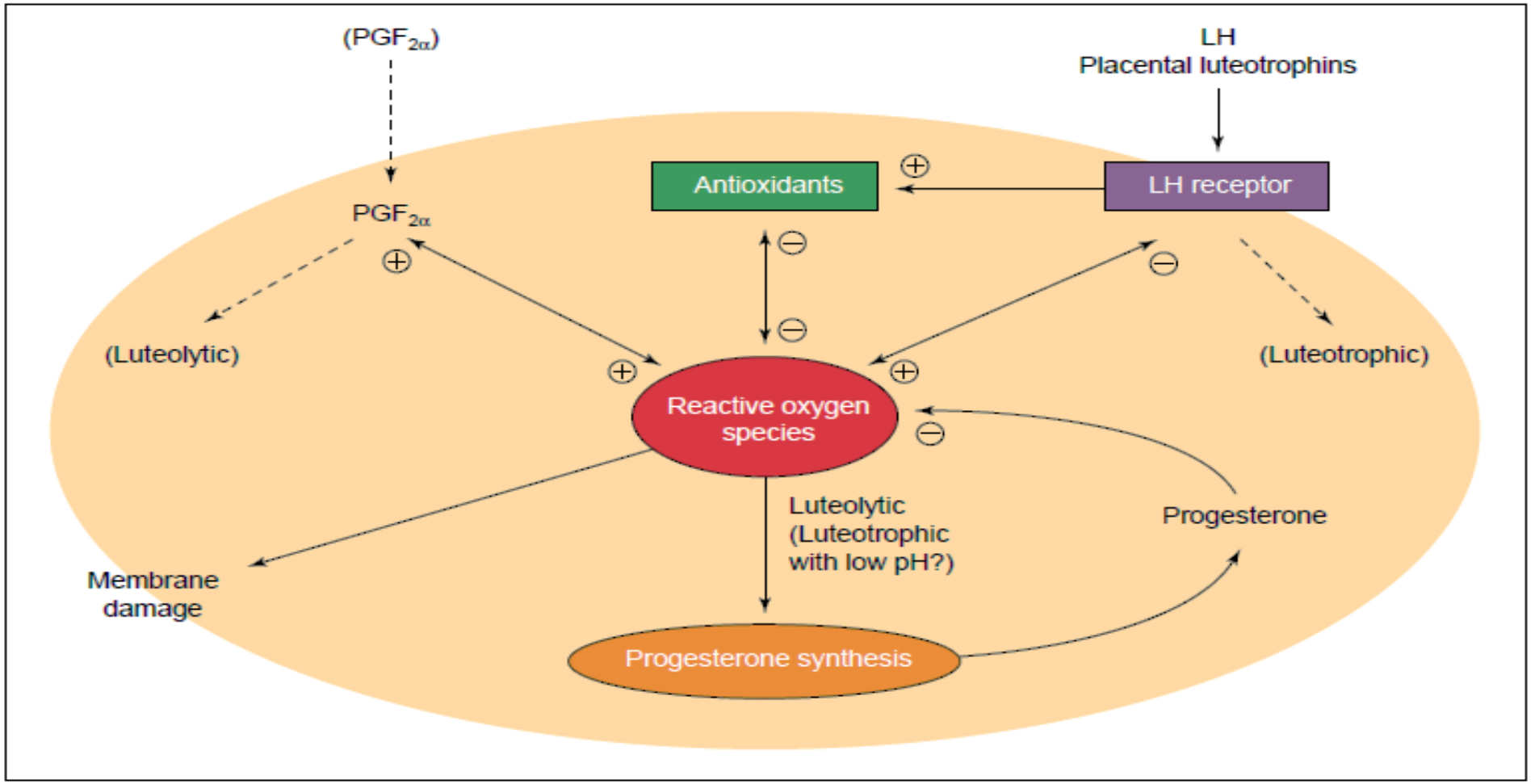
Treatment	Beginning of experiment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy	Total Progesterone
A	1.23±0.07^{a}	1.39±0.09^{b}	0.59±0.08^{b}	3.31±0.13^{c}	1.63±0.64^{c}
B	1.31±0.07^{a}	1.43±0.09^{ab}	0.87±0.09^{a}	4.11±0.15^{b}	1.93±0.67^{b}
C	1.34±0.06^{a}	1.68±0.08^{a}	0.64±0.08^{ab}	5.12±0.13^{a}	2.19±0.61^{a}
D	1.35±0.06^{a}	1.69±0.08^{a}	0.69±0.08^{ab}	5. 2±0.13^{a}	2.23±0.61^{a}

