

**Impact of Hair Coat Differences
on Rectal Temperature, Skin
Temperature, and Respiration
Rate of Holstein x Senepol
Crosses in Florida**

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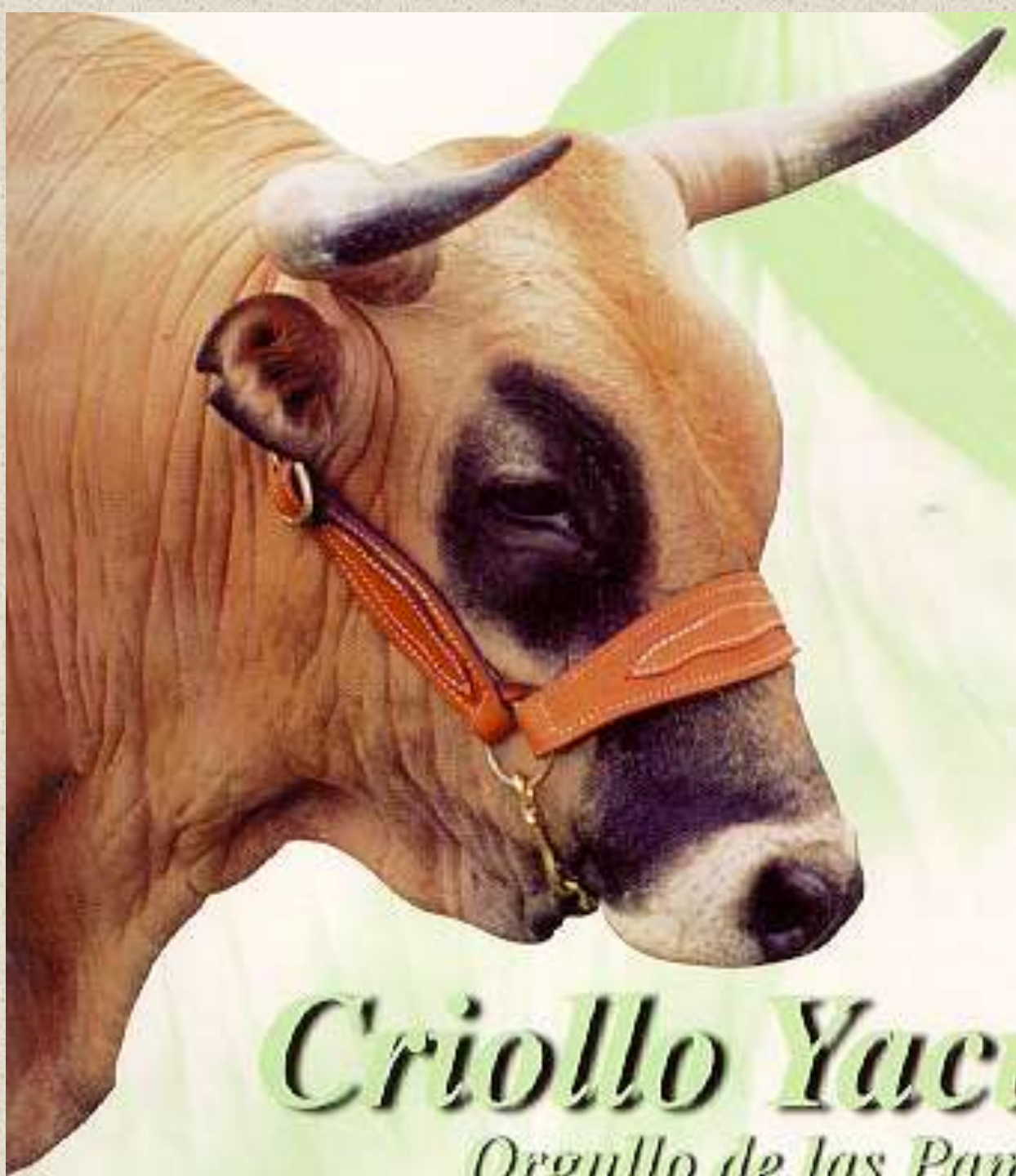
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Acknowledgement

- **Prime Rate Ranch of Okeechobee, Florida played a major role in this study by producing the 75% Holsteins (via a superovulation program) that were utilized in this study.**

The *Slick Hair* Gene

- The *Slick Hair* gene is a single gene, dominant in mode of inheritance that is responsible for the short, shiny, hair coat of the Senepol and other breeds
- Other breeds that have the *Slick Hair* gene include: Carora, Romosinuano, Criollo Limonero, Blanco Orejinegro, Chino Santandereano, Reyna and other criollo breeds



