Investigation of Fine Hair on American Cow Leathers

Part I

by

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Overview of Fine Hair

• Probably the biggest technical problem on American leathers
• It is seasonal (wintertime). The extension and severity changes year to year
• It downgrades the wet blue (or wet white) and/or finished leather
• Limits the use of wet blue, particularly for nubucks
• Mostly observed in wet blue made in the US
• Leathers displayed on the paper are from several US suppliers
Overview of Fine Hair

• Makes a challenge to sort the wet blue for fine hair. Inspection is sometimes subjective and not accurate. Sometimes the hair is hidden

• Some fine hairs can come out of the leather during retan processing; other times the effect is enhanced only after buffing (the enlarged hair follicle can be empty or have hair)

• Presence of fine hair on leather limits the types of articles that can be made

• What to do with finished leather that has fine hairs?
How fine hair looks on the wet blue leather
Hidden hairs on the wet blue

Grain side, hidden hair

Skived leather shows the hair roots
Typical hair residue

SEM photography

Optical microscope photography
How fine hair looks on the wet blue leather
Full grain leather

Grain side

Skived grain
Full grain leather

SEM photography

SEM photography
Full grain leather
How fine hair looks on the corrected grain leather
Corrected grain leather showing the empty hair hole

Nubuk leather showing a hair cut in half
Seasonal changes on the hair

- Winter hairs are long, summer hairs are shorter
- Summer hairs are thicker, winter are thinner and have broader diameter distribution
- Number of hairs is greater in winter compared to summer
- Winter hairs have felting
Seasonal changes on hair length and diameter on *Bos Taurus* and *Bos indicus*

Comparing Summer and Winter hair bundles

Summer (May)  Winter (January)
Factors that affect winter changes on the hair

- Living temperature of the animal; intensity and duration
- Animal breed – Hybrid x pure race
- Migration of the animals (hot to cold, cold to cooler)
- Steer x bull x heifer x cow
- Type and content of the feed
- Age of the animal
- Region of the animal
Mechanism of hair growth

• HAIR GROWTH PHASES

Youtube: https://www.youtube.com/watch?v=i-XUijAGJ-U
What happens to the hair on the transition from summer to winter

• The short and thick summer hairs are shed (during fall)
• Takes a few months to change from full summer to the winter coat; more time required from winter to summer
• Winter coat is more stable, summer sheds more
• New longer, thin and thick hairs start to be produced. The thin, medium and thick hairs will be present during winter
• Large amount of thin, shorter hairs grow
• The thick hairs have larger depth of the hair root
• All the three hair growth phases are present in the winter. The telophase accentuates when spring starts (shedding). The hair growth cycle is dynamic
• Winter hairs have felting properties
Winter hide

Variations on hair thickness, size and depth

Hematoxylin and Eosin stain
Hematoxylin and Eosin stain

Winter hide
Fine hairs observed on hides and leathers

- The winter hairs are present in different sizes, thickness and root depth
- Not all the called “fine hairs” on leather are fine. Most hairs have medium and/or large diameter (100 to 150 microns)
- Sometimes the “fine hairs” are caused by insufficient/improper unhairing
- When hair is not completely removed on the leather, it can have residues up to 500 microns length; the residues are cut on the top and show slight chemical attack
- Most of the time the problem of fine hair is minimized when salted hides are used; this can be related to the properties of salted hide and/or a longer leather process
- Salted American hides processed overseas have limited fine hair problem
- The fine hair problem is not new
- Most studies on hair seasonality are more than 40 years old; no new studies were found with current herds and breeding conditions
Future work – Part II of the paper

• Search and choose a tannery partner to work with
• Evaluate how summer hairs compare to winter hairs
• Investigate how soaking, alkalinity and reducing agents affect hair removal and residues
• Which hairs are the most resistant to regular unhairing
• Run comparative trials of improved unhairing versus traditional to assess the % improvement on fine hair removal
• Can we produce American leather without fine hairs?
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