

The Impact of Methionine Source on Characteristics and Intensity of Poultry Excreta Odor.

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Introduction

- **There are four principle classes of odor causing compounds:**
 - **Branched and chained volatile fatty acids**
 - **Ammonia**
 - **Indoles and phenols**
 - **Volatile sulfur containing compounds**

Introduction

- **Sulphide content correlated well with odor offensiveness in specific instances (Hobbs et al., 1994).**
- **Six of the ten compounds with the lowest odor detection threshold all contain sulfur (O'Neill et al., 1992).**

Hypothesis

- **Using different methionine sources in poultry feed could cause a difference in odor volatiles in broiler excreta.**

Diets- Exp. #1

- 3,135 (starter), 3200 (grower) Kcal ME/kg
- 23% (starter), 20% (grower) crude protein
- 0.35% total methionine activity in control diet
- 0.80% total methionine activity
(4 supplemental trts.)
DL-Met, Dry MHA, Na-Met, Liq-MHA
- Fed *ab libitum* from day 1 to end of study (6 weeks)

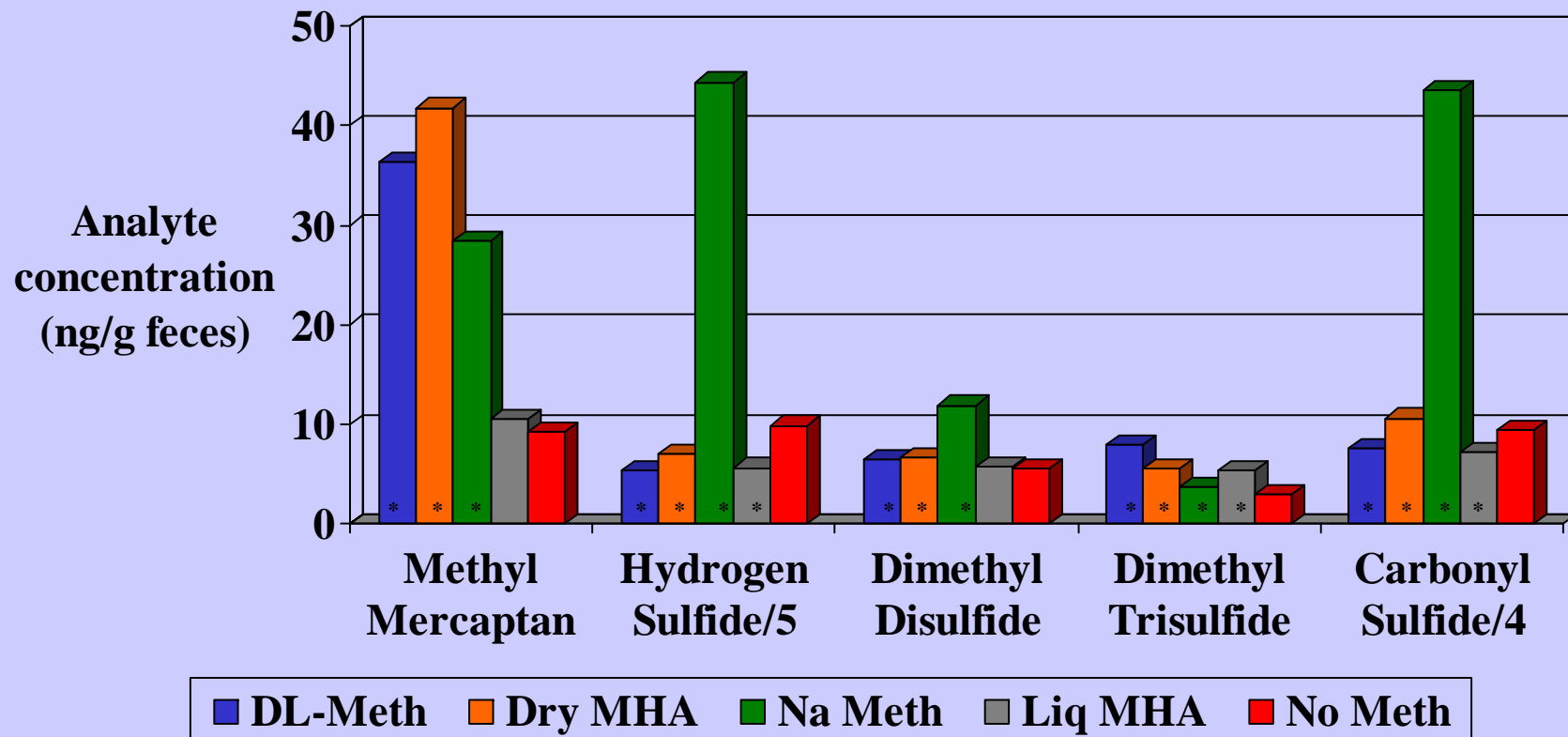
Objective Experiment 1

- **Gas Chromatography and Mass Spectrometry used to separate and identify volatile sulfur compounds in broiler excreta.**

Sample Collection

- All excreta collected in pans lined with aluminum foil.
- Collected for a 24 h period @ 6 wks of age
- 4.5 g transferred into 15 mL headspace vials
- Samples were analyzed by gas chromatography/mass spectrometry

Concentration of Volatile Sulfur Compounds in Broiler Excreta



* P < 0.05

Summary Exp. 1

- **Treatments significantly higher than control in 13 of 20 comparisons.**
- **Methionine source significantly influences volatile sulfur compound concentrations in broiler excreta.**

Objective Experiment 2

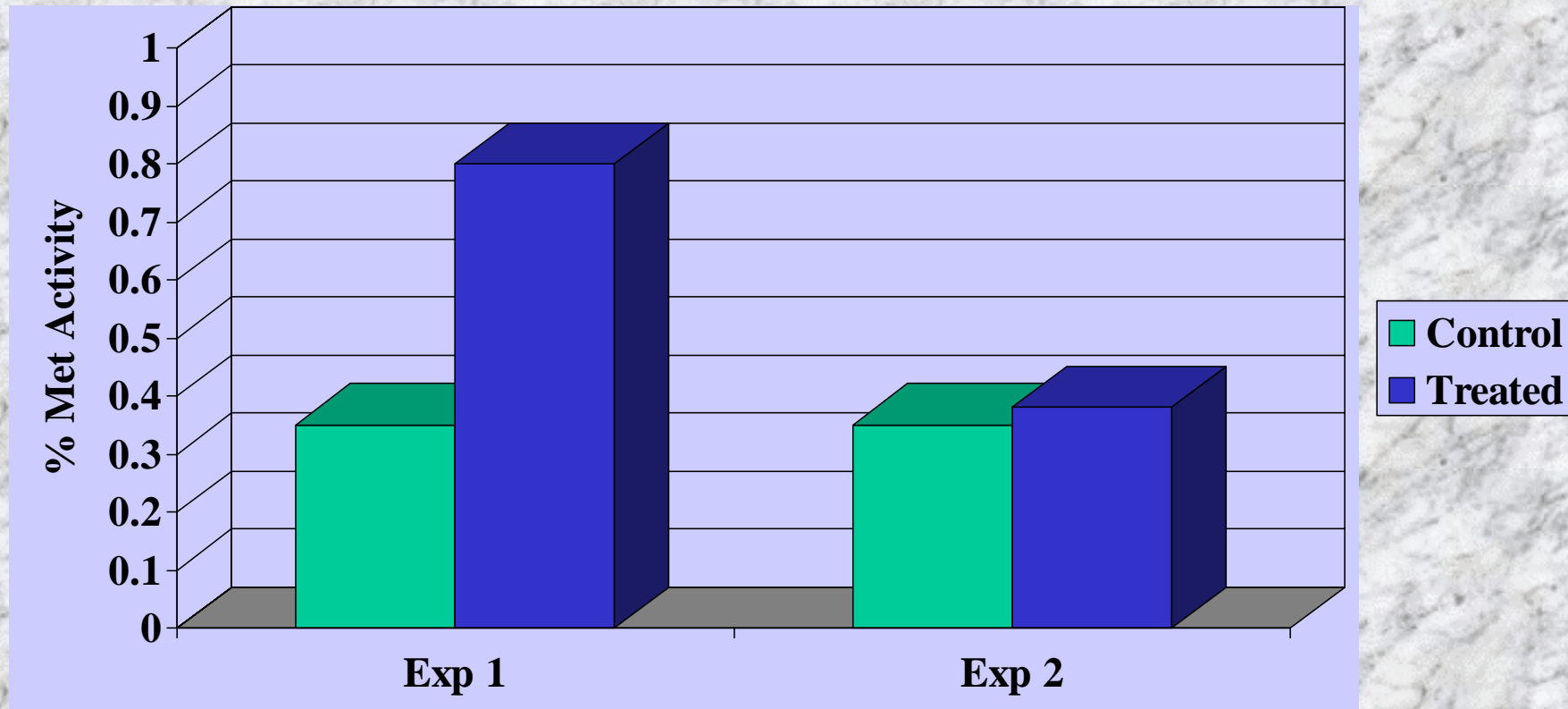
- **To determine if using lower methionine levels could continue to cause differences in odor volatiles in broiler excreta.**
- **Broiler excreta subjected to odor evaluation by sensory panel.**