Criollo Yaca

Orgullo de las Pan



Research Animals

- The primary animals involved in this study were $\frac{3}{4}$ Holstein: $\frac{1}{4}$ Senepol yearling bulls and heifers
- They were sired by two registered Holstein bulls (one red and white, one black and white)
- Their dams were two Senepol X Holstein F_1 cows that were paternal half sisters

Research Locations

- **Subtropical Agricultural Research Station – Brooksville, Florida**
- **Beef Research Unit – Gainesville, Florida**

Evaluations of Environmental Conditions

- **Relative Humidity (RH)**
- **Ambient Temperature (AT)**
- **Black Globe Temperature**
- **Temperature-Humidity Index: THI**
= .8*AT + RH*[(AT – 14.3) + 46.3]

Traits Evaluated

- **Rectal Temperature**
- **Skin Temperature**
- **Respiration Rate**
- **Clipped Hair Weight**
- **Growth Rate**
- **Feed Intake**

Weather Conditions – STARS

- **Highest Ambient Temperature --- 35.5 C in June of 2000**
- **Temperature Humidity Index --- 103**
- **Lowest Ambient Temperature --- 21.0 C in February of 2000**
- **Temperature Humidity Index --- 73**

Impact of Temperature-Humidity Index at STARS

- **Correlation of THI with Rectal Temperature:**
 - 0.10 ($P > 0.76$) in Slick Animals
 - 0.35 ($P > 0.29$) in Normal-haired Animals

These results are somewhat confusing but apparently indicate that the ambient conditions across the months didn't effect rectal temperature at STARS

Rectal Temperatures of Slick and Normal-Haired Holstein Crosses at STARS

- **September**
 - **Slick 39.4 C Normal 39.7 C P < 0.05**
- **October**
 - **Slick 39.3 C Normal 39.8 C P < 0.05**
- **November through June**
 - **No significant differences between slick and normal-haired animals**

Average Daily Gain of Slick vs. Normal-haired Animals at STARS

- **The average daily gain over a period of a year at STARS did not differ between slick and normal-haired animals**
 - **Slick** **1384 grams per day**
 - **Normal** **1345 grams per day**
- **This is comparable to results comparing slick vs. normal-haired beef animals at the same location**

Why didn't the slick ones gain faster?

- I don't know for sure**
- Apparently the heat stress wasn't sufficient to trigger an effect on growth under these conditions**
- These cattle always had access to shade and their temperatures never were recorded over 40.1 C**



Second Study

Beef Research Unit

July-August

Environmental Conditions at the Beef Research Unit

- Average Ambient Temperature -- 32.9 C**
- Average THI -- 99.7**
- Highest Ambient Temperature – 36.0 C**
- Highest THI -- 107.0**
- Highest Black Globe Temperature --
56.5 C**

Effect of Hair Type on Rectal and Skin Temperatures at the Beef Research Unit

Hair Type	Days	No.	Rectal Temp., C	Skin Temp., C
Slick	24	8	38.99	37.49
Normal	24	8	39.32	38.03
Difference			- 0.33*	- 0.49*