A: control group
B: flushing with barley grain,
C: flushing with barley + Vitamin E + organic selenium
D:flushing with barley + Vitamin E +inorganic selenium

↑ dietary selenium during mating and pregnancy → ↑ serum progesterone concentration of ewes (50, 90, 106 days of pregnancy) leading to fetal protection (Lekatz et al., 2009)

pregnancy rate increased 1.44% with increasing 1 ng of plasma progesterone (Staples et al, 1998).

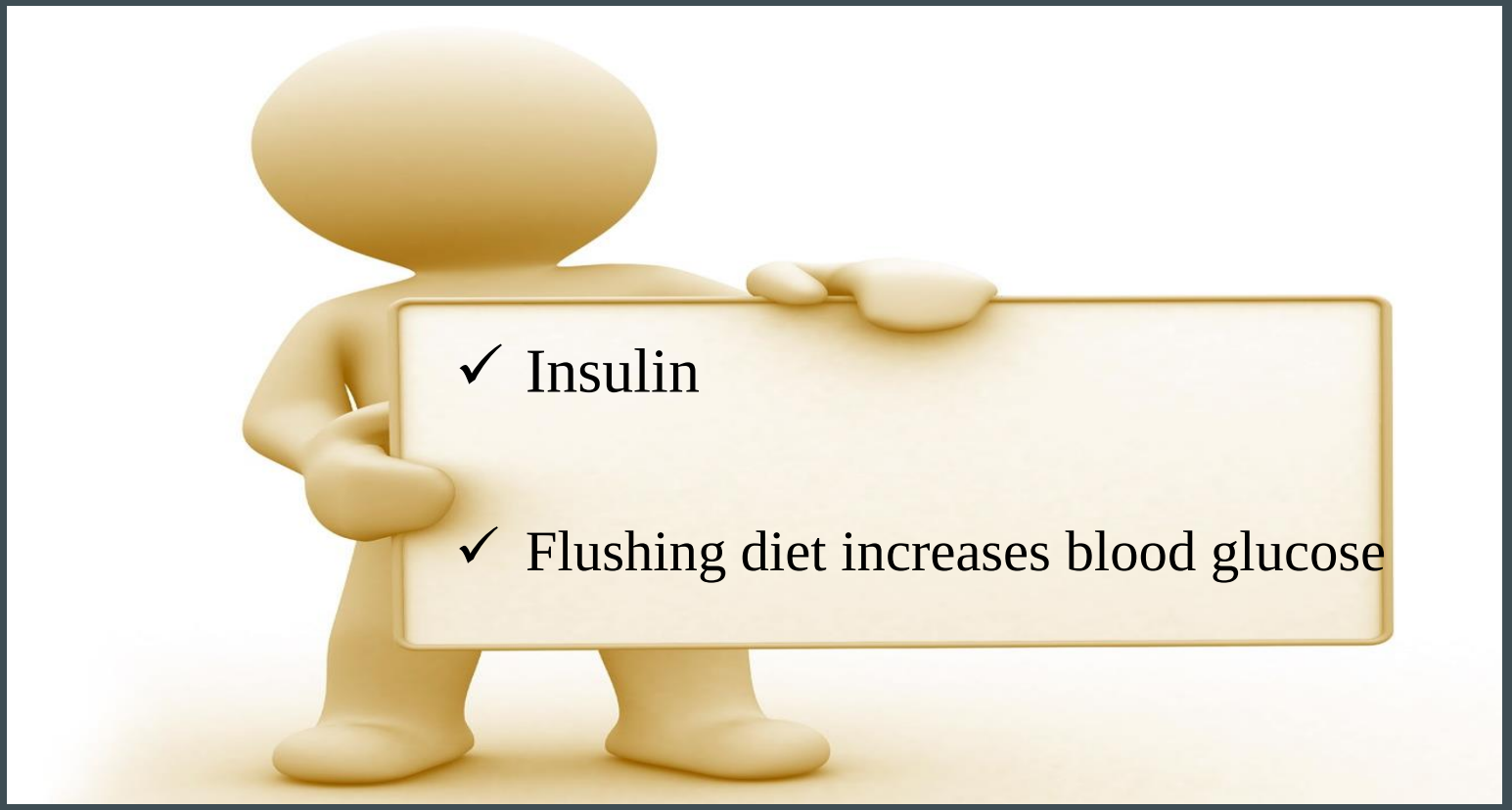
Grazul-bilska et al, (2014) showed that using organic selenium in ewes diet decreases progesterone concentration