Diets – Exp. 2

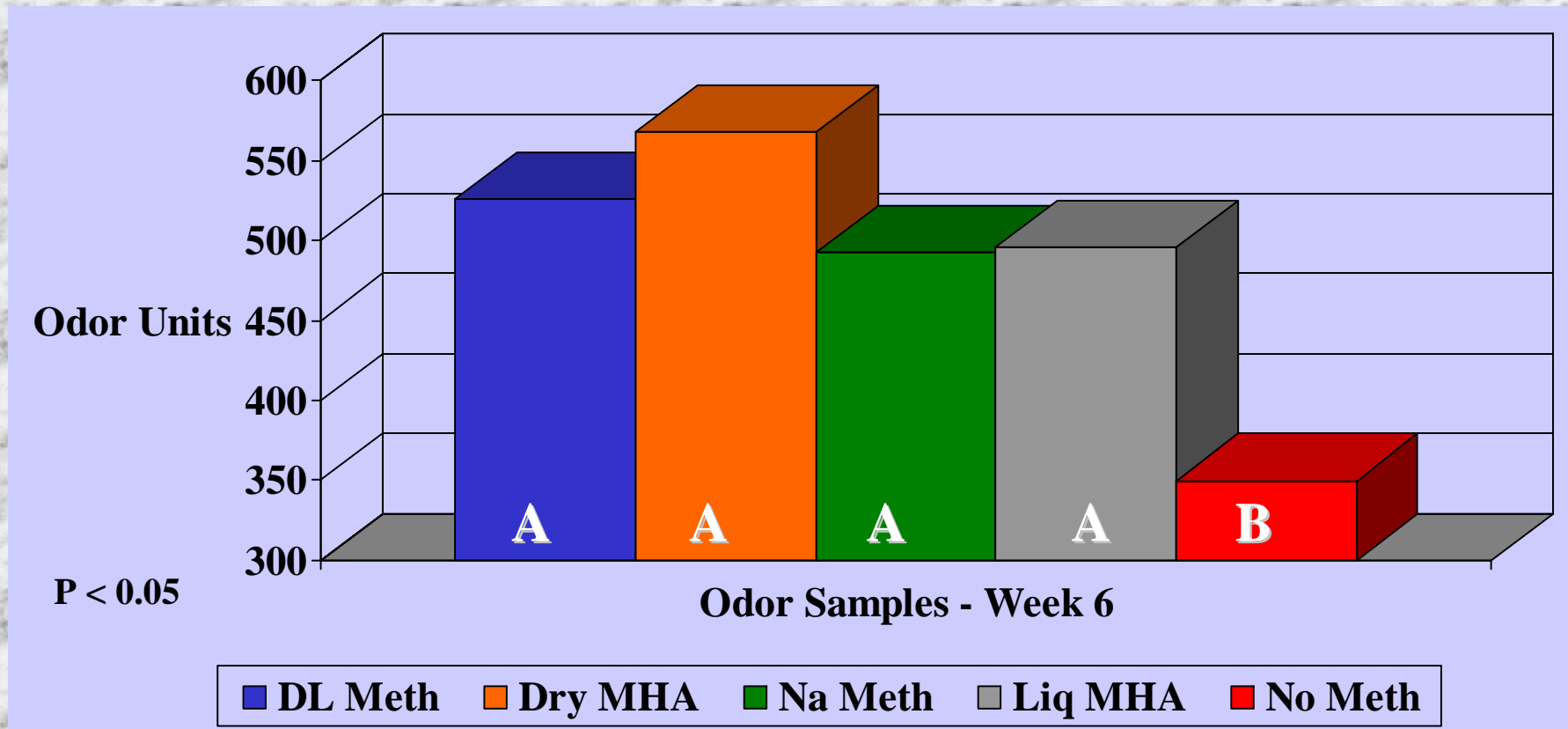
- **3,135 (starter), 3200 (grower) Kcal ME/kg**
- **23% (starter), 20% (grower) crude protein**
- **0.35% total methionine activity in control diet**
- **0.5% total methionine activity- starter (4 trts.)**
- **0.38% total methionine activity- grower (4 trts.)**

Methionine Activity in Grower Diets

(Fed > 3wks of age)



Detection Threshold of Odor in Broiler Excreta by Sensory Panel



Summary Exp. 2

- **Methionine source significantly influenced odor volatile concentrations in broiler excreta as perceived by human sensory panel.**

Introduction – Exp. 3

- **Exp. 1 – Differences in odor compound concentration**
- **Exp. 2 – Differences in odor intensity – human panel**
- **Previous experiments do not indicate if there are differences in offensiveness in odor volatiles in broiler excreta related to treatments.**

Objective Exp. 3

- **Utilize a trained human descriptive aroma attribute sensory panel to determine differences in offensive odor volatiles in excreta from broilers fed different methionine sources.**
- **Same diets as Exp. 1**

Trained Sensory Panel (11 people)

•14 Attributes

- Feathers/Wet Poultry
 - Pungent
 - Musty Wet
 - Ammonia
 - Fermented Rotten Fruit
 - Sharp
 - Fermented
 - Dirty Socks
 - Hay
 - Sour Fermented
 - Urinous
 - Rotten Eggs
 - Irritating
 - Nauseating
- (Civille and Lyons, 1996)

Sensory Panel – Exp. 3

- **Use of a trained human descriptive aroma attribute sensory panel (Meilgaard *et al.*, 1991)**
- **Universal scaling system:**
 - 0 = none**
 - 15 = extremely intense**
- **Each panelist – given 2 reps of each treatment group**
 - One session per week (10 samples/session)**
 - Total of 5 sessions**

Sensory Panel Intensities of Odor Attributes

•No significant differences in these odor attributes between the treatment groups.

