

EM2707

**freeze brand
seminar**

PROCEEDINGS

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FREEZE-BRAND SEMINAR

WASHINGTON STATE UNIVERSITY

May 17, 1966

Much of these proceedings has been assembled from tape recordings and shorthand notes during the session. They have been extensively revised and edited to reflect the main points brought out by various participants.

COOPERATIVE EXTENSION SERVICE • COLLEGE OF AGRICULTURE • WASHINGTON STATE UNIVERSITY • PULLMAN

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TABLE OF CONTENTS

	Page
Summary of the Freeze Brand Seminar	
Dr. Roy I. Hostetler	1
The Freeze Branding Technique	
Dr. R. Keith Farrell	5
Questions and Answers	11
Histological Effects of Cryogenic Branding	
Dr. Gerald Hegreberg	12
Regulatory Problems in Freeze Branding	
Harold Hull	15
Branding and the Leather Industry	
Gordon Potter	16
Questions and Answers	18
Production Testing and Freeze Branding	
Joe Johnson	21
Attendance Roster	35

SUMMARY OF FREEZE BRAND SEMINAR, WASHINGTON STATE UNIVERSITY

May 17, 1966

Freeze branding or branding animals with extreme cold instead of heat was developed at the College of Veterinary Medicine, Washington State University by Dr. Keith Farrell, Veterinarian, U.S.D.A.-ADP and lecturer, College of Veterinary Medicine, Washington State University.

The ideal goal of freeze branding is to destroy the melanocyte, or pigment-producing cells, without destroying the hair follicle, thereby leaving the hair over the branded area white. One of the obvious advantages, of course, is greater visibility and legibility of the brand. As the epithelial cells are not destroyed, there is little or no scar formation and no blotching. It is possible to use relatively small brands and have them plain and distinct.

Freeze branding also has the advantage of being relatively painless. This reduces the amount of shock to the animal and the amount of restraint to be applied. Reduction of scar formation should result in a saving of most of the \$20 million now lost to the livestock industry due to dockage from hide damage by brands.

The branding technique being used at Washington State University is to chill a heavy copper iron in an alcohol-Dry Ice mixture. The proportions are not critical but the iron must be covered by refrigerant. The animal must be clipped over the brand sight. This requires the use of a number forty surgical clipper as any under-fur left would act as insulation and increase the time required for proper branding. The brand area is dampened with refrigerant, usually alcohol. This prevents the iron from freezing to the animal. The chilled iron is then applied for the proper time. (See page 9)

To get a proper brand, there are four variables that need to be checked. Time, temperature, hide texture, and season of the year or stage of hair growth. Time required varies from 5 seconds on thin-skinned animals in the spring of the year when their hair is growing fast, to as much as 60 seconds on thick-skinned animals in winter months. Apparently the melanocytes are more easily destroyed during periods of active hair growth. Time and temperature trials are still being conducted at Washington State University to determine the proper contact time at any given season of the year or stage of hair growth.

There will be certain disadvantages to freeze branding, the brand will not be readily distinguishable on white animals, as there is no scarring. It will be more difficult to identify brands that have been altered. (This factor may limit the use of freeze branding for ownership identification.) Exacting technique and careful observance of the time that the iron is applied to the animal will be necessary to produce uniformly good results. Excessive branding will destroy the hair follicle and leave bare skin which is a readily recognized brand. Under-branding may produce a few white hairs but may not be legible.

The brand will be identifiable shortly after it is placed on the animal due to the inflammatory action around the brand.

It is believed that improved techniques of freeze branding can be developed. With the present knowledge and available equipment, the use of such refrigerants as liquid nitrogen is too expensive to be universally adopted.

The most frequent questions about freeze branding follow:

1. Q. Is the freeze brand legal?
 - A. The freeze branding technique is so new it isn't even mentioned as yet, in the brand laws. Brand officials are studying this technique.
2. Q. Is freeze branding recommended by the Department of Agriculture or State Extension officials?
 - A. Freeze branding is still an experimental procedure. No recommendations for its widespread use have been made.
3. Q. Can this technique be used to remove unwanted hair and pigment from human beings?
 - A. Under no circumstances do we recommend the use of this technique by individuals on themselves. Cryogenic techniques are utilized in medicine but only under physician's directions. The careless destruction of pigment-producing cells will leave the skin at the mercy of the sun's rays. These pigment-producing cells are very necessary in preventing severe sunburning.
4. Q. Can a successful brand be made using the usual steel branding iron?
 - A. Yes, however, thick copper branding irons are recommended inasmuch as you do not have to hold the cold iron in contact for such a long period of time. We use brands 1/4" to 5/8" thick, 1" to 1-1/2" from face to back and 4" high.
5. Q. What is the purpose of the alcohol when mixed with Dry Ice?
 - A. The alcohol is used as a refrigerant. The Dry Ice chills the alcohol and the alcohol chills the copper branding irons. Methyl alcohol, Isopropyl alcohol, Ethyl alcohol, and Acetone work as well.
6. Q. Can a brand be produced without clipping the animal?
 - A. The contact between the cold iron and the skin itself is one of the most critical variables. For this reason we always clip the hair as short as possible. We use a shaving-head clipper because the hair interferes with the transfer of heat. For this reason also we usually wet the skin with the same type of refrigerant that we used in the Dry Ice-Alcohol bath. The refrigerant to wet the skin is, of course, kept at room temperature.

