



Monitoring of the physiological and behavioral stress response of Holstein calves following mixing prior to marketing

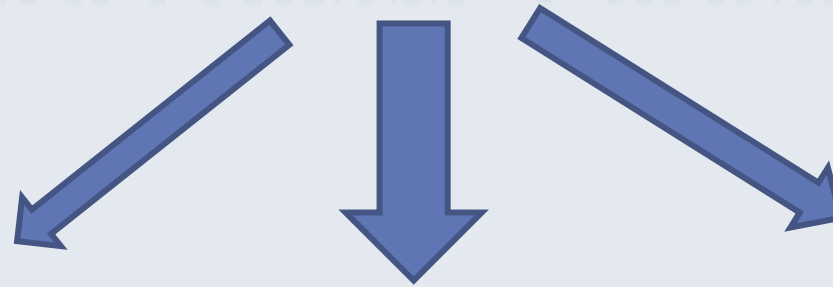
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STRESS FOLLOWING GROUP MIXING



welfare

**Meat
quality**

productivity

**How can we reduce stress-related
negative effects?**

Introduction

- Beef cattle in Israel are reared until the age of 12-14 months.
- During cattle rearing stress-full events may decrease meat quality by interfering with proper meat acidification, and negatively affect the organoleptic properties of the meat (color, flavor, juiciness).