▪ Feathers/Wet Poultry

▪ Pungent

▪ Dirty Socks

▪ Hay

▪ Rotten Eggs

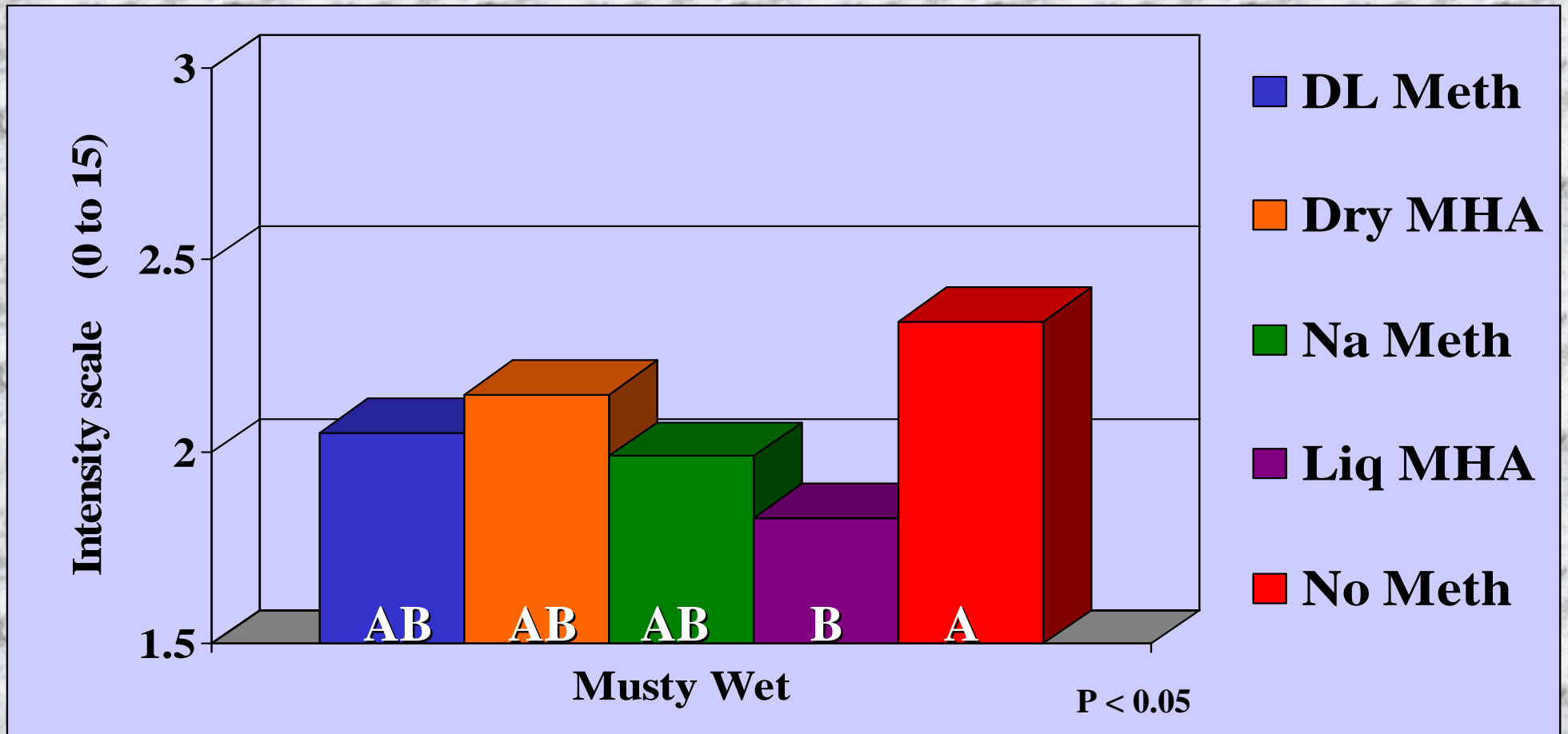
▪ Irritating

▪ Nauseating

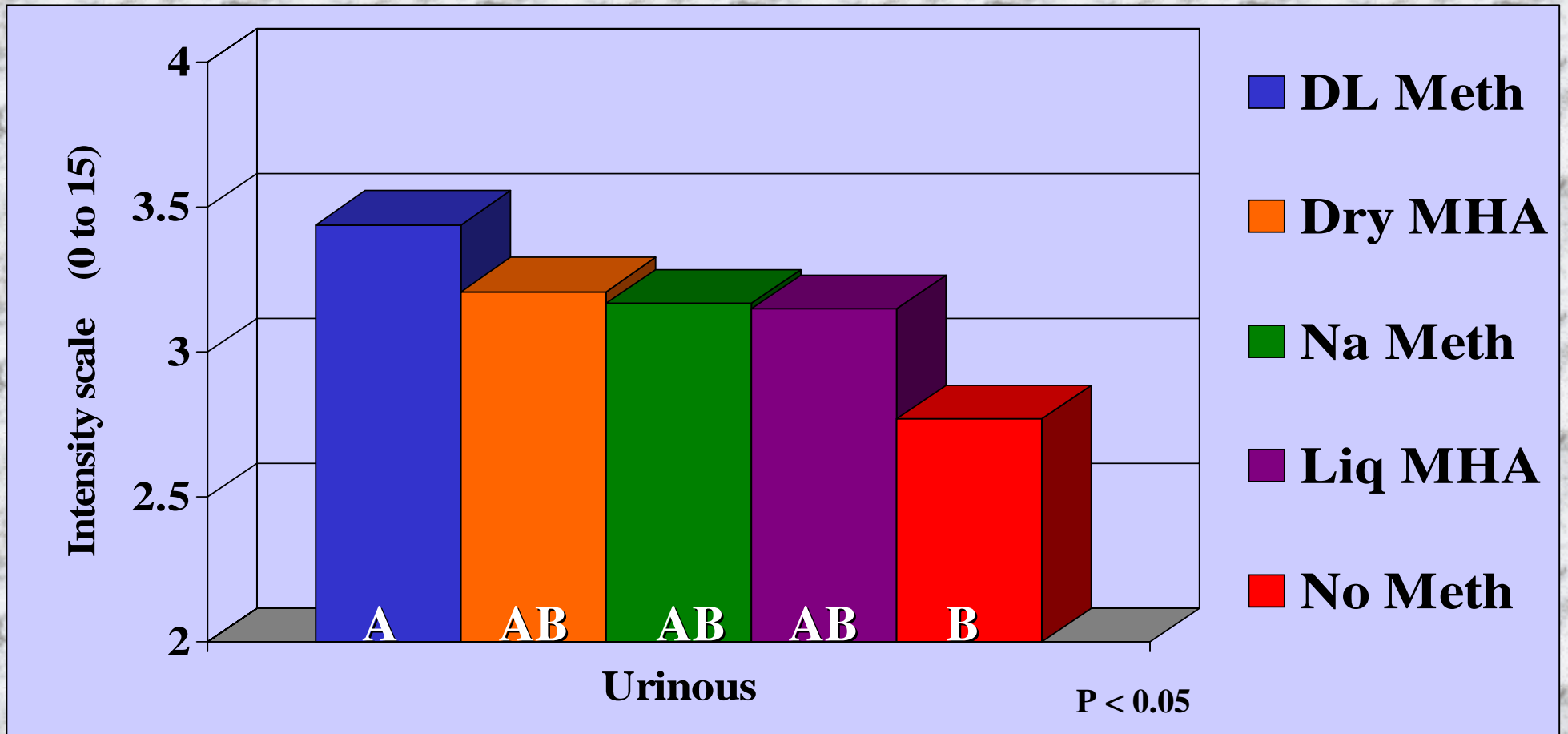
▪ Sour Fermented

▪ Fermented

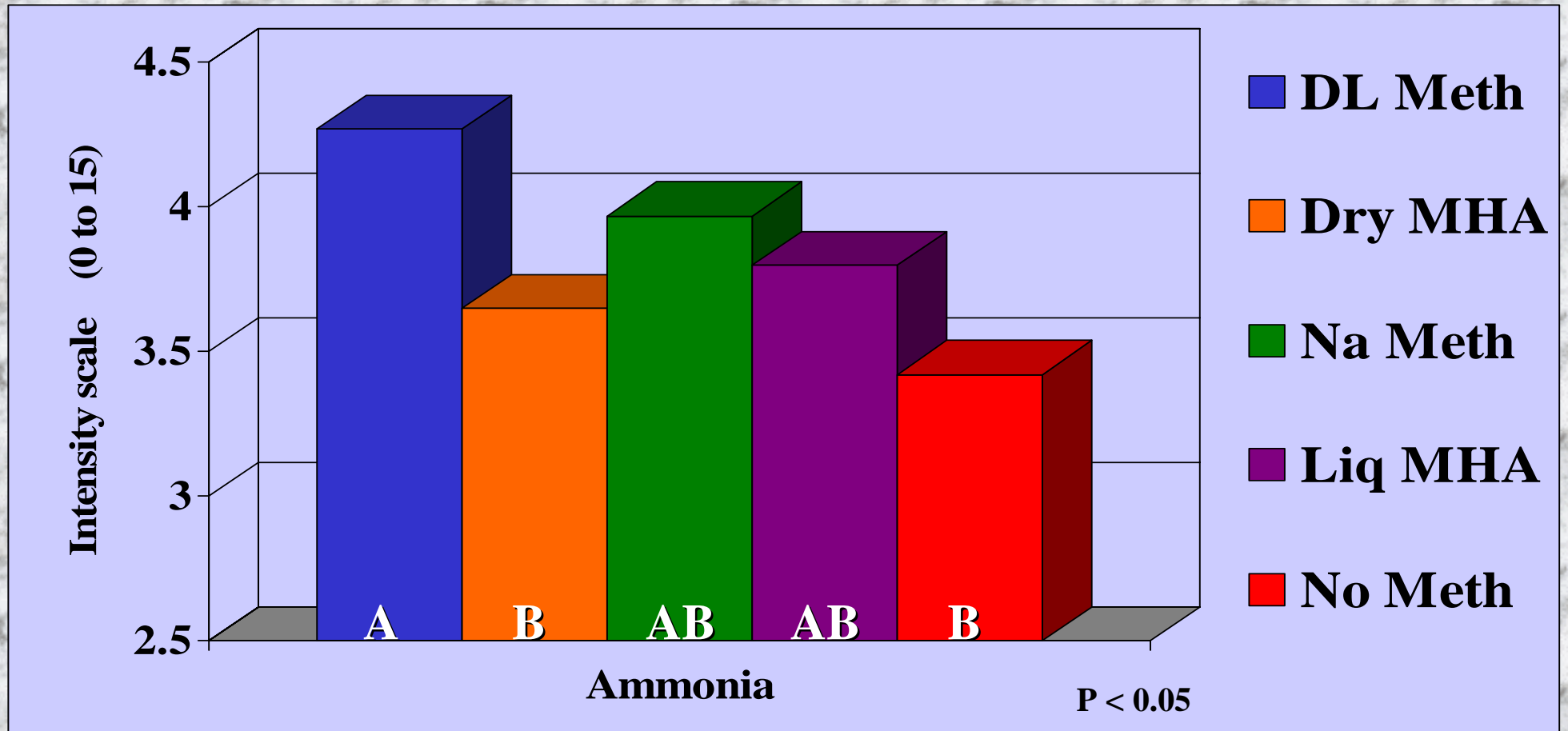
Sensory Panel Intensities of Musty Wet in Broiler Excreta



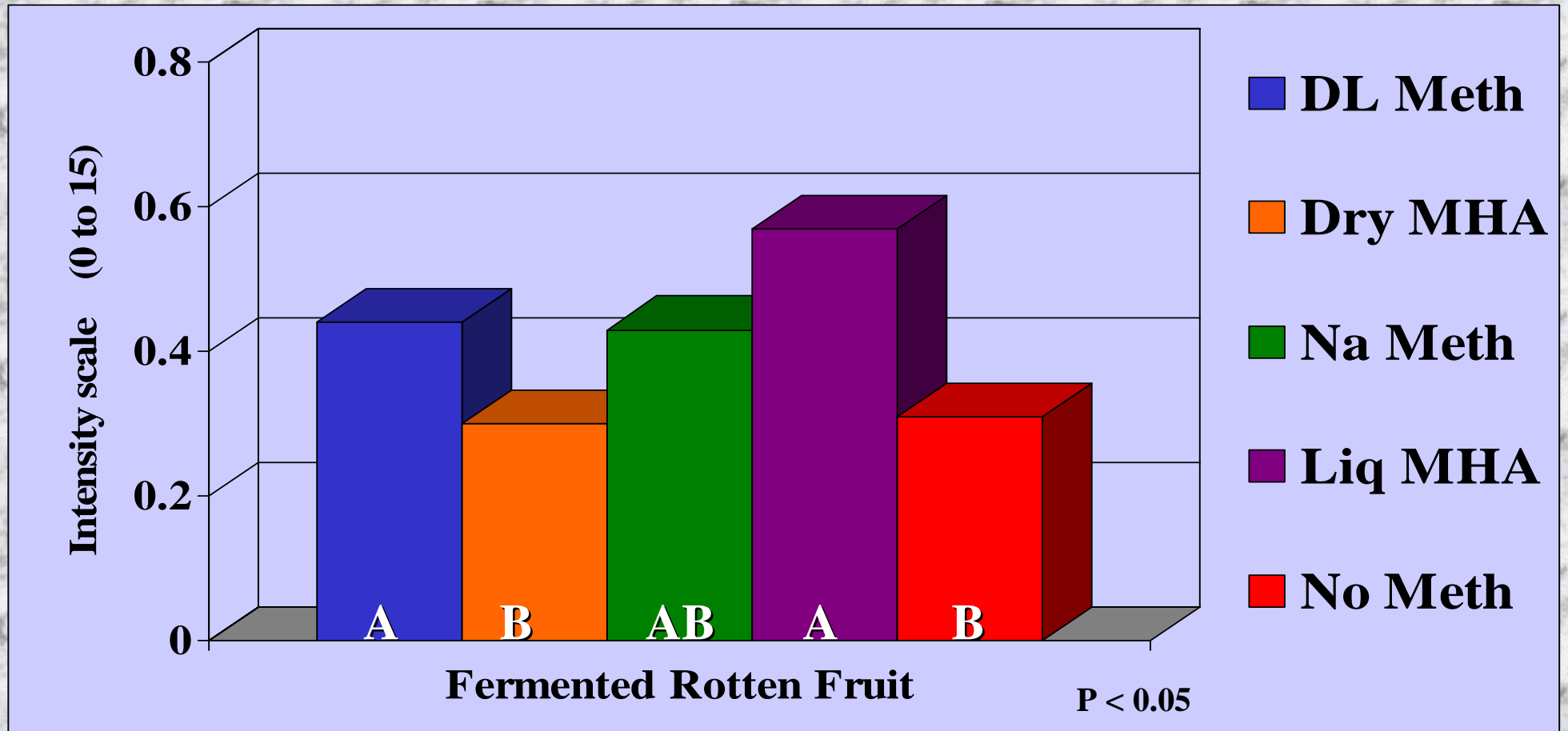
Sensory Panel Intensities of Urinous in Broiler Excreta



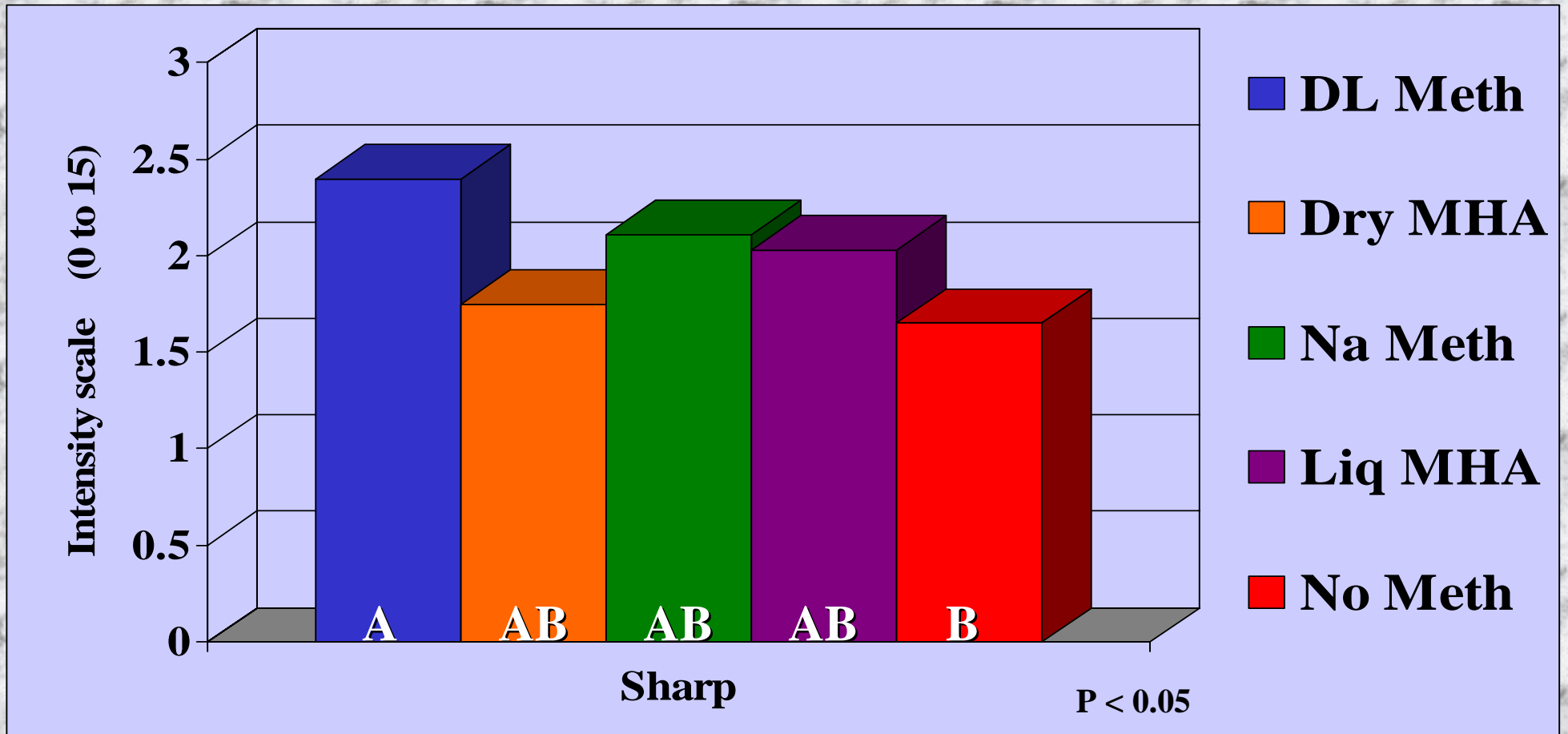
Sensory Panel Intensities of Ammonia in Broiler Excreta