7. Q. Are the super cold materials dangerous to work with?
- A. Super-cold liquids should be handled carefully. Even the gases issuing from such liquids are very cold and can damage delicate tissues such as the eyes. Super-chilled objects can stick to the skin and cause tearing. Proper ventilation should be maintained around liquid-nitrogen containers.
8. Q. How long does the branding iron need to remain in the Dry Ice-alcohol solution?
- A. The copper branding irons cool quite rapidly in any of the super-cooled liquids (a matter of a few minutes). When first placed in the bath, they boil. When bubbles from the iron are being produced at the same rate as the rest of the mixture, the iron is chilled adequately.
9. Q. What is the ratio of Dry Ice to alcohol?
- A. You need adequate alcohol to cover your brands sufficiently and enough Dry Ice to adequately chill the alcohol. This is not critical.
10. Q. Is the white hair produced permanent?
- A. At the present time we have only seen brands through two hair growth cycles. So far, it is permanent. We do know a great deal about the destruction of melanocytes from observations with X-irradiation and "saddle sores" on horses. These conditions result in permanent loss of color from the affected areas. We really feel that this color loss will be permanent. However, in all good faith we should mention that there are some skeptics.
11. Q. Will this process be expensive?
- A. At the present time the nitrogen-chilling technique is expensive, however, the Dry Ice technique is very inexpensive, probably around five cents or less per brand.
12. Q. How long will it take the hair to show white?
- A. The speed of hair growth in the branded area appears dependent on the natural hair-growth cycle. For example, brands made in November and December are showing white-hair growth in March. However, with the technique we are now utilizing, we do get a hair loss prior to the regrowth of white hair and this is visible on the animal.
13. Q. How do I brand an all-white animal with the freeze branding technique?
- A. At the present time we have been branding in excess by leaving the nitrogen-chilled copper irons on the skin for 60 seconds. This stops hair growth and causes a depigmentation of the skin. We have not had sufficient time to determine if this change will be absolutely permanent. There has not been regrowth in eight months.

14. Q. Where can I obtain the equipment and materials to do this freeze branding job myself or who is commercially available to do the freeze branding?
- A. There is no commercial firm engaged in freeze branding. This is, as yet, an experimental procedure. The commercial use of this procedure will be dependent upon the action of the Federal Government on patent applications.
15. Q. Can swine and horses be branded by freezing?
- A. Yes, but it is too early for recommendations on time and temperature. Branded swine may have a greater tendency to sunburn at the brand site. (This is now under study).

THE FREEZE-BRANDING TECHNIQUE

R. KEITH FARRELL, D.V.M.
W.S.U. RESEARCH VETERINARIAN

Dr. Farrell, D.V.M.

I was tickled to death to hear Glenn Lorang, Regional Editor - Farm Journal, say that freeze branding is the finest thing since the manure spreader. I will have to admit I have never seen so much excitement over a few white hairs.

A hot branding iron has been used as a means of identification of animal and man since our earliest recorded history. The need for a technique which is less painful, less injurious and more legible has probably been on the minds of everyone who has used the hot branding method since the time of Cleopatra. Many means of animal identification have been tried to circumvent the disadvantages involved with the hot iron brand. Techniques such as ear tags, collars, and tattoos, have left much to be desired.

Legibility from a distance is a problem in most all techniques except the hot-iron brand; and even the hot-iron brand is dramatically legible only under the best of circumstances. In the winter, branded animals have to be clipped to make the brand legible. Tags and collars cause problems by catching on objects and tearing free or causing damage to the animal. Tattooing has been a very successful technique when used on sparsely haired anatomical areas, but again it necessitates catching each animal for identification.

The extreme pain associated with the hot branding iron has long concerned everyone who has had anything to do with this technique. The dilemma has been complicated by the need of the livestock industry for animal identification; as opposed to the concern of the tanning industry which reports a \$20 million yearly loss from hide damage brought about by the use of the hot branding iron. The livestock industry has been concerned about the damage done to the animal by excessive branding.

Open wounds invite bacterial infection and external parasites.

Identification problems are not unique to the livestock industry. The need for identification is of concern to anyone who is working with laboratory animals, fisheries, game management, ecology, herd health or even the identification of pets.

The ideal identification technique would result in a minimum amount of pain to the animal while producing a permanent mark that is legible from a distance. Such a technique should produce as little stress to the animal as possible and a minimum amount of skin damage.

The experimental results on the technique referred to as "freeze-branding" shows promise of fulfilling many of the requirements outlined. The results to be

presented in this seminar should be considered preliminary. They are presented to give you a background for your evaluation of the problems that might exist in your own field of interest if this technique were to be adapted by the livestock industry.

The ultimate goal of freeze branding will be the selective destruction of the melanocyte, by using extreme cold. The melanocyte can be best described as a one-celled pigment-secreting gland which is responsible for both hair and skin color. We have used extreme cold for years in an attempt to preserve the cells in the living state. Sometimes we were unsuccessful in these attempts and destroyed the cells. When this happened we considered the experiment a failure. In the freeze-branding experiments our role is reversed. If the melanocytes survive after freezing, the experiment is a failure.