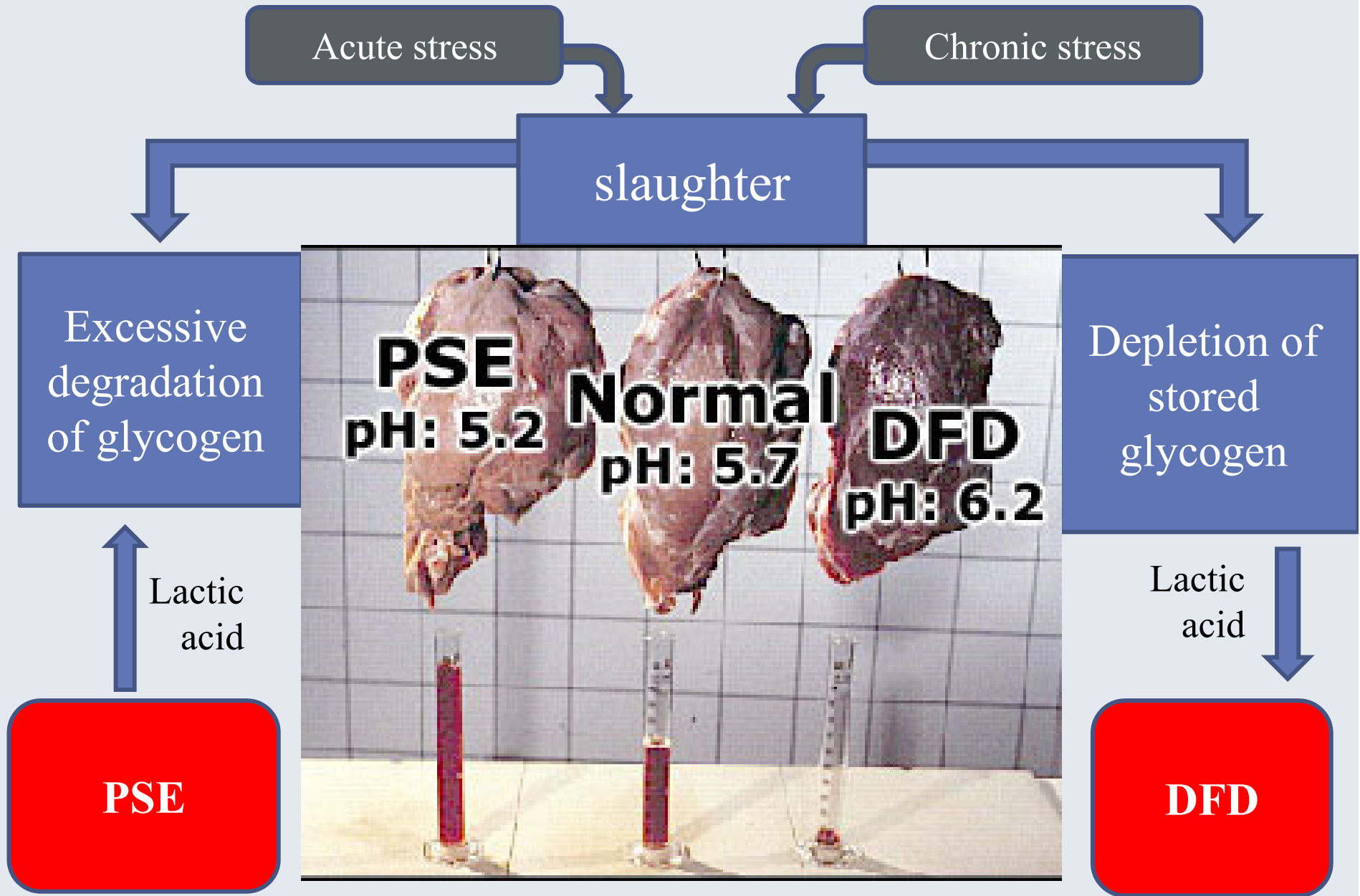
Stress inducing events

Acute stress:

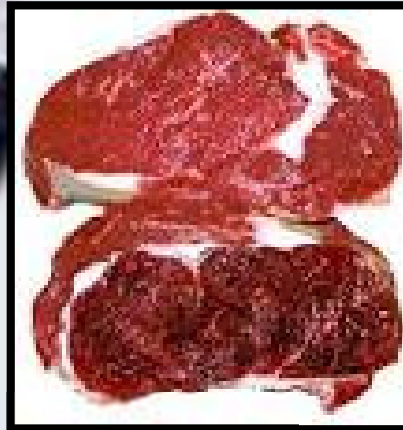
Loading, transportation, crowdedness, mixing, starvation, close contact with man.



Deleterious effect of stress on the meat



Incidence increases (Warriss, 2000) and ranges between 10-30%, but can reach up to 60% (Adzitey and Nurul, 2011).



What is the consumer preference?

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**Estimated annual loss of 20 million \$
(Cassell et al., 1991).**



A major cause of Dark Cutting Beef is mixing unfamiliar animals, thus promoting agonistic behavior in young bulls.

The abattoir requested for homogenous group assembling at least 3 weeks before marketing



Study objectives

1. how can we monitor the behavioral and physiological effects of mixing in an objective and continuous manner?

2. Are 34 days prior to marketing enough in order to reduce mixing effects?



Experimental design

- 22 calves were reared between the ages 7-15 months, in groups of three in 9m² pens.
- 34 days prior to marketing calves were mixed from triplets into 2 groups.
- Weight measurements were performed once monthly, 1 day before mixing (DBM), 3 and 33 days post mixing (DPM).
- Calves were monitored for rumination, activity, metabolic and oxidative stress responses.
- Meat pH levels were measured 24 hours after slaughter.

Sensor monitoring

- Leg-activity (Pedometer PlusTM, AfiFarm[®])



- Neck-activity (Hi-TagTM, SCR Engineers)