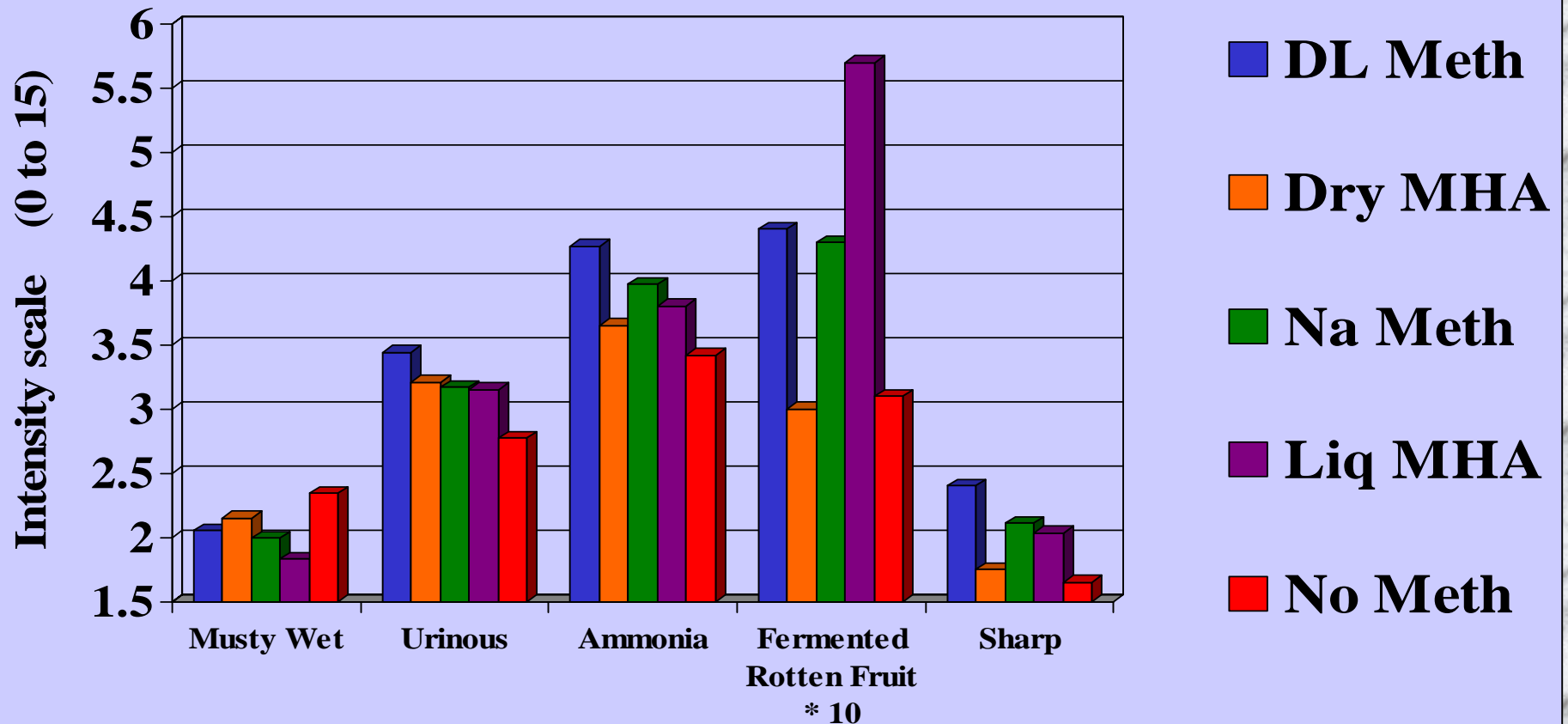
Sensory Panel Intensities of Fermented Rotten Fruit in Broiler Excreta



Sensory Panel Intensities of Sharp in Broiler Excreta



Sensory Panel Intensities of Odor Attributes in Broiler Excreta



Summary Exp. 3

- **Significantly lower than control:**
 - **Musty Wet – Liq MHA**
- **Significantly higher than control:**
 - **Ammonia – DL Meth**
 - **Fermented Rotten Fruit – DL Meth, and Liq MHA**
 - **Sharp – DL Meth**
 - **Urinous - DL Meth**

Summary Exp. 3

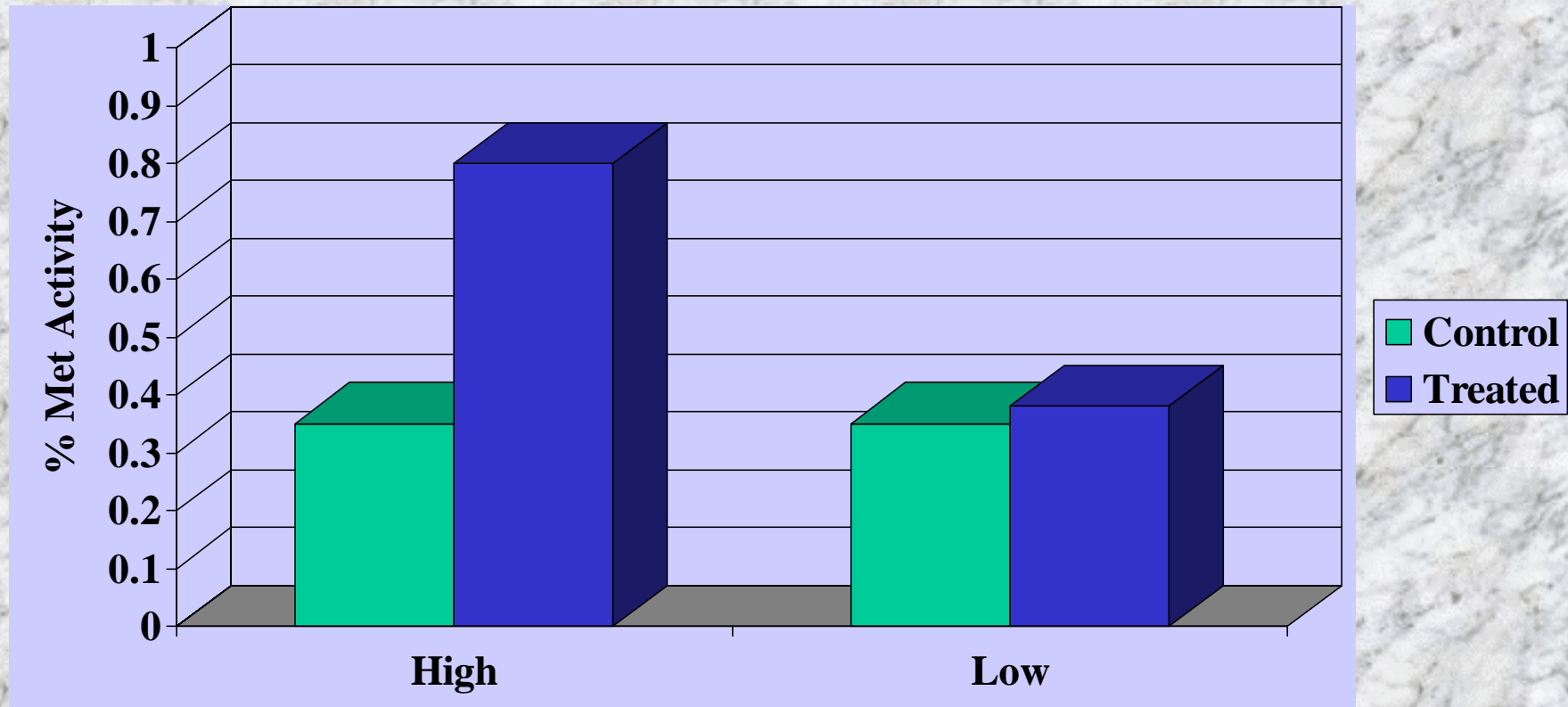
- **Trained Sensory Panel was able to determine different intensities of odor attributes.**
- **Methionine sources significantly influence odor attributes in broiler excreta.**

Objective Exp. 4

- **Sensory Panel to measure offensiveness of broiler excreta at differing methionine levels.**