The problem is complicated by the fact that we want to destroy the melanocytes selectively without destroying the other cells of the skin. The destruction of this cell by freezing results in the growth of pure white hair from the frozen area, as well as a lack of color in the skin itself.

The application of extreme cold to the skin has been used as a local anesthetic by physicians. To determine if pain was involved in the freeze branding, a small copper branding iron was chilled at liquid nitrogen temperatures and placed in contact with the skin of my arm. I felt a distinct tingling sensation momentarily as the skin was frozen. Surprisingly there was no sensation of itching as the skin thawed. The skin subsequently became inflamed and swollen over the brand site with no sensation of pain. We have not, as yet, completed an evaluation of pain with dry ice and alcohol temperatures, but we have noticed that cows have a tendency to lick the brand-site as the skin thaws, which might be an indication of some irritation at these temperatures. Some of the cows have a tendency to move around at the time the skin is frozen, and we don't know if this is a manifestation of some sensation that they are getting from the extreme cold or whether they object to pressure from the iron. However, we have observed no tail wringing or paddling of the feet which would be an indication of extreme pain.

The series of events seen after the skin is frozen are; (1) the frozen skin is indented in the form of the cold object, (2) as the skin thaws there is a marked reddening of the skin over the branded area, which is followed shortly by edema, and (3) the hair is usually lost over the brand site over a period of days and will remain bare until the next hair cycle.

If sufficient cold is transferred to the skin, one of several things occur. Melanocytes are destroyed without damage to the hair follicles in which case the hair will continue to grow but all subsequent hair produced will be white. This hair grows much more rapidly than the hair from the unbranded skin and will appear much longer. This hair stimulation is seen in some cases where there has not been sufficient freezing to destroy the melanocyte. The hair will remain colored but will grow more rapidly.

Strangest of all, some of these animals insufficiently frozen will show a marked darkening of the hair coat and skin as well. In other words, it appears that if we do not kill the melanocytes we may stimulate them to produce excessive amounts of pigment. This phenomenon has been seen with a variety of other irritants,

including ultra-violet radiation as well as certain chemicals. Some animals are very sensitive in this regard and will grow dark hair even after the hair is clipped very close.

Of major concern to us is the question of permanence. We believe that once an animal is branded by the freezing technique all subsequent hair growth will be white. We are not yet willing to hazard a guess as to the effect on melanocytes of the skin. However, we have observed one adult dog for over one year in which the skin has also remained white. Adult cows have also maintained the depigmented skin condition for over one year.

However, many more experiments should be conducted over long periods of time, particularly in very young animals, before we speculate on the permanence of skin depigmentation by the freeze-branding technique. We do feel, however, that the destruction of the melanocyte in the hair follicle will result in a lack of pigment in all succeeding hair growth cycles.

We feel there is strong evidence to indicate that the freeze brand will result in permanent white hair growth. There have been studies on other techniques of melanocyte destruction which resulted in permanent growth of white hair. The best known natural occurring effects are the so-called "saddle sores" on horses. Further, the use of X-ray radiation has frequently resulted in the destruction of melanocytes within the hair follicle. After such destruction the hair growth is white in all succeeding hair growth generations. In some naturally occurring situations, such as are seen in old age of animals and man there is a tendency for the melanocyte to become exhausted or in some way inactivated so that white hair is produced and even though we cannot say that the melanocyte is dead these changes also result in permanent white hair.

The freeze-branding technique has been attempted on a variety of animals including the horse, cow, deer, elk, seal, sea lion, monkey, goat, mouse, hamster, and chicken. It is too early to evaluate the technique on many of these animals. However, we have reason for optimism on all species mentioned except the chicken. We used the chicken as an experimental model in hope of determining the feasibility of utilizing this technique for water fowl migration studies. So far, the results on the chicken have been extremely discouraging.

Response varies greatly among the different species as to the time and temperatures necessary to achieve a legible brand. There are so many variables involving the individual animal. It appears at the present state of knowledge, that the melanocyte will be destroyed more easily during the time of maximum activity of the pigment-producing cells. Unfortunately it appears that the skin is also more sensitive at this season. Individual animals vary a great deal in response to freeze branding - the amount of hydration of the animal, the difference in susceptibility between the young and old animal all play a part. The general condition of the animal appears to be a variable, as does the amount of under-fur and hair density. (See Table 1, Page 8)

We have received a number of letters inquiring about the final recommendation on the method of freezing the skin. It is too early to make an evaluation of the most efficient future techniques. Many techniques are now under consideration,

including thermoelectric devices, liquid carbonic devices, techniques of pumping super-chilled liquid from a container through lines to the animal, and a variety of other methods. Some of these techniques appear, on the first observation, to be rather expensive to develop.

FREEZE - BRANDING

Time and Temperature Titration Bovine
One Inch I.D. Copper Brand
Legible Brand With White Hair

Time Seconds	Alcohol-Dry Ice Clipped-skin wet		Nitrogen-liquid Clipped-skin wet	
	No.	%	No.	%
5	3/29	10.	22/31	71.
10	10/29	34.	25/31	81.
15	19/29	65.	25/31	81.
20	27/29	93.	28/31	90.3
25	28/29	96.	30/31	97.
30	29/29	100	31/31	100
35	29/29	100	31/31	100
40	29/29	100	30/31	97.