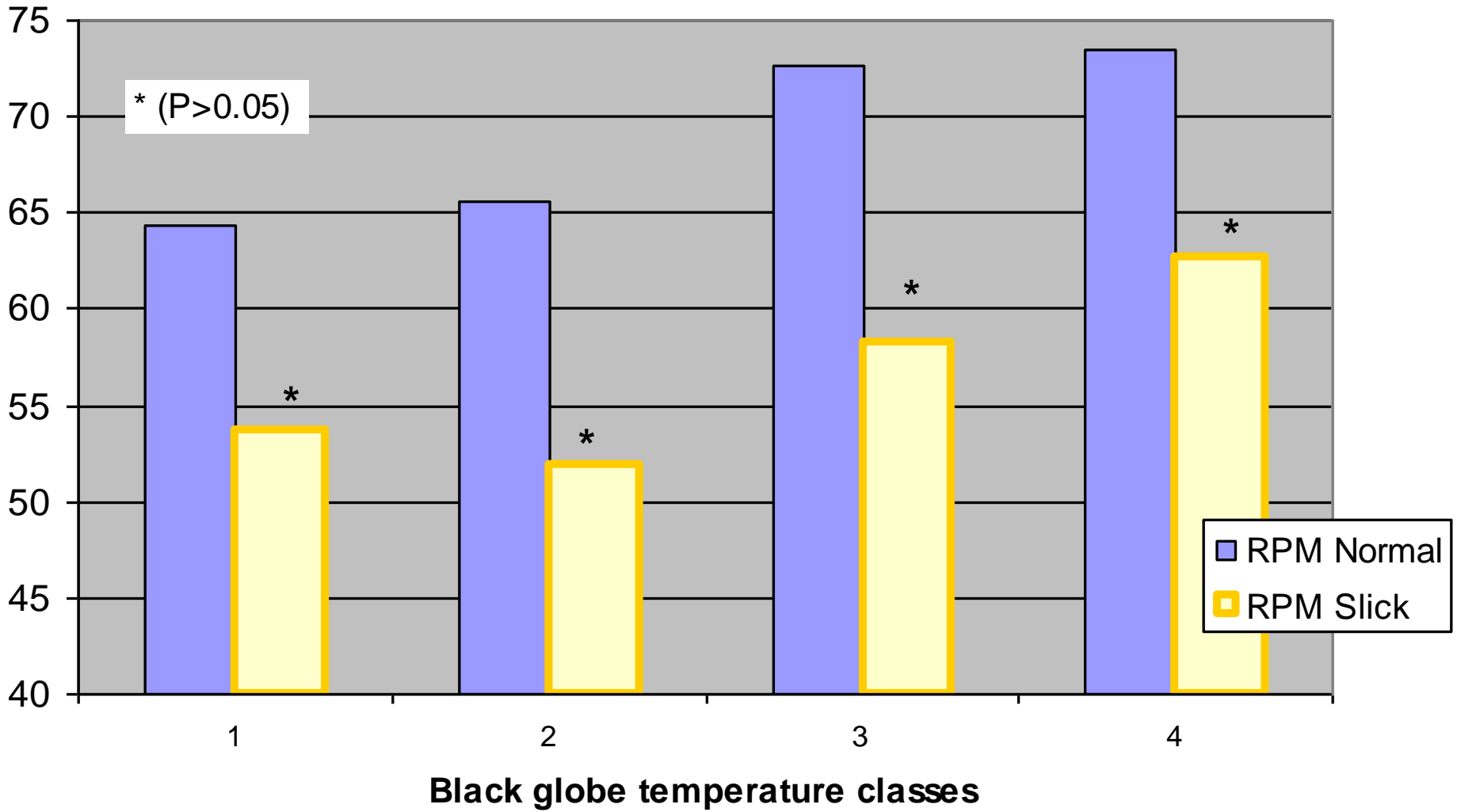
Respiration Rates of Slick vs. Normal-Haired Animals at the Beef Research Unit

- **Slick-haired animals**
56.6 breaths per minute
- **Normal-haired animals**
69.0 breaths per minute
- **This difference was significant at the 0.05 level**

Black Globe Temperature Categories

- **BGTC1** **< 40.0 C**
- **BGTC2** **40.0 – 44.9 C**
- **BGTC3** **45.0 – 50.0 C**
- **BGTC4** **> 50.0 C**

Respirations per minute



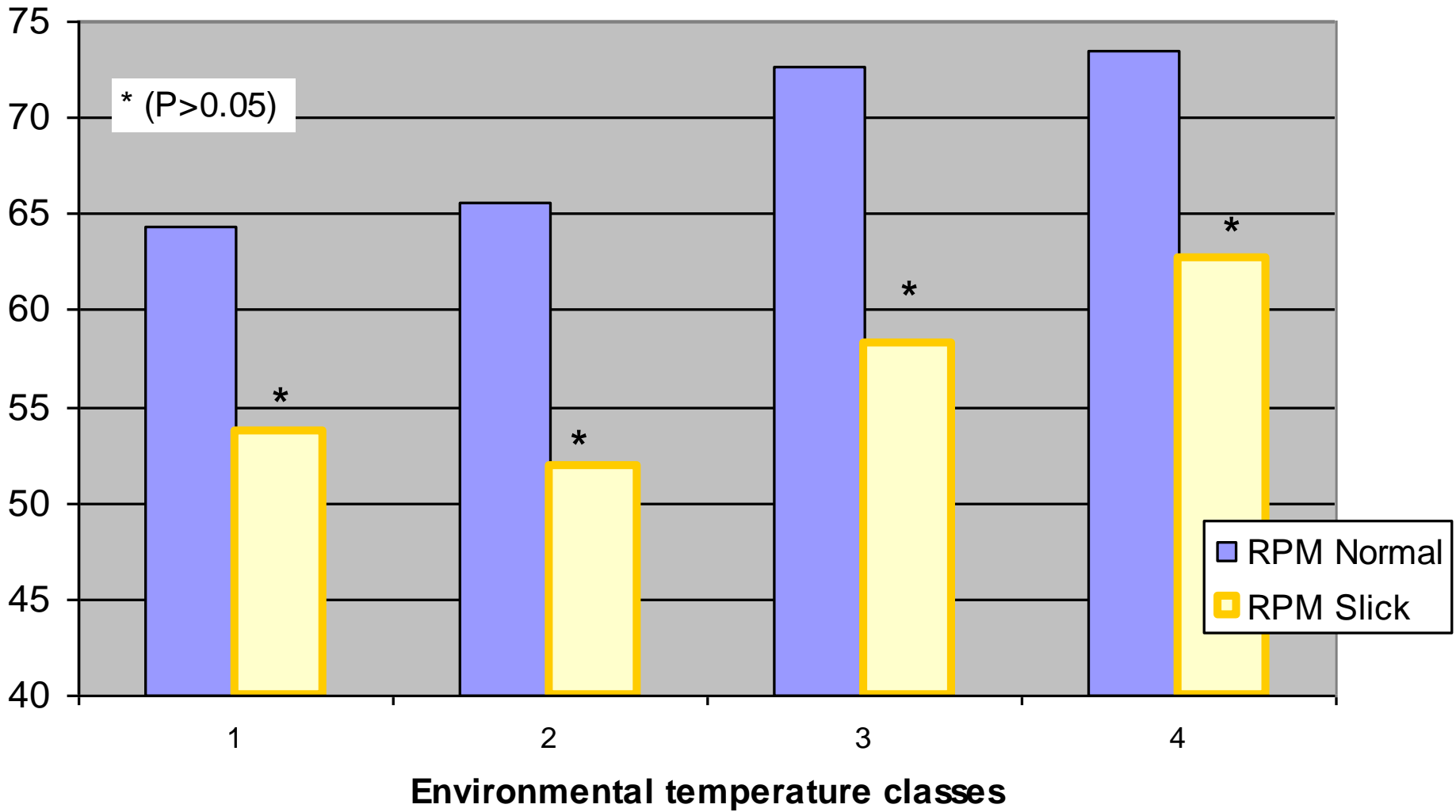
Reduced Respiration Rates of Slick-haired Animals