Methionine Activity in Grower Diets

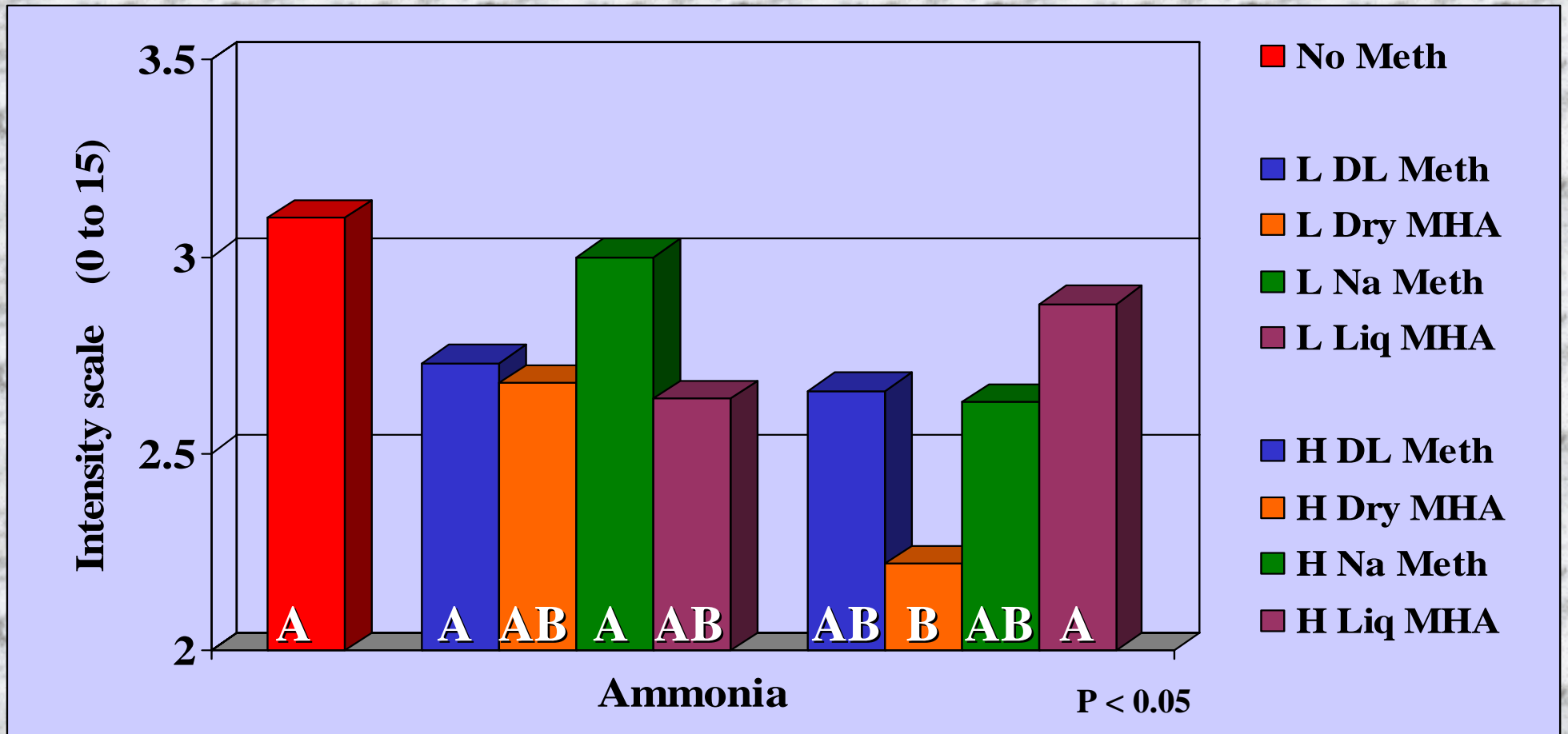
(Fed > 3wks of age)



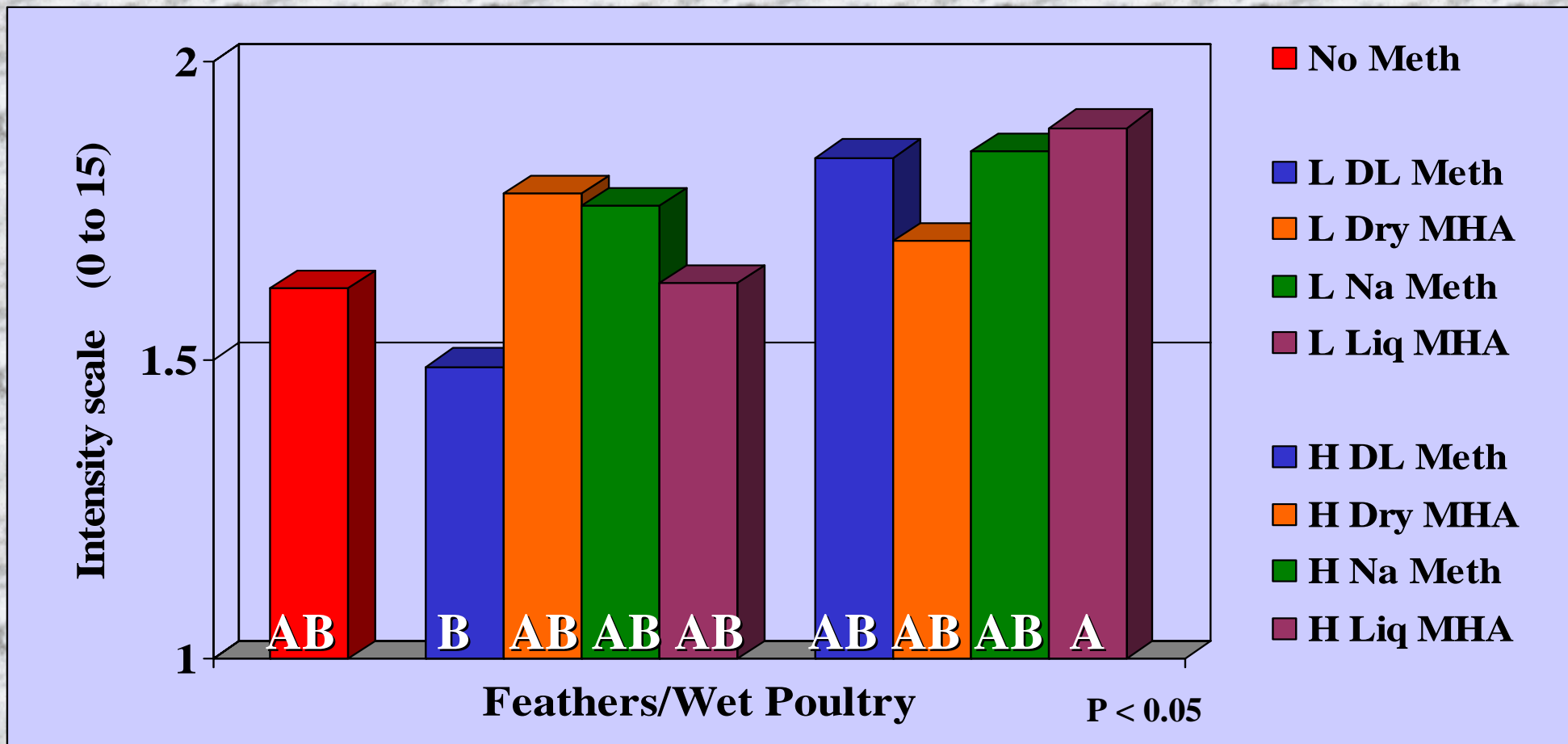
Sensory Panel Intensities of Odor Attributes

- **No significant differences in these odor attributes between the treatment groups.**
 - **Musty Wet**
 - **Irritating**
 - **Hay**

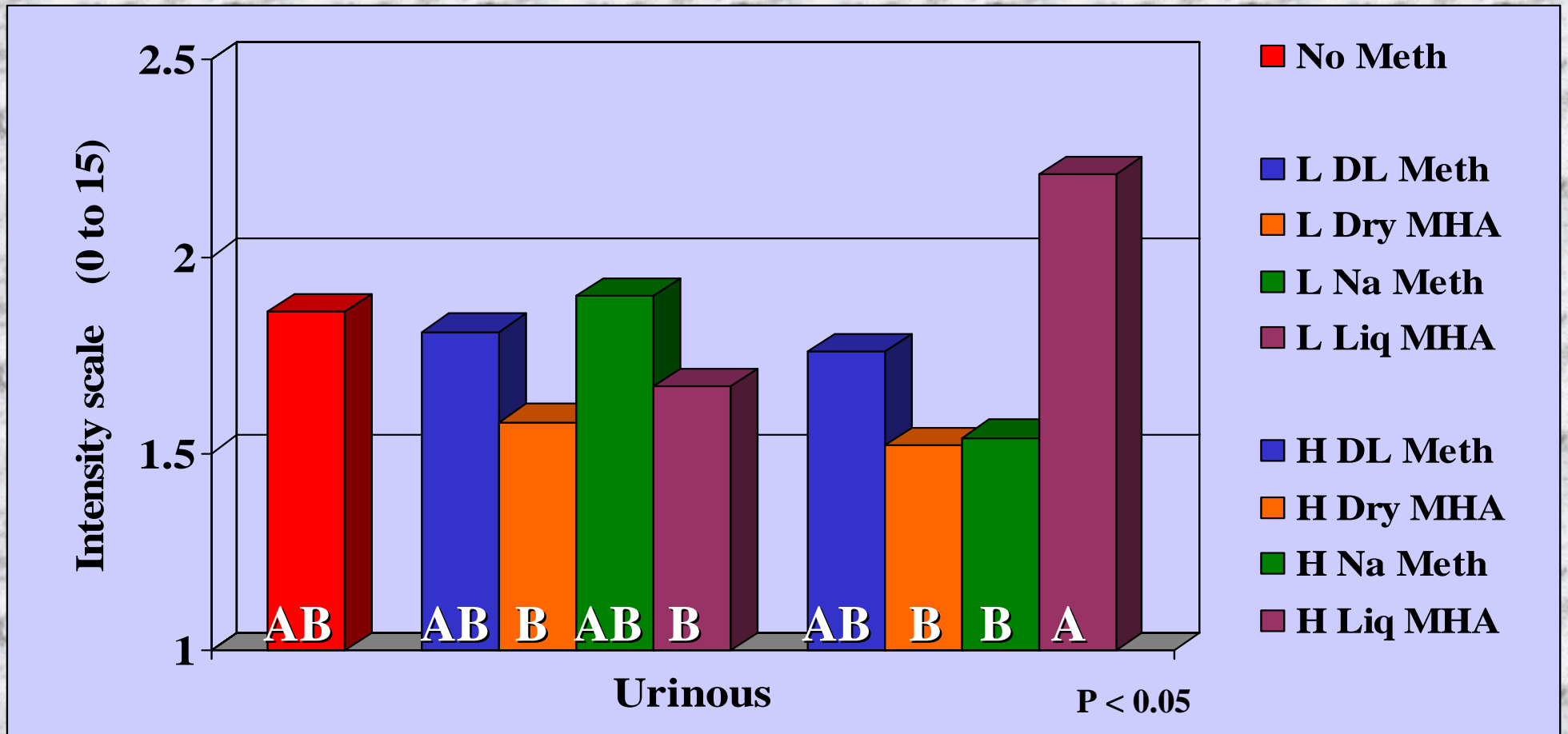
Sensory Panel Intensities of Ammonia in Broiler Excreta