Table I

The two techniques of greatest interest to us now are the use of a copper branding iron chilled in either liquid nitrogen or Dry Ice and alcohol, and the direct application of liquids that boil at very low temperatures to the skin itself. The latter is the so-called "stencil" or "cookie-cutter" technique and involves liquified gas, under pressure, sprayed onto the skin in a pattern controlled by the stencil or so-called "cookie cutter".

We have great hopes for the "cookie-cutter" technique. We are wrestling with a few engineering problems before subjecting it to a more extensive evaluation. Most work, so far accomplished, has utilized the copper branding iron. This is a copper metal stamp (chilled in Dry Ice and alcohol, or liquid nitrogen) and then placed in contact with a shaved area of the skin after the skin has been wet with a suitable refrigerant. This technique is not fancy but does result in legible brands.

Evaluation of copper, aluminum, and steel branding irons has shown that copper is the most efficient for heat transfer. The irons are simply placed in the refrigerant (Dry Ice-alcohol or nitrogen) until the rapid boiling ceases at which time

it has reached the temperature of the surrounding liquid. The ratio of Dry Ice to alcohol is not critical. You simply need enough alcohol to cover your metal branding irons and enough Dry Ice to chill the alcohol. An insulated container is a necessity.

To acquire a legible brand it is necessary to shave the hair as closely as possible. We use an Oster, Number 40 shaving head clipper to achieve this. Cordless, self-powered clippers are of great advantage to this technique. I understand that such clippers will eventually be on the market. After clipping, the skin of the animal is wet with a suitable refrigerant to prevent the iron's sticking to the animal. The iron is placed firmly in contact with skin for the desired length of time. Table 1 demonstrates the results obtained in a group of pregnant and lactating cows branded at Dry Ice and alcohol temperatures and liquid nitrogen temperatures. The results are somewhat more variable than what we had anticipated. All animals were clipped with a No. 40 Oster shaving head clipper prior to the application of the brand.

It should be pointed out that it requires 30 seconds before 100% legible brands were obtained in the Dry Ice alcohol group. This table is not designed to demonstrate differences in susceptibility at different anatomical sites. It should also be pointed out that these animals do not, at present, show the excellent hair growth of non-pregnant, non-lactating animals. These figures could change somewhat after there is a more adequate hair growth in this group. The liquid nitrogen column demonstrates a more rapid effective time on a greater number of animals at 5 seconds and 10 seconds. Why we were unable to produce legible brands in 100% of the animals until the contact time was raised to 30 seconds has not been explained.

Table 2 represents an attempt to evaluate the efficiency of the different refrigerants when used as a wetting agent for the skin and as a refrigerant to be mixed with Dry Ice alcohol. In each column the same refrigerant was utilized as a refrigerant and as a skin wetting agent with the exception of liquid nitrogen where kerosene was utilized as the skin wetting agent.

Pilot Experiment on Refrigerants
Dry Ice and Ethanol, Methanol, Isopropyl Alcohol
Acetone, Jet fuel, and Kerosene

Legible brands/Total							
Time In Seconds	Dry Ice Alcohol		Dry Ice		Dry Ice		Nitrogen
	Ethyl	Methyl	Isopro.	Aceton.	Jet Fuel	Kero.	Kero.
5	1/6	2/6	0/6	2/6	0/6	0/6	4/6
10	5/6	6/6	3/6	5/6	3/6	3/6	6/6
15	6/6	6/6	6/6	6/6	4/6	4/6	6/6
20	6/6	6/6	6/6	6/6	6/6	4/6	6/6
25	6/6	6/6	6/6	6/6	6/6	5/6	6/6
30	6/6	6/6	6/6	6/6	6/6	5/6	6/6
35	6/6	6/6	6/6	6/6	6/6	4/6	6/6
40	6/6	6/6	6/6	6/6	6/6	4/6	6/6

Table II

This table is the combined result of 3 cows branded on each side, all solvents when mixed with the Dry Ice, were comparable as far as reduction of temperatures was concerned. It appeared that jet fuel was less efficient than the different types of alcohol and acetone. The branding iron had a greater tendency to slip when jet fuel and kerosene were used than with the other techniques.

Table 3 demonstrates the effect on skin damage when these different refrigerants were used.

Skin Damage and Severe Hair Loss
with
Different Refrigerants
Brands with Epithelial Defoliations
(Severe Hair Loss)

Time In Seconds	Dry Ice Alcohol Ethyl	Dry Ice Methyl	Dry Ice Isopro.	Dry Ice Acetone	Dry Ice Jet Fuel	Dry Ice Kero.	Dry Ice Nitrogen Kero.
5	0/6	0/6	0/6	0/6	0/6	0/6	3/6
10	1/6	1/6	0/6	0/6	0/6	0/6	5/6
15	0/6	3/6	1/6	2/6	0/6	2/6	5/6
20	2/6	4/6	1/6	5/6	0/6	0/6	4/6
25	3/6	6/6	3/6	5/6	0/6	0/6	6/6
30	5/6	5/6	3/6	6/6	0/6	0/6	6/6
35	4/6	5/6	6/6	6/6	0/6	0/6	6/6
40	4/6	5/6	5/6	6/6	0/6	0/6	6/6

Table III

This is an evaluation of severe hair loss and epithelial defoliation. It would appear that most severe skin damage occurred with the methyl alcohol and acetone. The most startling result was the protective effect of jet fuel. This protective effect did not interfere too greatly with destruction of the melanocyte (as we observed in Table 2). It appears that jet fuel increases the time necessary to produce an effective brand by at least 5 seconds over the techniques utilizing Dry Ice as a refrigerant. It also appears that the refrigerant used has more effect than we had anticipated.