(PGF2α)
LH
Placental luteotrophins
Antioxidants
LH receptor
PGF2α
(Luteolytic)
(Luteotrophic)
Reactive oxygen species
Luteolytic (Luteotrophic with low pH?)
Progesterone
Membrane damage
Progesterone synthesis

Insulin

Treatment	Beginning of experiment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy	Total Insulin
A	0.47±0.01^{a}	0.48±0.01^{b}	0.55±0.02^{b}	0.41±0.02^{b}	0.48±0.01^{b}
B	0.45±0.01^{a}	0.50±0.01^{b}	0.58±0.03^{b}	0.47±0.01^{a}	0.51±0.01^{a}
C	0.47±0.01^{a}	0.59±0.01^{a}	0.66±0.02^{a}	0.54±0.02^{a}	0.56±0.12^{a}
D	0.46±0.01^{a}	0.55±0.01^{ab}	0.74±0.02^{a}	0.56±0.02^{a}	0.58±0.12^{a}

A: control group
B: flushing with barley grain,
C: flushing with barley + Vitamin E + organic selenium
D:flushing with barley + Vitamin E +inorganic selenium



Antioxidants (selenium and Vit E) → Increase insulin

→ Increase ovulation rate

Glucose

Treatment	Beginning of experiment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy
A	58.40±1.13	57.40±1.04^{c}	56.64±1.04^{d}	54.80±1.04^{c}
B	57.46±1.07	63.20±1.04^{b}	66.00±1.04^{c}	61.60±1.04^{b}
C	59.01±1.04	66.40±1.04^{a}	69.20±1.04^{a}	65.80±1.04^{a}
D	58.19±1.09	67.91±1.04^{a}	71.80±1.04^{a}	66.80±1.04^{a}

- Selenium ⇨ thyroxin and thyroid for metabolism regulation (hefnawy & tortora-perez, 2010).
- Thyroid hormone ⇨ ↑ gluconeogenesis ⇨ ↑ serum glucose concentration (brenta, 2011).

Cholesterol

Treatment	Beginning of experiment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy
A	66.25±0.84	67.00±0.92^{c}	69.40±0.92^{d}	70.00±0.92^{c}
B	66.17±0.63	73.00±0.92^{b}	74.15±0.92^{c}	83.00±0.92^{c}
C	66.10±0.27	93.40±0.92^{a}	95.32±0.092^{a}	90.20±0.92^{a}
D	66.40±0.71	92.80±0.92^{a}	93.00±0.92^{b}	89.40±0.92^{a}

Ziaei (2014) showed that selenium and vitamin E supplementation have significant effect on lipoprotein profiles and plasma cholesterol of Raeini goats

Baiomy & suliman (2012) showed that interactions between vitamin E and selenium inhibit fatty acids oxidation, so decreases plasma cholesterol.