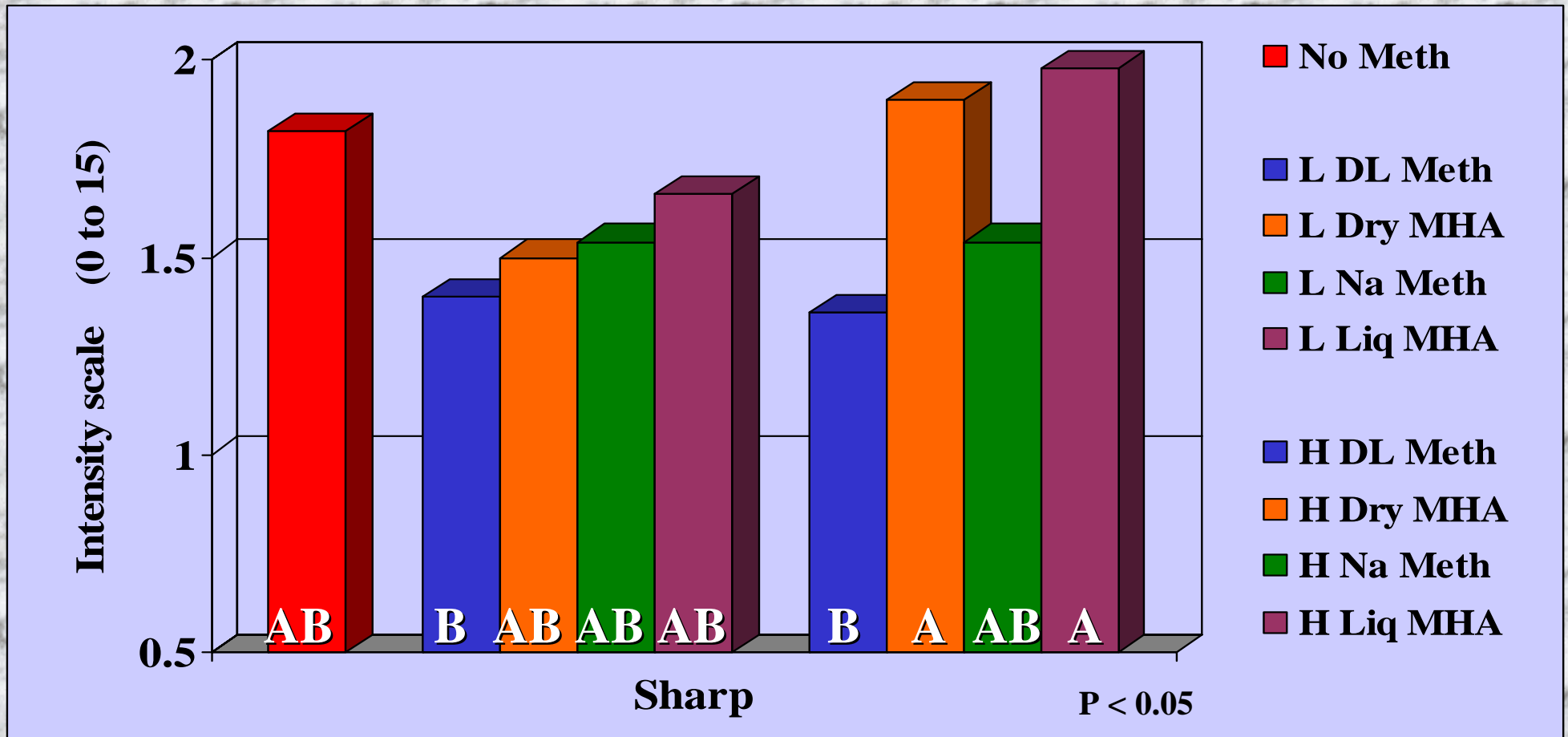
Sensory Panel Intensities of Feathers/Wet Poultry in Broiler Excreta



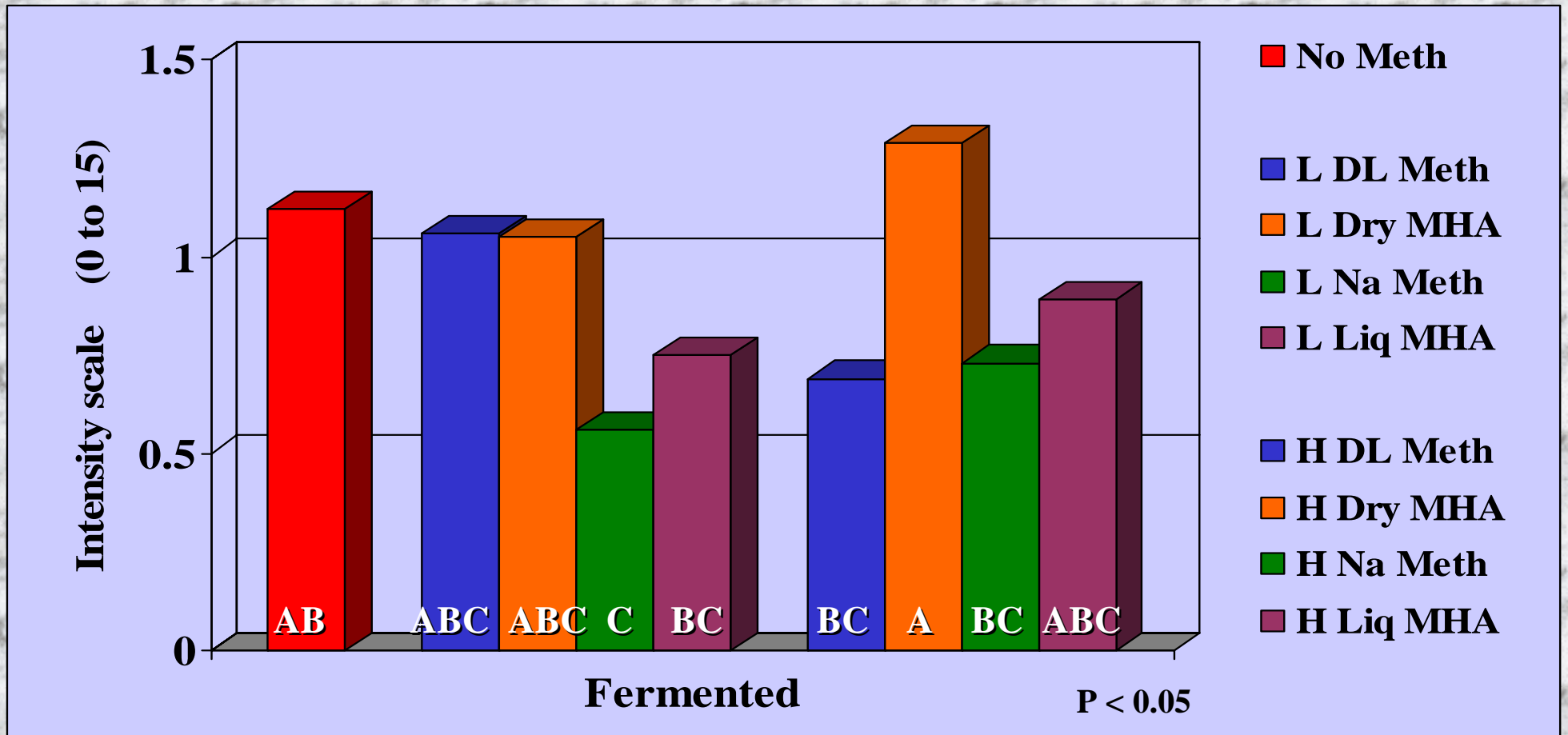
Sensory Panel Intensities of Urinous in Broiler Excreta



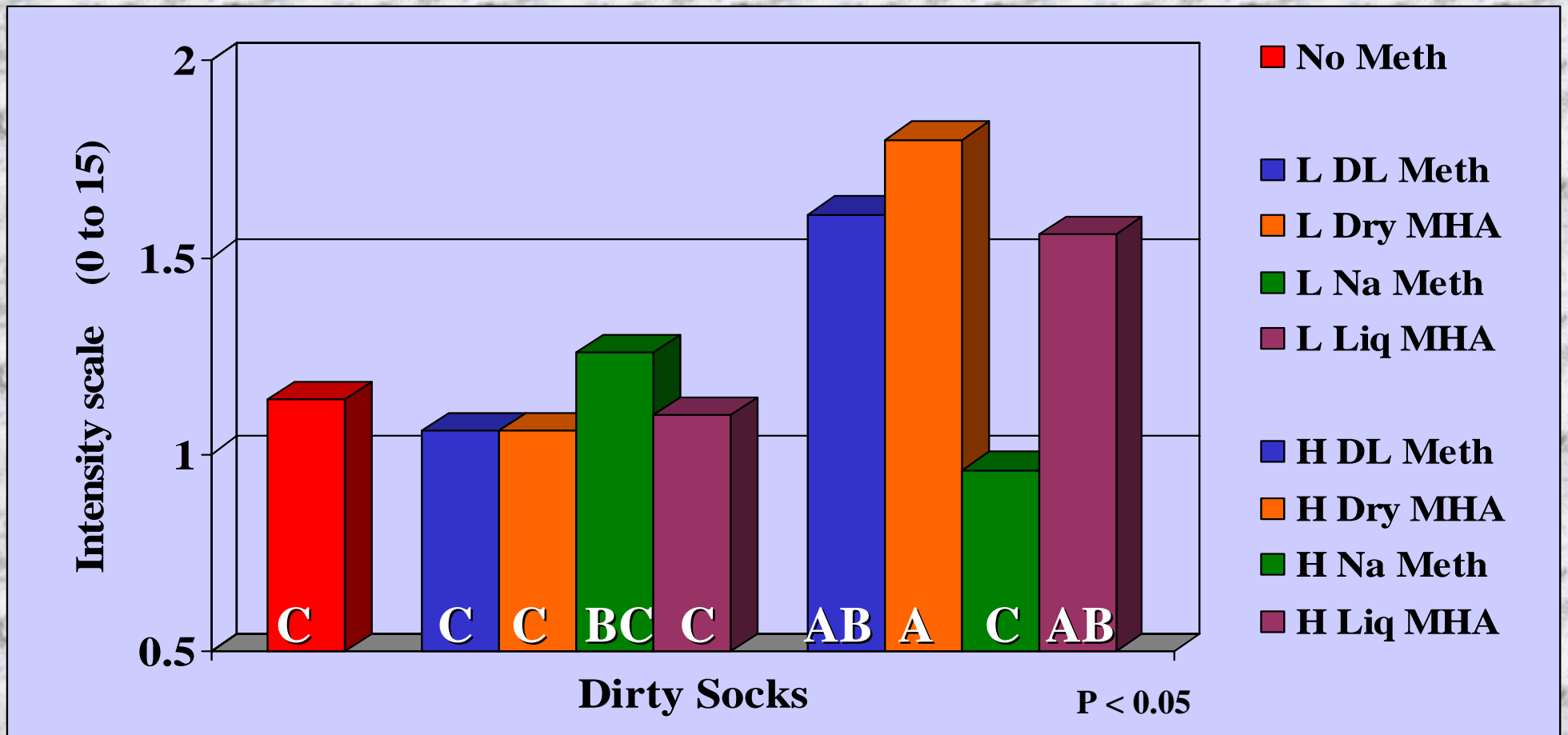
Sensory Panel Intensities of Sharp in Broiler Excreta