Water soluble refrigerants leave something to be desired in that they act as a vapor pump after becoming cold and pump themselves full of water. The refrigerant becomes thicker and thicker until it has to be thrown away. The jet fuel and kerosene theoretically should not act as a vapor pump in this respect. However, it was noted that this material also became thick after 2 days use. This problem is being investigated further.

Table 4 demonstrates the difference in double skin thickness in centimeters between adjacent normal skin and over the brand itself.

Skin Damage Study
Double Skin Thickness in Centimeters
Average of Seven Measurements

Technique	Control Thickness in CM	Brand Thickness in CM	Animal
Dry Ice Alcohol (8 sec. contact)	0.36 $\pm$ 0.09	0.33 $\pm$ 0.02	Dog (561), black skin dry and shaved.*
Liquid nitrogen (8 sec. contact)	0.35 $\pm$ 0.07	0.25 $\pm$ 0.03	Dog (561), black skin dry and shaved.*
Liquid nitrogen (8 sec. contact)	0.29 $\pm$ 0.04	0.30 $\pm$ 0.04	Dog (561), white skin dry and shaved.*
Hot brand (instantaneous contact)	0.35 $\pm$ 0.05	0.85 $\pm$ 0.12	Dog (561) black skin dry and shaved.*
Liquid nitrogen (40 sec. contact)	0.90 $\pm$ 0.30	0.89 $\pm$ 0.33	Average of 61 Here- ford cattle shaved wet with alcohol.

Table IV

*Small animal electric clipper, Model A-2, size 40 John Oster Mfg. Co., North Lydell & Thomas, Milwaukee, Wisconsin.

The freeze brands feel supple and average out close to the normal double skin thickness. The hot brands on the other hand produced a marked thickening. The microscopic examination of the damage involved will be discussed by Dr. Hegreberg.

QUESTIONS & ANSWERS

Dr. Erickson -- How close do you feel you are to actually controlling the length of time? Don't you think this is a very difficult problem? You were talking about variables like the season of the year, etc.

Dr. Farrell -- We can successfully brand adult cows by simply placing the chilled iron in contact with the skin for thirty seconds. However, at 40 seconds, we had a cow that didn't produce white hair at the brand site with liquid nitrogen. That is the first one we have encountered like that. This is an experimental procedure, as far as I am concerned. These results imply that we can brand all animals in 30 seconds, with Dry Ice-alcohol, under the conditions of this experiment.

HISTOLOGICAL EFFECTS OF CRYOGENIC BRANDING
GERALD HEGREBERG, D.V.M.
COLLEGE OF VETERINARY MEDICINE
W.S.U.

The gross effects to the skin resulting from cryogenic branding developed by Dr. Farrell are most dramatic. Further interest in the histologic effects of cryogenic branding on skin pigmentation and injurious action of freezing to the skin prompted us to initiate an investigation into this area.

Today, I would like to discuss briefly the histology of the skin, its response to heat and cold, and some observed effects to the skin of cryogenic branding.

Histology of the skin:

Microscopically, the skin can be divided into two parts: the epidermis, and the dermis. The epidermis is the most superficial layer and consists of a number of layers of cells which in man and animals extend into the underlying dermis in deep projections. The epidermis has among its functions:

1. The maintenance of a surface layer which forms an inert protective covering for the body, and
2. Formation of melanin pigment, which insures protection of the dermis against the effects of solar radiation. The cells containing and forming melanin pigment are located predominantly in the deeper parts of the epidermis. The pigment granules gradually decrease in number in the more superficial layers of the epidermis and virtually none are present on the surface.

Numerous epidermal appendages, namely hair follicles and glandular elements, primarily the sebaceous glands and apocrine sweat glands are seated deep in the dermis. Hair consists of a hair shaft and a hair nest. The hair root is that portion of the hair follicle located in the deep dermis and consists of closely packed matrix cells, some of which contain melanin. The matrix cells become cornified toward the surface of the skin and form the hair shaft. The hair shaft is composed of a medulla or inner portion, a cortex which lies next to the medulla, and the outer cuticle. The cortex of the hair shaft contain pigments which gives hair its color. The dermis is separated from the epidermis by a clear boundary. Lying immediately beneath the dermis, it is composed of tissue having a dense fibrous structure and numerous cellular components.

Cold and Heat Injury to the Skin:

1. Heat injury - Grossly a rather severe reaction is produced in the skin when it is subjected to a severe burn. Initially, in humans, the epidermis separates from the dermis when only a slight frictional trauma is applied. The heated area and usually the surrounding tissue becomes reddened. Microscopically, a blister appears between the epidermal-dermal junction and the epidermis becomes necrotic. Cells in the region of the epidermal-dermal junction disintegrate (acantholysis) giving a rough appearance. The blisters usually appear within a few minutes after insulting the skin. The effect of heat is mediated in part by the release of enzymes from dying cells which further break down tissue protein. (proteolytic enzymes)

2. Cold Injury - Human skin subjected to liquid nitrogen for 5 seconds shows an initial raised swelling of the skin (edema) followed by reddening which persists until a blister formation occurs. Usually the reaction produced by freezing the skin is confined to an area equal to or only slightly larger than that of the frozen area.