- The advantage of slick-haired animals was similar to that of shaded vs. unshaded animals shown by Brown-Brandl et al. (2001)
- It is also comparable to the advantage of zebu-crossbred over unadapted *Bos taurus* animals

What is the advantage of a reduced respiration rate?

- Adapted cattle are less affected by higher heat loads and thus are able to maintain lower respiration rates at the same temperatures.**
- They are thus more efficient, as a result of using less metabolic energy to maintain a normal body temperature.**

Respirations per minute





Feed Intake of Slick vs. Normal-haired Animals

- **We expected that the slick-haired animals would consume more feed**
- **Heat-stressed animals eat less**
- **The slick ones did eat somewhat more:**
 - **Slick 27.0 g of feed per kg live wt/day**
 - **Normal 26.7 g of feed per kg live wt/day**
 - **This difference, while small, did approach significance**

Objective Evaluation of Quantity of Hair on Slick and Normal-haired Animals

- **Slick-haired animals**
11.47 mg/cm²
- **Normal-haired animals**
17.82 mg/cm²
- **This difference is significant at the
0.05 level**

Quantity of Black vs. White Hair on Spotted Animals

- **Black Areas** **11.02 mg/cm²**
- **White Areas** **18.28 mg/cm²**

- **This difference is almost identical and of the same probability, 0.05, as the slick vs. normal hair difference!**

Quantity of Black vs. White Hair on Spotted Animals

- The difference in quantity of hair of slick vs. normal-haired animals was nearly twice as large in black vs. white areas**
- The weight of clipped white hair from slick-haired animals was only slightly less than that of clipped black hair from normal-haired animals**



What is the importance of these white vs black hair results?

- Answer: We don't know yet. It seems that a solid, light red animal, like that of most of the Criollo breeds might be the preferred coloration.**
- Holsteins with higher percentages of white have been shown to be superior in Florida but these animals don't graze and thus, are not as susceptible to sunburn.**



Conclusions:

- In addition to producing a shorter, shinier hair coat, the *Slick Hair* gene also results in animals having the ability to maintain lower rectal temperatures
- This reduction in rectal temperature appears to be up to 0.5 °C, the same reduction as 50% or more zebu influence in crosses provides

Conclusions:

- **Cattle with the *Slick hair* gene also have slower respiration rates while maintaining lower body temperatures**
- **This should allow them to be more efficient**
- **Such cattle aren't likely to be more productive unless placed under grazing conditions under heat stress**

What is next?

- Identification of the genomic location of the *Slick Hair* gene
- Sequencing of the *Slick Hair* gene
- Evaluation of the impact of the *Slick Hair* gene on milk yield, reproduction and survival in commercial dairies in south Florida and Puerto Rico



Puerto Rican Slick-Haired Holstein Cow #66

Also

- **Production of homozygous slick, red Holsteins**
- **Evaluation of the impact of the *Slick Hair* gene on growth and semen characteristics of Holstein bulls**
- **Possible importation of Reyna semen for use in dairy crossbreeding programs**





First Lactation Reyna Cow in Nicaragua