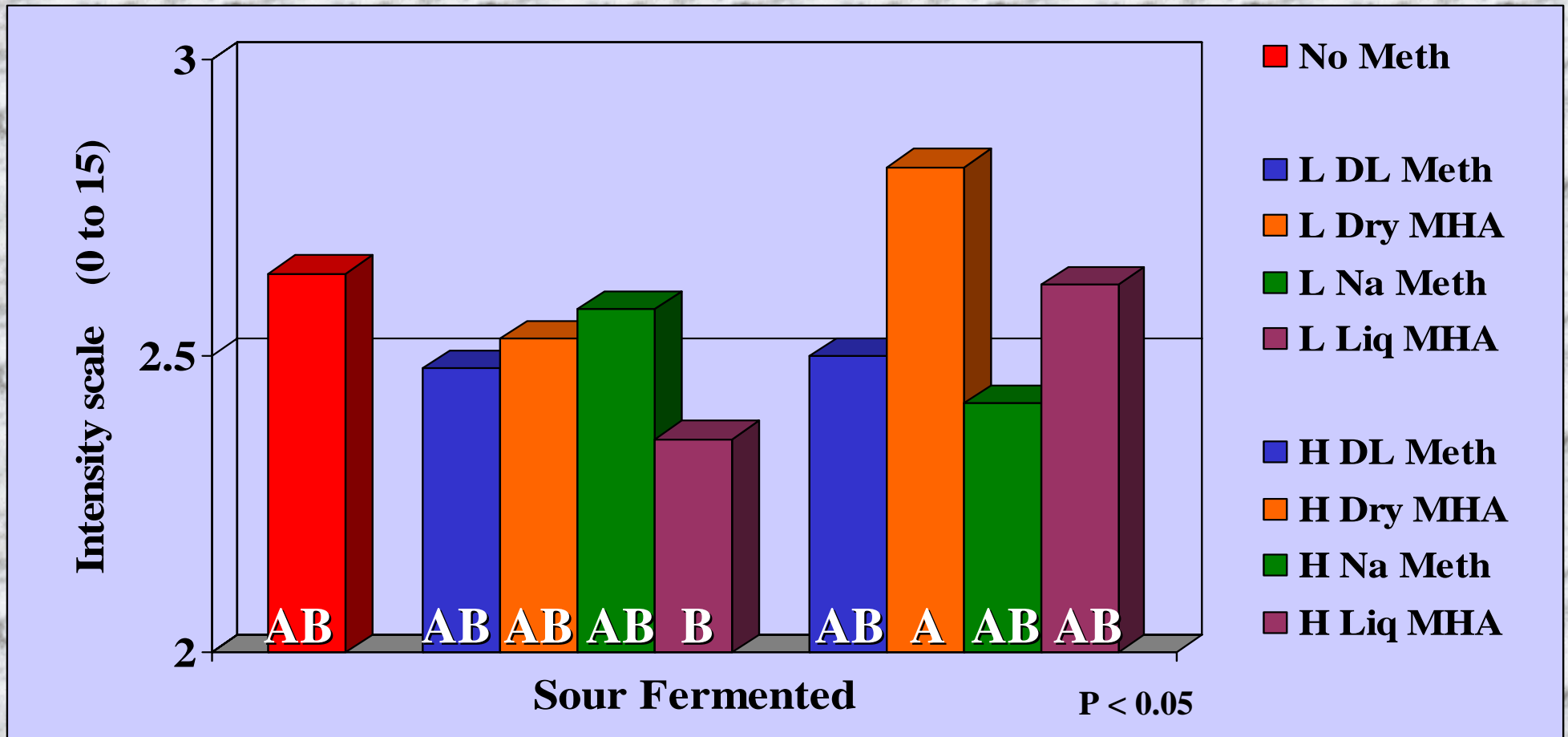
Sensory Panel Intensities of Fermented in Broiler Excreta



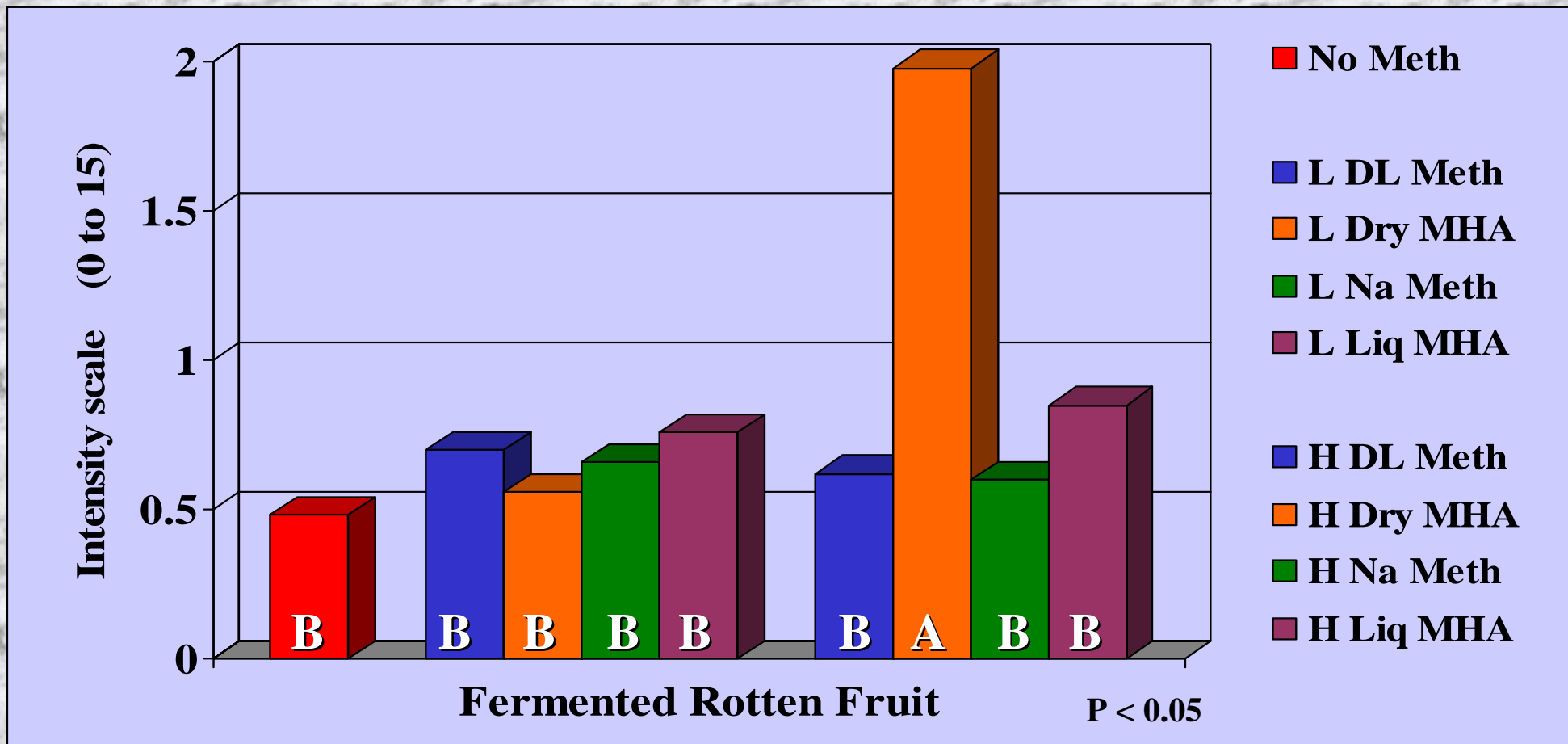
Sensory Panel Intensities of Dirty Socks in Broiler Excreta



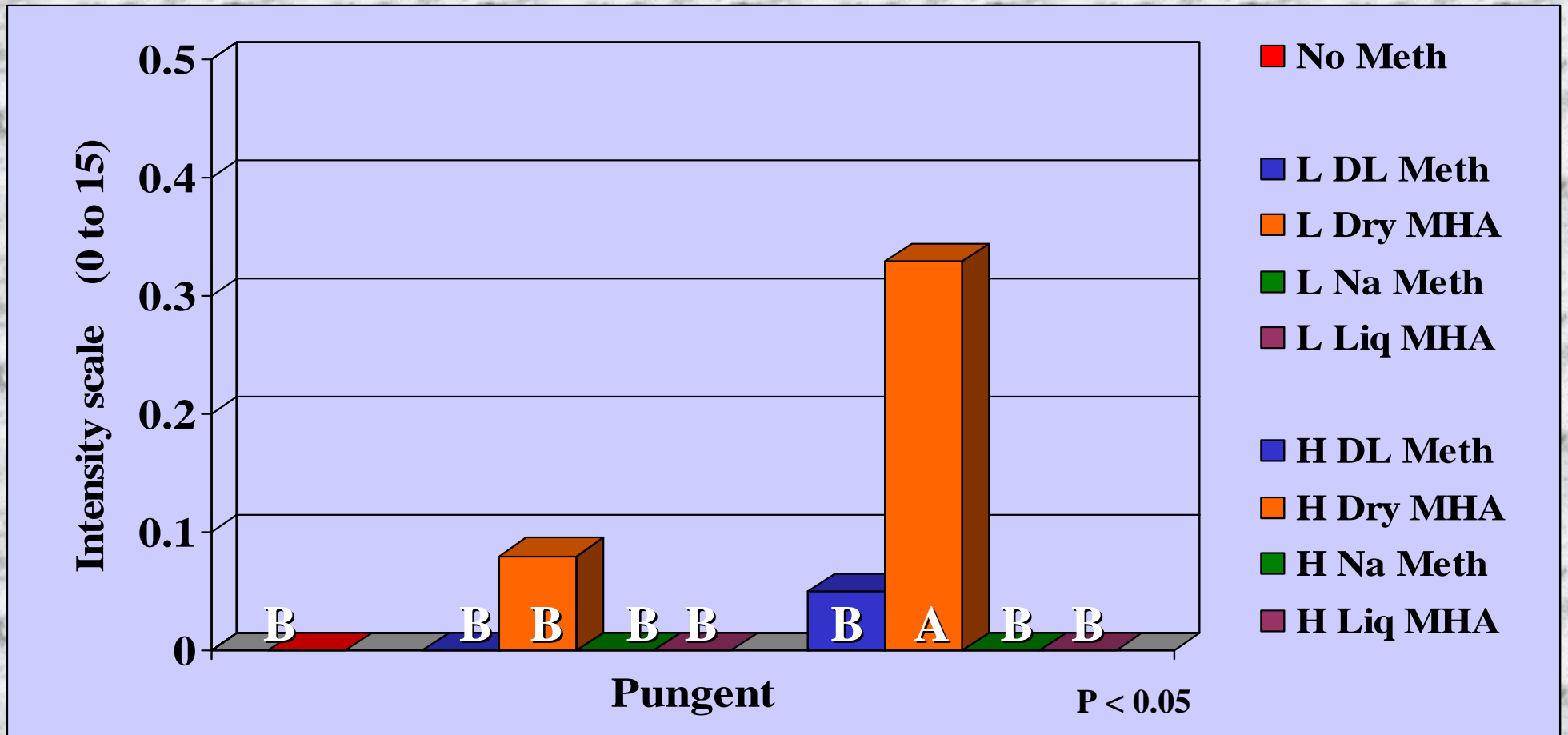
Sensory Panel Intensities of Sour Fermented in Broiler Excreta