Microscopically, blister formation occurs as early as 30 minutes after freezing in the human (shorter time periods have been observed in animals). The blister formation in humans is characteristically confined to the epidermal-dermal junction as is heat injury but produces a clean separation in this region. Pearson states that the effects of cold on the epidermis are in striking contrast to the effects of heat. Cold seems to exert its effects in the intermembrane space between the epidermis and dermis and may affect some material which gives adhesiveness between these two structures.

Another worker, Kulha, has performed studies on the effect of cold injury to determine whether the changes in the skin from cold application are direct injurious effects or whether the tissue changes are mediated through some secondary reactive change. His work indicates that the exposure of the skin to cold produces its effects through progressive microcirculatory disfunction with the following sequence of vascular events; (1) arterial and arteriolar constriction; (2) excessive venular - capillary dilation; (3) increased endothelial leakage; (4) erythrocytosis; (5) arteriovenous shunting; (6) segmental vascular necrosis; (7) massive thrombosis.

Effects of cryogenic branding: Grossly, changes to the skin resulting from cryogenic branding include reddening and swelling initially depending on the temperature, length of time applied, species, age, and area of the body to which the cold is applied. In severe exposure, this is followed by an eschar (scab) formation of the epidermis over the brand with subsequent sloughing of the scab over varying periods of time. The response is a gradient one and little reaction is produced when cold is applied for only short periods of time.

Complete epithelialization appears to occur by the time the scab is sloughed. The epidermis has a smooth velvety feel especially after excessive freezing due to disappearance of epidermal appendages.

Microscopically, little pathologic change is noted in the skin of the bovine examined 5 months after cryobranding. Sites examined included those branded 40 seconds with copper, 40 seconds with steel, and 20 seconds with steel at -90 degrees F. as compared to the controls. The epidermis appeared slightly thicker on the 40-second copper brand site, but was not significantly different than the controls at the .05 level of significance.

Changes in the epidermis of sites branded at 40 seconds and 20 seconds with steel showed virtually no change in epidermal thickness histologically and measured epidermal thickness showed no significant difference between branded areas and control areas.

The dermal changes were not remarkable. No inflammatory reaction was observed and no increase in thickness of the dermis was noted.

The most remarkable change noted histologically in the skin was the lack of melanin pigment both in the epidermis and hair follicles. A rather dramatic demarcation was present between the brand site and the adjacent tissue.

To date, we have examined primarily the histologic change with regard to the fairly long-termed response of cryogenic branding of the skin. Further studies on acute and chronic effects are being initiated.

REGULATORY PROBLEMS IN FREEZE BRANDING
HAROLD HULL
SUPERVISOR, REGULATORY DIVISION
STATE DEPARTMENT OF AGRICULTURE
OLYMPIA, WASHINGTON

To all intents and purposes here today, the Regulatory Division is head of the Brand Division. This is true in most other states represented in this seminar. The main part of our work is identification of animals throughout the state and registering brands in Olympia. I have two of my associates with me today. Bob Armstrong, Assistant in the Regulatory Division and Gisela Turley, Brand Registrar. I am sorry that I must suggest that freeze branding is not legal at this time. I'm sorry because I can see that Dr. Farrell and others have spent a lot of time developing the method.

The reason I am forced to suggest this however, is because our law in the State of Washington states: "A brand means a permanent fire brand or any artificial mark approved by the director to be used in conjunction with a brand or by itself."

We may develop a new regulation to incorporate other methods, such as freeze branding; but in doing this, first we must establish if this new brand is identifiable from the instant it is placed on the animal through the continuous life of the animal. This is what is most important. Another necessity is permanency.

The reason I emphasize identifiability is that our brand inspectors in the field, have to be sure when animals have to be inspected to change ownership, that this is the brand of the person who is selling the animal; otherwise the buyer may come back later saying, "I was gypped." You can see the position in which the brand inspector is placed. It would put the whole Department in the same position. Therefore, my main concern here today is protecting the cattlemen and his livestock.

We are willing to go along with this new freeze branding or any other branding that will do the job. We came here mostly to learn. I might mention that we have had many inquiries in our Department as to what freeze branding is. The first few we received, we referred to WSU. We became tired of sending these letters on and finally made up a form stating that we know nothing but we are trying to learn.

As little as we do know about it, we feel that production brands would be the best place to start. We do suggest that a regulation be passed immediately, relative to freeze branding. This would allow the work to continue legally, as an identification brand to be used in conjunction with the ownership brand. We think this is as far as we want to go today, but we certainly want to look, listen, and learn.

BRANDING AND THE LEATHER INDUSTRY
BY
GORDON POTTER

I appreciate the opportunity of coming to Pullman and speaking before this key group of the livestock industry.