BUN

Treatment	Beginning of experiment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy
A	17.19±0.60	17.10±0.60^{c}	18.84±0.60^{c}	18.36±0.60^{b}
B	17.64±0.60	21.60±0.60^{b}	21.06±0.60^{a}	21.18±0.60^{a}
C	17.07±0.60	19.68±0.60^{a}	20.30±0.60^{ab}	20.48±0.60^{a}
D	17.36±0.60	19.38±0.60^{a}	19.88±0.60^{b}	21.62±0.60^{a}

El-shahat & abdel monem (2011) that reported selenium and vitamin E supplementation as a mixture did not have significant effect on blood urea level

Increasing urea may increase energy consumption for ureagenesis. Increasing BUN through decreasing uterine pH leads to $PGF_{2\alpha}$ releasing and pregnancy failure and decreasing of ovulation rate (scaramuzzi et al, 2006).

Total Protein

Treatment	Beginning of experiment	24 hours before CIDR removal	Estrus	Day 21 of pregnancy
A	7.28±0.15	7.31±0.14[a]	7.66±0.14[b]	8.26±0.14[b]
B	7.31±0.15	8.91±0.14[a]	8.14±0.14[a]	9.00±0.14[a]
C	7.01±0.15	8.44±0.14[a]	8.12±0.14[a]	9.38±0.14[a]
D	7.53±0.15	8.72±0.14[a]	8.89±0.14[a]	9.21±0.14[a]

Selenium and vitamin E supplementation as a mixture

↓

↑ blood total protein, albumin and globulin compared

Ziae (2014) abdel monem (2011)

↑↓ Total protein

↑ reproduction efficiency as changing mating season to an earlier time,

↓ unfertile ewes,

↓ estrus and lambing birth weight

Effect of experimental treatments on fertility and frequency rate in *Ghezel* ewes

Treatment	Total offspring	Fertility (%)	Twining (%)	Lambing rate (%)	Herd reproduction (%)
A	12	100	9	109	109
B	11	72.7	37.5	137.5	100
C	15	100	36.4	136.4	136.4
D	14	100	40	140	140

- Makkawi et al, (2009) on Awassi sheep which showed that vitamin E supplementation increases lambing and fertility rate.
- Van Niekerk et al, (1996) showed that using selenium supplementation in synchronized ewes decreases lambing rate to 19% which is in contrast to the results of this study.

Daily weight gain

Variables	Birth weight	Daily weight gain (to 30 days)
A	4.05 ± 0.05^{c}	89.91 ± 2.48^{c}
B	4.26 ± 0.05^{b}	100.62 ± 2.2^{b}
C	4.52 ± 0.04^{a}	123.08 ± 1.73^{a}
D	4.44 ± 0.04^{a}	123.2 ± 1.85^{a}

- The study on polish merino ewes showed that sodium selenite increases birth weight of lambs (Balicka-ramisz et al,. 2006).
- On the other hand, it is demonstrated that Selenoproteins increases conversion of T4 to T3, so affects the metabolism of mother and fetus and finally increases fetus weight (Pappas et al, 2008).
- However, in another study selenium did not have significant effect on birth weight (Sanchez et al, 2008).
- Selenium and Vit E increases daily weight gain of merino lambs (Gabryszuk & Klewiec 2002) .

CONCLUSION

- The results of the present study showed that, supplementation of Se and Vit E improved reproductive efficiency especially percent of lambing, fertility and herd proliferation in Ghezel sheep.

- Using organic or inorganic selenium and Vit E in flushing diet before mating has increased some reproductive hormones (Estrogen, Progesterone and Insulin) and blood metabolites, so improved reproductive efficiency in ghezel sheep.

- Increase in hormones level improves ovaries performance, follicles growth and steroidogenesis activity of ovaries, so increased ovulation rate and finally improved twinning, fertility rate and numbers of progeny.

Thanks for your attention!