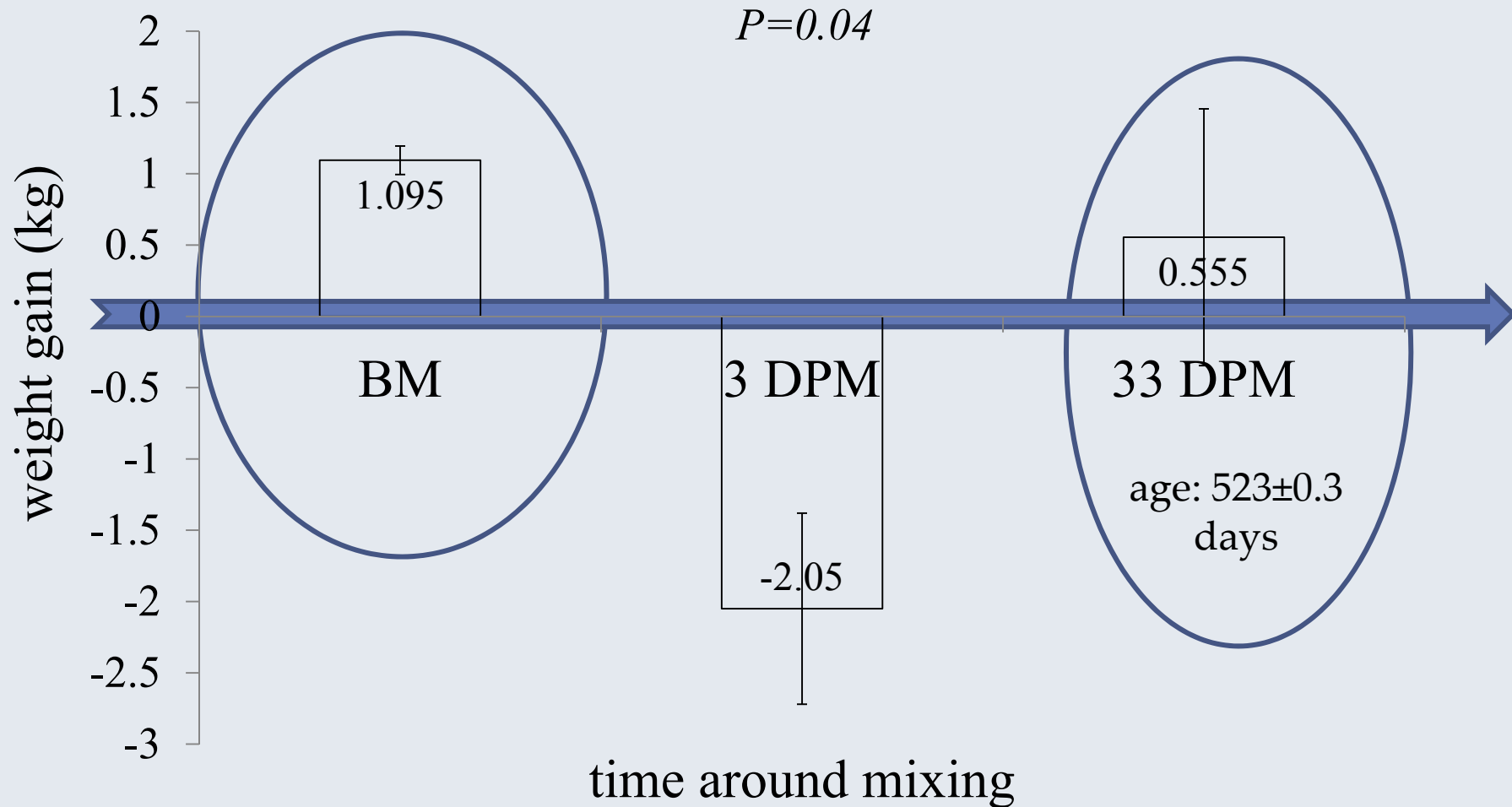
- Ruminant duration (SCR)