The tanning industry is extremely interested in breaking the tradition of hot iron branding. They feel that more emphasis should be put on the fact that it is an antiquated and wasteful way of identifying livestock, despite the fact that literature, movies, television, restaurants and even the U.S. Government, at times, publicize its romantic past as a symbol of the Old West.

In Webster's New World Dictionary, a definition of the word "brand" is as follows: "A mark made on the skin with a hot iron, formerly used to punish and identify criminals, now used on cattle to show ownership." Hot iron branding dates back to the beginning of organized society, and you would think that in this day and age of technological achievements, a break-through away from this barbaric practice would present itself.

Hot iron branding is a major cause of the downgrading of cattlehides. A delivery of branded hides is normally discounted anywhere from 5% to 20% in value, depending on the size and location of the brands, as well as changes in marketing conditions. Some tanners, such as those who tan cattlehides for upholstery, don't use branded hides. Based on the fact that 40% of the domestic cattle supply is marked by the hot iron, I can safely state that the losses in leather due to branding amount to \$20 million annually. Fortunately for the tanners, most of this loss is passed back to their suppliers, since branded hides are discounted from the free-of-brand selections.

As you can see, I have here beside me a side of leather containing 3 huge brands. This side was sent here through the courtesy of a West Coast tanner who is plagued by many such multiple-branded sides, due to the extensive branding throughout the Far West. The square area on the side represents the most valuable portion of the hide for making quality leather. Please note that because of these brands, nearly the entire cutting area has been ruined. In many states, this valuable area of the hide is specifically designated for applying brands, so you can readily see why so much money is lost due to hot iron branding. Please note also that these brands run all the way through to the fleshed side.

In 1965, the Economic Research Service of U.S.D.A. developed a study on the segmentation of cattlehides. The purpose of this study was to show that by removing the head and belly from the hide, the resulting rectangular shape would be of higher quality and more adaptable to automation by the tanner and shoe manufacturer. At present, only a small quantity of leather is sold on the U.S.D.A.'s recommended pattern, but if such segmentation is eventually universally adopted, you will see a much wider span in value between the free-of-brand hides and the branded hides because, as we stated earlier, brands are applied to the portion of the hide which yields the quality leather.

The reasons for adequate livestock identification are certainly sound. We understand the cattleman's necessity for having permanent identification which can be seen from afar, and which can be easily and economically applied. We do not dispute these requirements. However, we believe that improvement in present practices can definitely be accomplished. Believe me, it is extremely consoling to find that the tanning industry is not alone in this endeavor. It has been encouraging this past year to learn of the interest of different organizations, both public and private in working for an up-to-date method of livestock identification. Naturally, only a method that will not damage the leather-making qualities of the hide will satisfy the tanning industry, and at the same time it will add millions of dollars to the cattlemen's return for their cattle and calves.

The interest and enthusiasm that Dr. Farrell and his staff have shown in their work in cryo-branding is truly heartening. Our Tanners' Laboratory reports that the first hide sample containing cryo-brands has been analyzed. Unfortunately, the results showed that freezing still damaged the hide extensively enough to ruin the grain. The questions I hope will be answered today are can the application be modified to minimize the damage to the hide, and secondly, can it be applied to a smaller area than a hot iron brand and still be acceptable to the cattlemen.

More seminars like today's should be encouraged to that we all fully understand each other's problems on this important subject. Efforts should be made to educate branding commissioners. They should fully understand the problems of present day livestock identification methods so that their support and help can be solicited. A step in the educational process would be to issue a pamphlet pointing out the losses due to present livestock identification, practices, and ways which are open for the cattlemen to eliminate such losses. The pamphlet should be made available to the cattlemen, meat packers, Government agencies and others concerned with the problem.

Our tanners are at a loss to understand why so many brands are applied on each animal and why it is necessary to have such enormous brands caused by a large iron or a free-hand artist using a hot wire as a brush. Efforts should be made to curtail the size. Even a 3½" diameter branding iron (which I understand is the minimum size for an effective hot iron brand) allows for too much wasted substance. The size of the brand should definitely be reduced and should be applied to a less valuable portion of the hide. These complaints are not new, and other countries have definite branding restrictions to protect the leather-making substance of the hide.

Thank you, gentlemen, for allowing me to present the tanners problems with branding. I am extremely pleased to participate at this seminar as only in seminars like today's can we hope to develop a satisfactory livestock identification program.

QUESTIONS AND ANSWERS

Dr. Gorham -- First of all, I am not a pathologist. In looking at the sections for the first time I see only an absence of the melanin. In relation to your statement about loss of grain, would you define what was meant by loss of grain?

Mr. Potter -- Grain is what we call the hair side. In the leather, this side is considered the grain side or the hair side. And this is the area which you see on a pair of shoes or on your luggage. This is the area which is the beauty part of leather. The other side, which we call the flesh side, is the inside. From the samples we have, the mark was deep enough to hurt the grain, but you do buff the buff side. You can buff some off. But some of the samples that were submitted indicated damage severe enough so that it could not be buffed off.

Now may I ask this question of Dr. Farrell? Does this scar tissue ever completely heal over with age?

Dr. Farrell -- The hide we sent to Mr. Potter was the only hide we have had.

Mr. Cheney -- How long had that hide that we sent to Mr. Potter been branded?