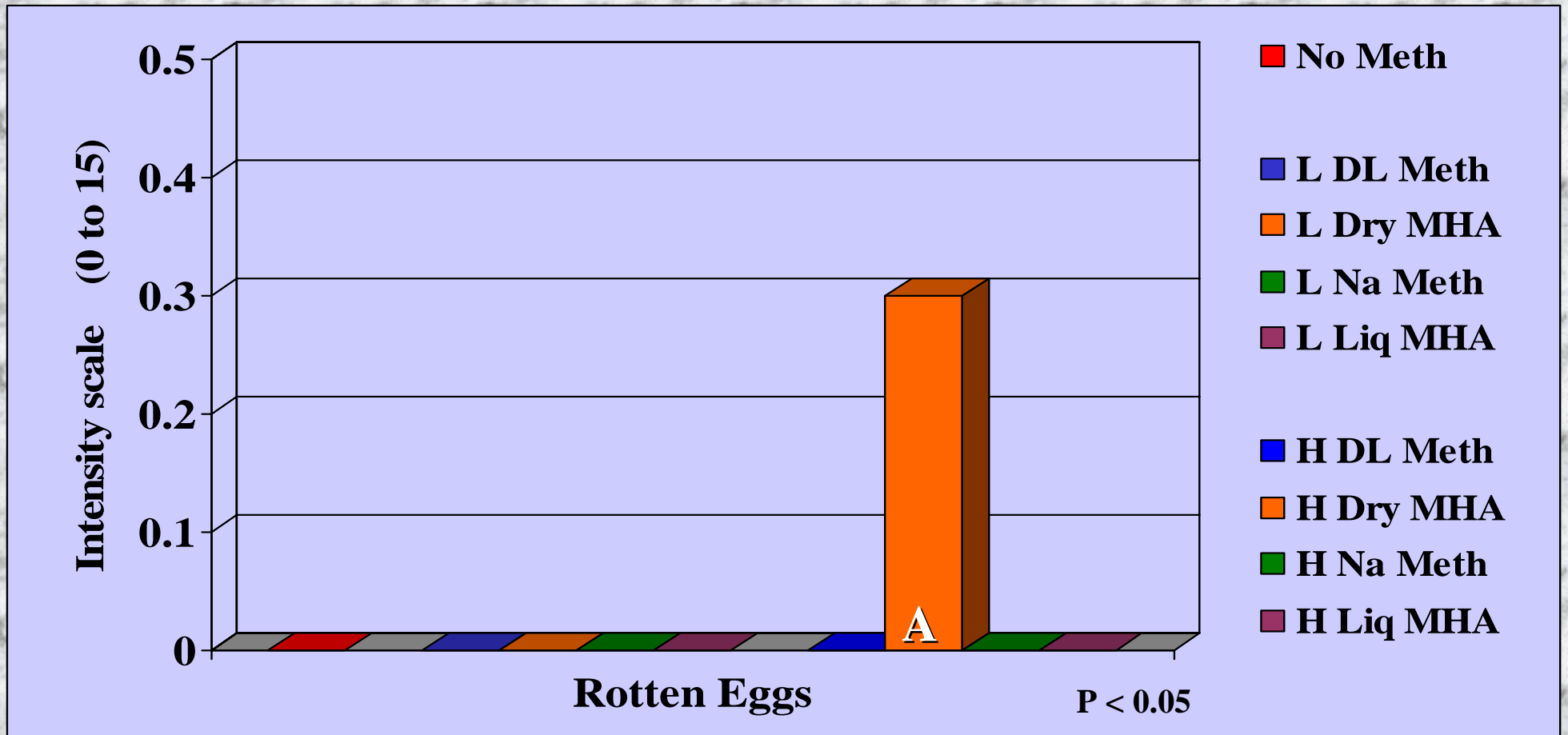
Sensory Panel Intensities of Fermented Rotten Fruit in Broiler Excreta



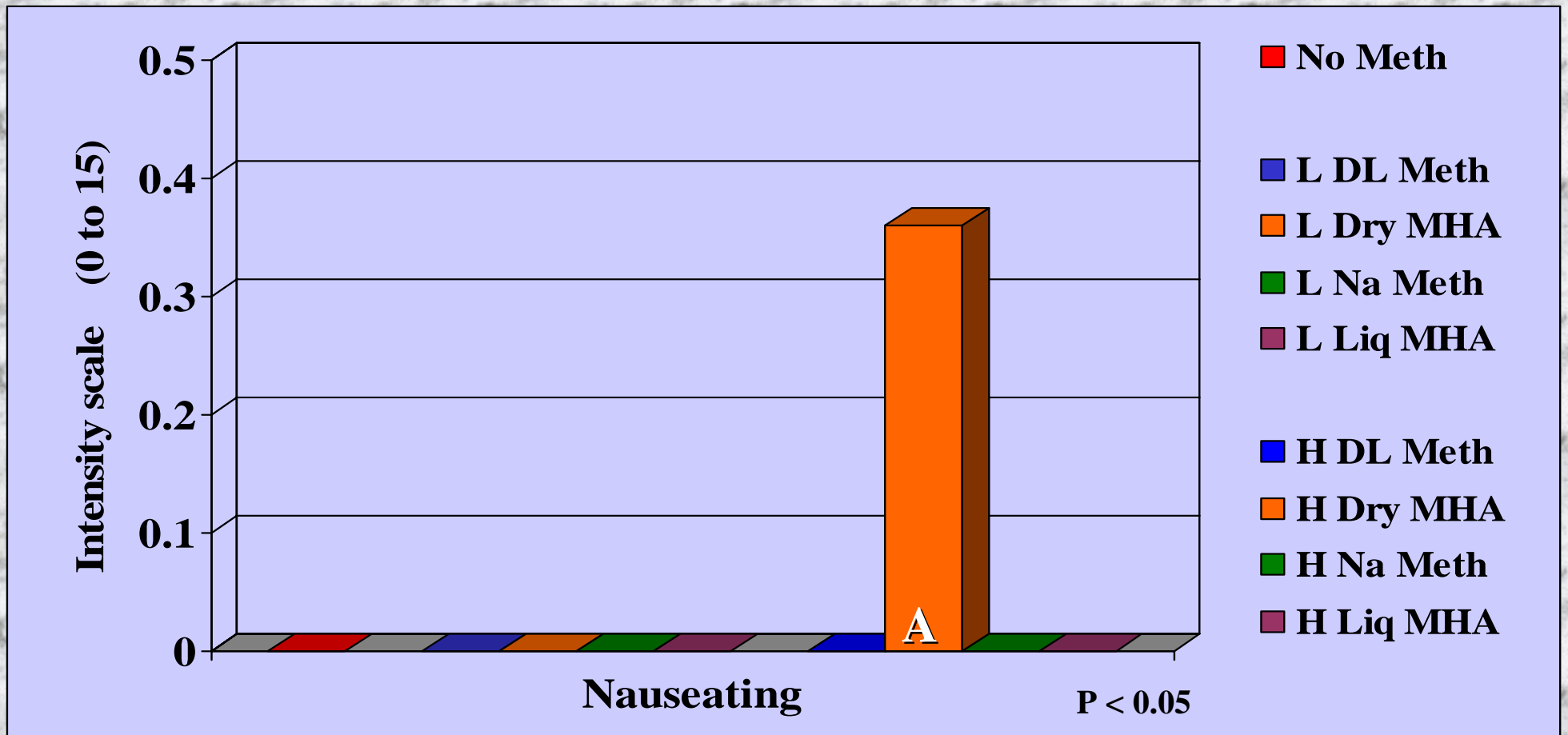
Sensory Panel Intensities of Pungent in Broiler Excreta



Sensory Panel Intensities of Rotten eggs in Broiler Excreta



Sensory Panel Intensities of Nauseating in Broiler Excreta



Summary Exp. 4

- **Significant differences in these odor attributes between the treatment groups.**
 - **Ammonia**
 - **Feathers/Wet Poultry**
 - **Pungent**
 - **Dirty Socks**
 - **Fermented**
 - **Rotten Eggs**
 - **Sharp**
 - **Nauseating**
 - **Sour Fermented**
 - **Fermented (rotten) fruit**
 - **Urinous**

Summary Exp. 4

- **Ammonia - High Dry MHA – Lower than control**
- **Urinous – High Liq MHA higher than Low Liq MHA**
- **Fermented – Low Na Met Lower than control**
- **Dirty Socks – High DL Met, High Dry MHA, and High Liq MHA higher than control**

Summary Exp. 4

- **Fermented Rotten Fruit, Pungent, Rotten Eggs and Nauseating – High Dry MHA higher than all other treatments.**

Summary Exp. 4

- **Trained Sensory Panel was able to determine different intensities of odor volatiles from broiler excreta fed different methionine treatment groups.**

Conclusion

- **Exp. 1 - GC/MS – Differences in odor compound concentration**
- **Exp. 2 - Odor Detection Threshold Sensory Panel – Differences between control and treatments**
- **Trained Human Descriptive Aroma Attribute Sensory Panel – Odor characteristics differ**

Conclusion

- **Supplemental Methionine sources increase odor compounds and odor intensity.**
- **Differing characteristics could be perceived as more or less offensive depending on individual sensitivities.**

Resources

- **<http://posc.tamu.edu>**
 - **Faculty – Carey**
 - **Powerpoint and proceedings article**
 - **Chavez, et al., 2004 Poultry Science 83:359-364**
 - **Chavez, et al., 2004 Poultry Science 83:901-910**
 - **Chavez, et al., 2004 Poultry Science 83:1655-1662**