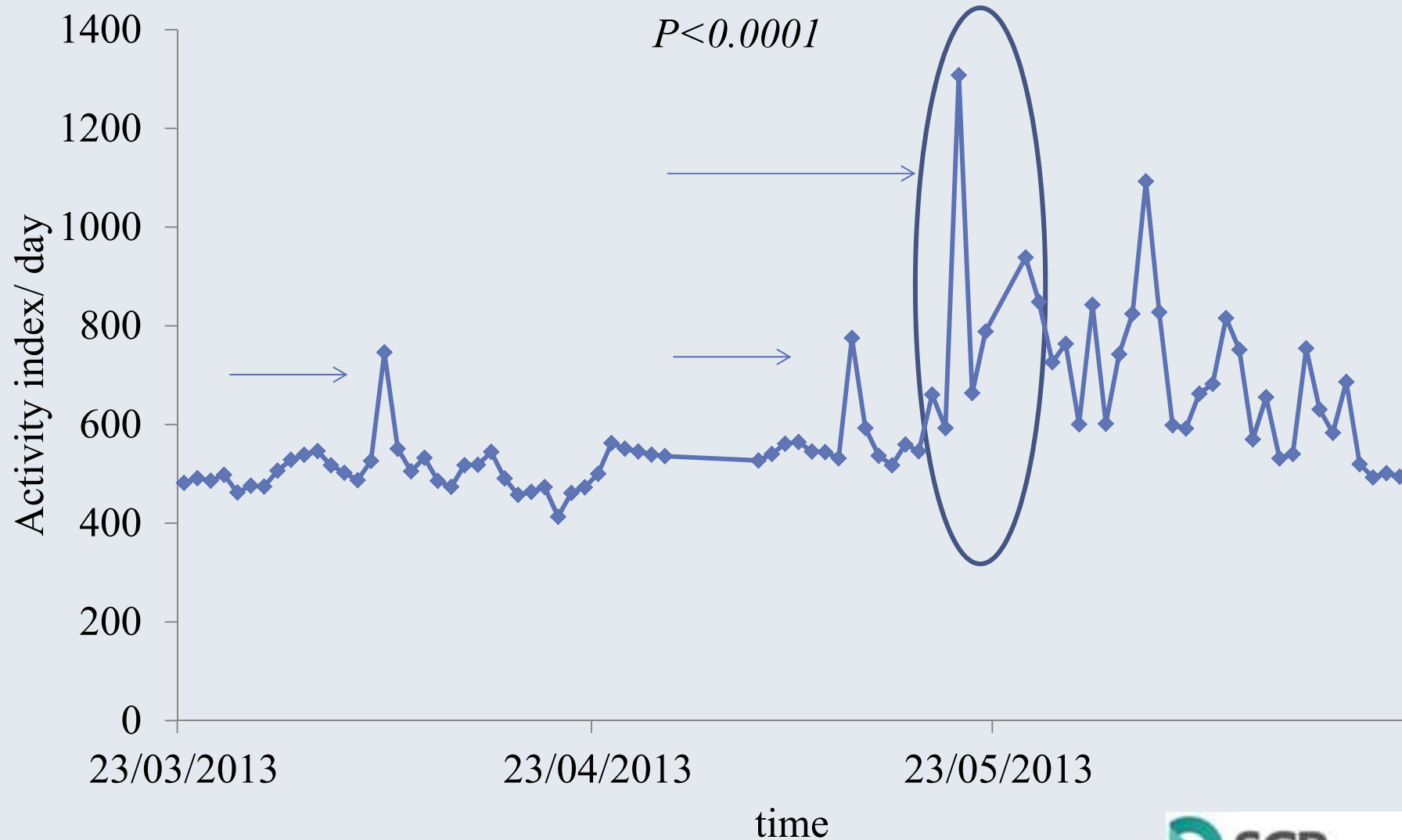
Combination of sensors

RESULTS

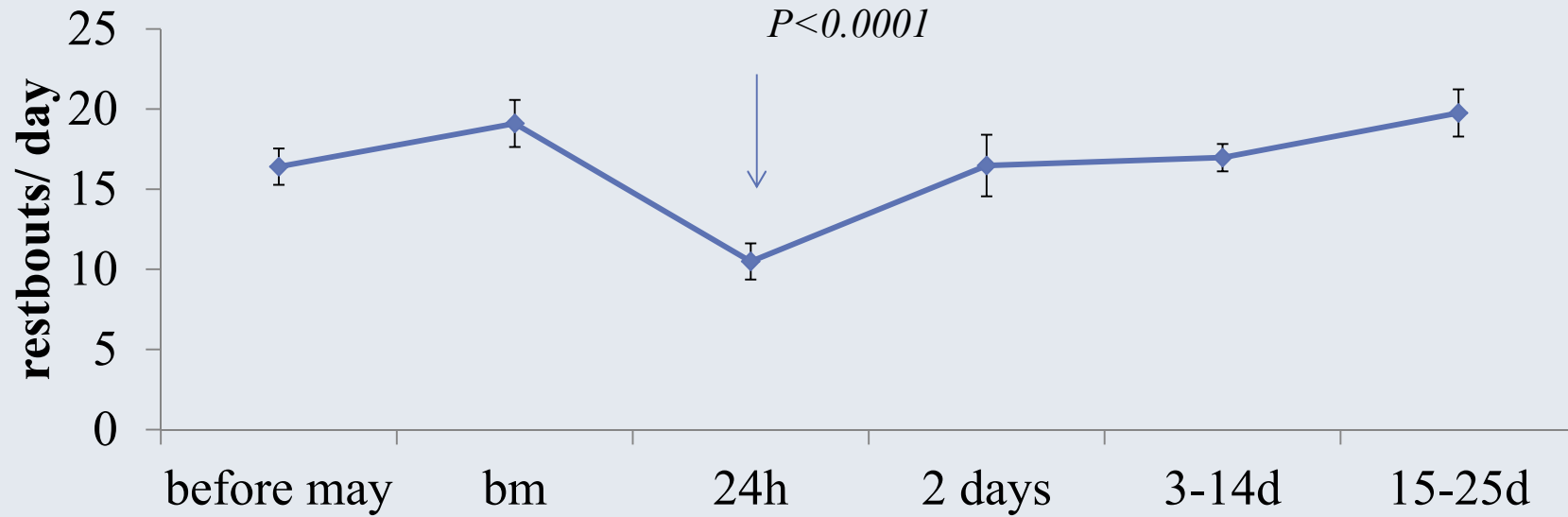
1. Effect of mixing on weight gain



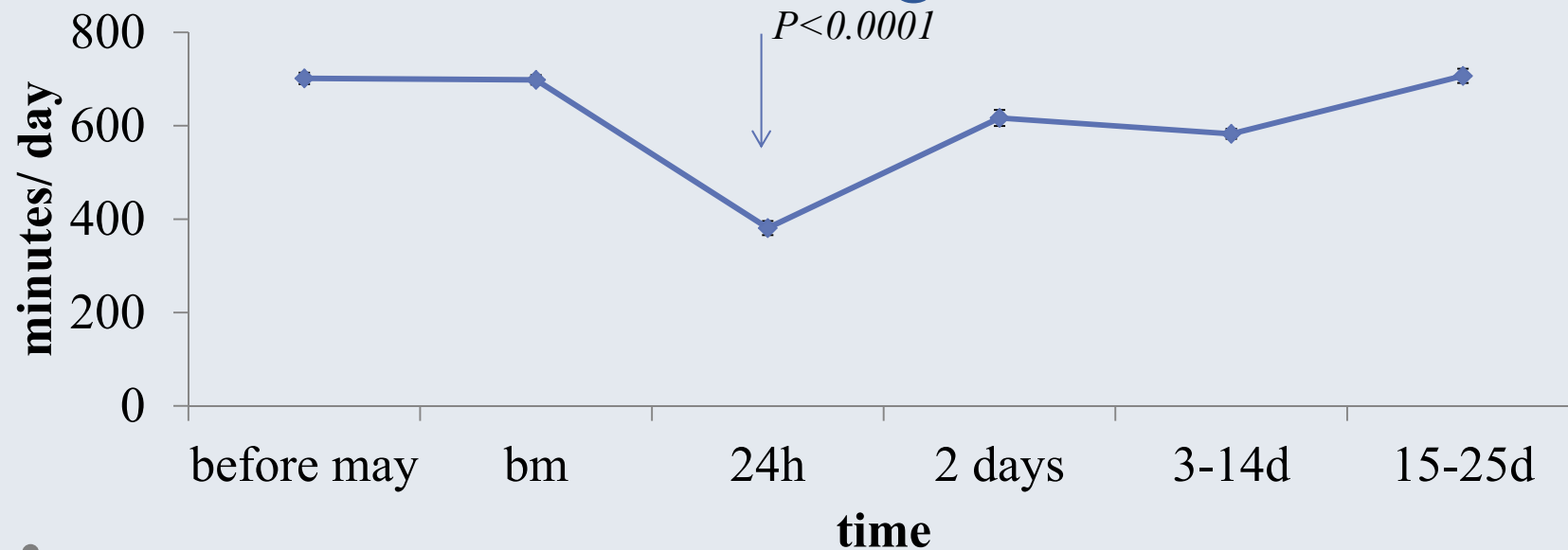
3. Effect of mixing on neck-activity



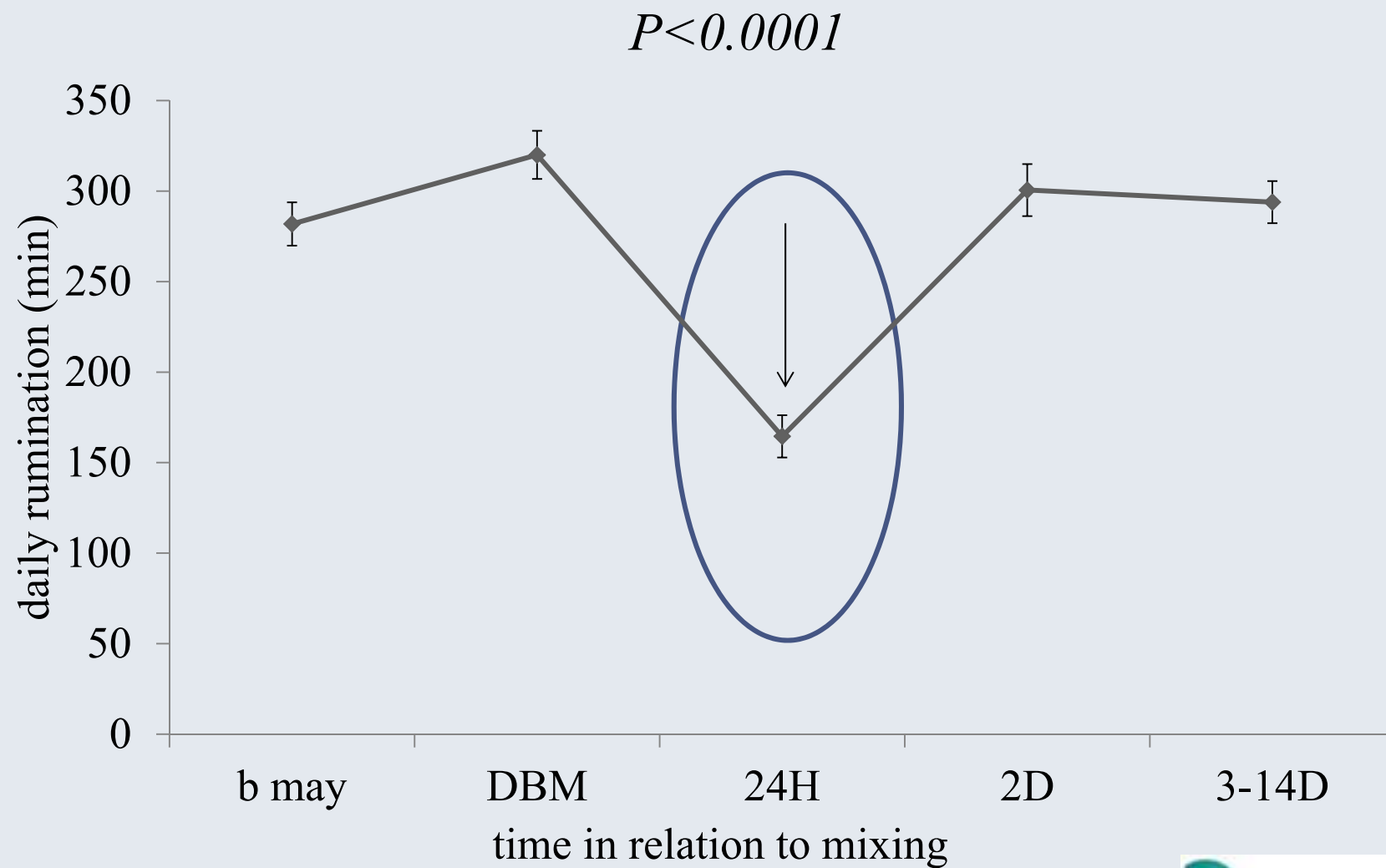
4. Effect of mixing on rest-bouts



5. Effect of mixing on rest time

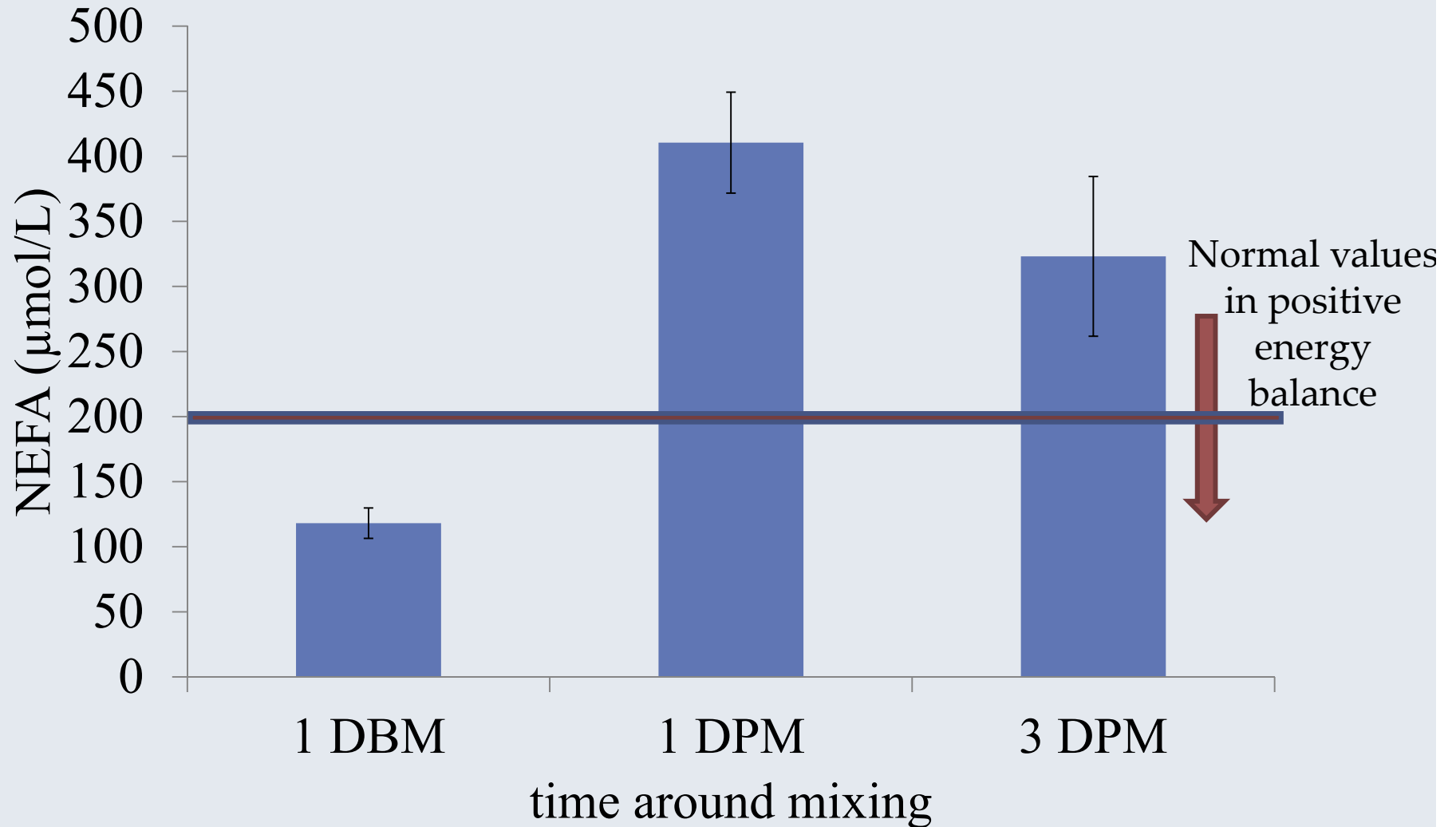


6. Effect of mixing on rumination

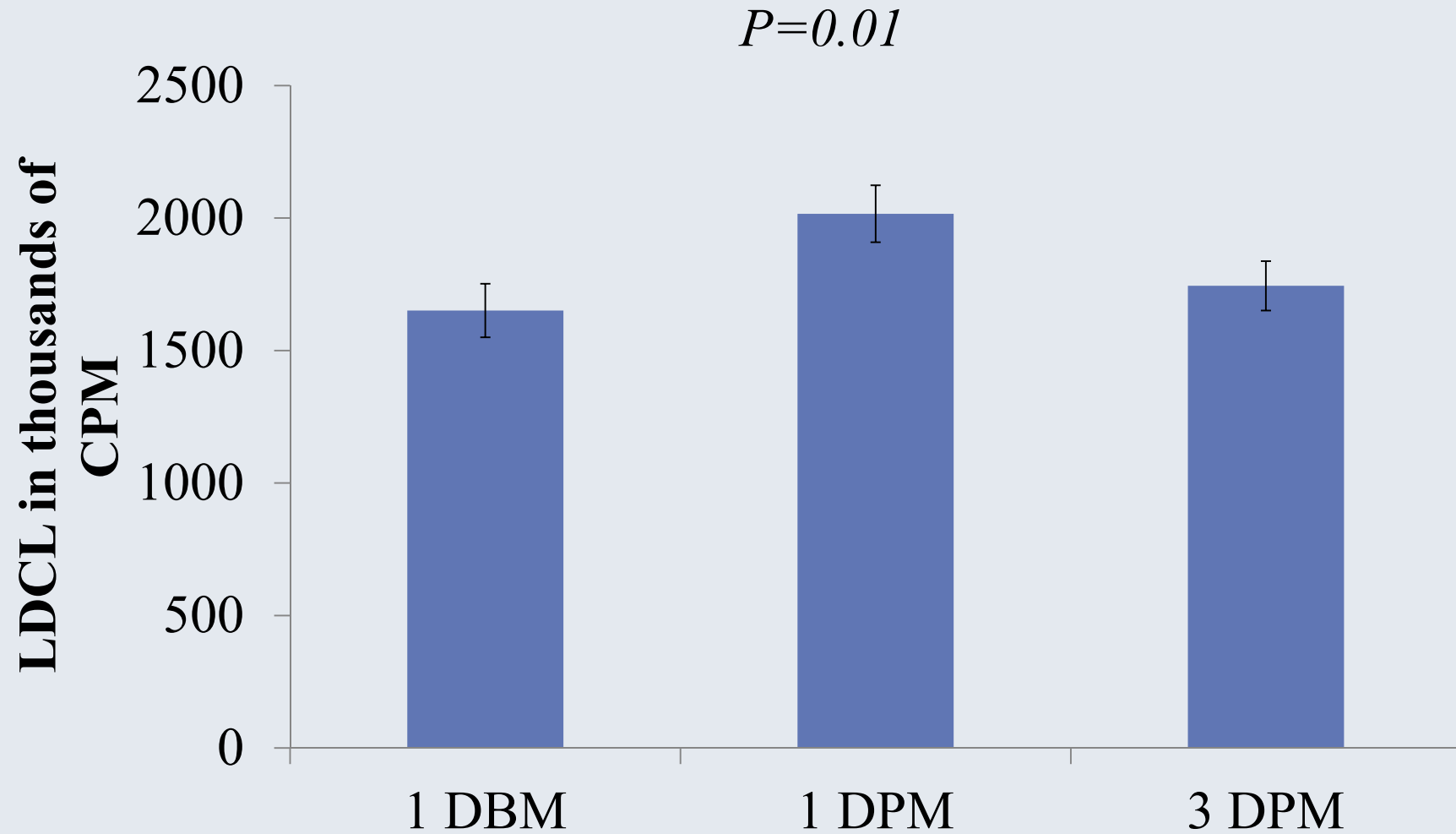


7. Effect of mixing on the energy balance

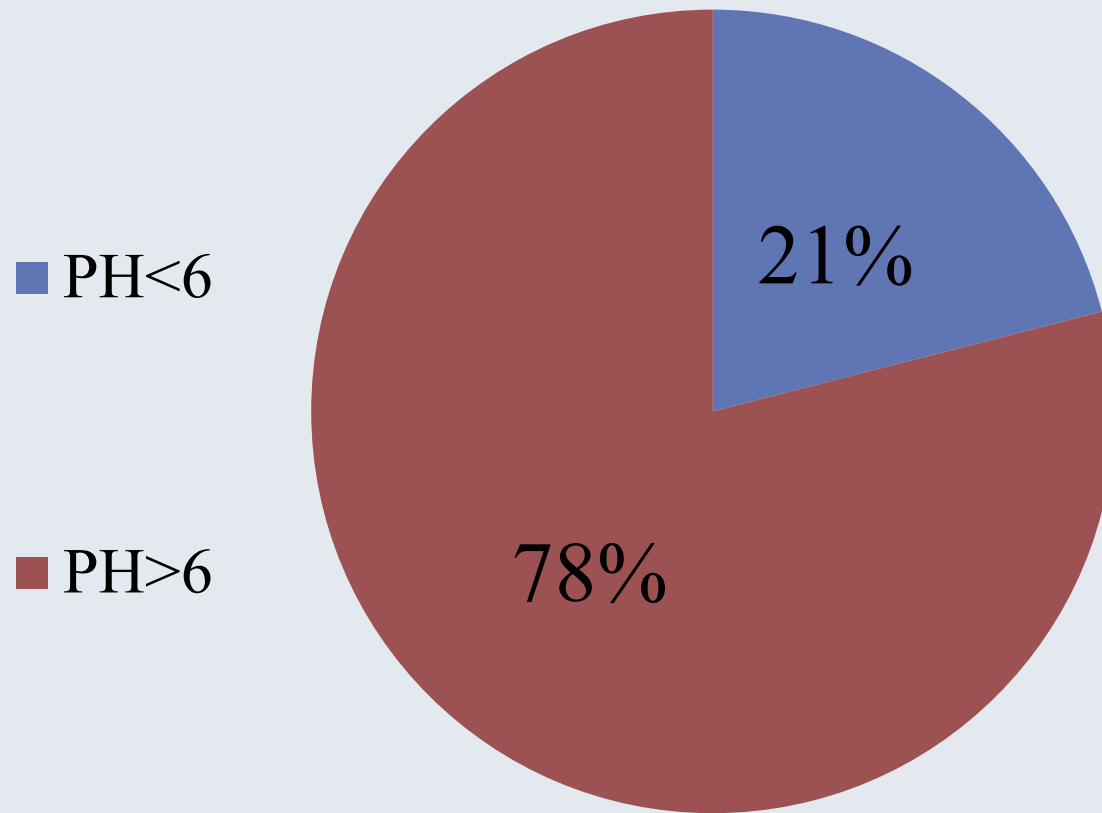
$P < 0.0001$



8. Effect of mixing on the anti-oxidative capacity



9. Effect of mixing on meat pH



Incidence of meat pH<6 in this abattoir is 60%

Summary

- Early mixing decreased weight gain and increased activity and mean values were not restored a month later.
- Rumination decreased 24 hours following mixing but a recovery was recorded 2 days later.
- Mixing led to elevated oxidative and metabolic stress.
- Group mixing led to improper meat acidification.



**Sensors for rumination
and activity potentially
enable us to determine
the recovery time
required following
stress-inducing events**



Practical implementations

- **Avoid mixing!**
- **If you must, mix early...**
- **Sensors - objective tool for welfare and productivity monitoring.**
- **Implement sensors for recommendations/ guidelines in order to enhance meat quality in European legislation.**



Acknowledgments

- *Department of ruminant science, ARO*
- *Institute of Agricultural Engineering, ARO*
- *Afimilk company* 
- *SCR company- for contribution to the experiment and for sponsoring the EAAP presentation* 