Dr. Farrell -- About five months. This was a doubling time-temperature study, so some of the brands were greatly in excess. At 30 seconds with copper, we did get follicle damage, permanent hair loss and very smooth feeling skin. Would this account for the "loss of grain?"

Mr. Potter -- Well, you create a scar tissue. Isn't this what I understand?

Dr. Farrell -- No, there is no scar tissue. The dermis is free of connective tissue. Dr. Hegreberg's pictures mean that pathologically we can't tell the difference between branded and normal skin except for the loss of the melanocytes in the skin. The dermis remains the same thickness. If you brand in excess, you are going to lose the hair and it will be bare, like baby skin with no follicles.

We are going to get things you don't like, Mr. Potter, if we brand at 30 seconds. But, we can't assure adequate contact of all animals at 10 seconds with the chilled iron. I have hopes that we can get away from the contact problems with new technique.

Is it possible that the loss of the hair follicle makes the skin too smooth on the surface?

Mr. Potter -- No, this is actually damage in the skin itself. Hair follicles, to my knowledge, don't cause any problem except maybe in the full grain.

Dr. Farrell -- I guess we are in an area of additional research. As Dr. Hegreberg's slides show, we cannot equate the leather damage described with what we have been seeing in the skin by microscopic examination.

Mr. Pattingale -- The time element is so critical it seems to me that our cowboys are going to have one heck of a job by the time they tie up and rope the cow and have to use a stop watch.

Dr. Farrell -- If we freeze skin for 30 seconds, we have a good brand even if we may have some hide damage. At the present time, it is better than the hot-iron brand. We must get fancy, eventually to take care of Mr. Potter's hides.

Mr. Hull -- Dr. Farrell and Mr. Potter are both concerned with this particular point. If you do not damage the hide, is the brand immediately identifiable, or say for the next 30 days or until the hair turns white?

Dr. Farrell -- The brands we are doing at 30 seconds are almost immediately readable because of redness and swelling. The hair coat becomes rough, there is hair loss, and variable amounts of epithelial loss: on an excess brand this hair loss will remain until the new hair grows, so they will be observable. We are using cryogenic liquids and boiling them on the skin surface. Some of these animals do not have a hair loss and the brand will not be immediately readable.

Mr. Potter -- What size of brand or branding iron do you envision?

Dr. Farrell -- The size is a problem. For one year we have had a 3/4" letter "H" of the leg of a dog. Where the hair is long this "H" looks like a white spot but, when you clip it, there is the letter "H" as pretty as a picture. The size that you finally select will depend on age and anatomical location. Letters 4" high show up nicely on long haired areas but you can use much smaller letters on the ear, lower leg, or jaw.

Mr. Cheney -- Dr. Farrell, in brand inspection and determination of ownership, we make an actual inspection of the cow and a close inspection of the brand. In that examination we may determine that the brand has been altered or changed. Have you done any experimental work in changing the original brand? Do you see any problem in changing an original circle to an 8 or a B?

Dr. Farrell -- Sure, I think you can change it.

Mr. Cheney -- And of course, the thing I am looking for is the change that will occur in the month he has a new brand showing and the fact that there will be no scar tissue on the under side of the hide.

Dr. Farrell -- A brand with hair follicle destruction should work for an ownership brand. Maybe you should put your name, address and telephone number on the neck.

Dr. Erickson -- What is the length of the oldest brand you have by this freeze branding method?

Dr. Farrell -- A year this March.

Mr. Nelson -- Dr. Farrell, is livestock as susceptible to hair dyes as is the human?

Dr. Farrell -- Yes.

Mr. Armstrong -- If you dyed this hair, then, doctor, would it probably hold until the next hair change?

Dr. Farrell -- Yes. With ownership brands I can see a real problem. And to approach anything like the hot iron brand you are going to have to require follicular damage; you are not going to dye the white skin. But, if you had a real good hairdresser, you could dye the hair.

Mr. Hull -- Even if you damage the hide by excess branding, can you feel the scar?

Dr. Farrell -- No. You cannot feel this brand like you can a hot-iron brand.

Dr. Reynolds -- I would like to ask a question of Mr. Hull. You said that production brands would have to be recorded. Is it illegal to use freeze branding for production testing at this time?

Mr. Hull -- According to our law, anything but a fire brand is illegal.

Mr. Frischnecht -- Is the law the same in the State of Oregon?

Mr. Nelson -- In Oregon, both shoulders on cattle are left open to use a brand of three letters or three numbers of a combination of either without recording for identification purposes.

Dr. Hostetler -- It is hoped that one of the benefits of this seminar will be to create an awareness of these problems so that when changes are made, the various state regulations can aim at uniformity.

Dr. Frank -- I would like to ask Mr. McCracken what the status of freeze branding would be in Idaho.

Mr. McCracken -- We have reserved the left neck of the animals for production testing. You don't have to register that with the Department. We have seven locations for ownership brands. One thing I would like to comment on is that I think that possibly this thing has really caught on like wildfire. A kid called me Saturday morning and said he had 150 head in the corral and had it all set up; he wondered if it would be legal. I told him that since he was already set up to go ahead and put it on them and if it didn't work he could always use the hot iron later.

Dr. Farrell -- I want to make this very clear ---- that I have not recommended that any individual should brand anything with a freeze brand. As a matter of fact, I have stated repeatedly that I don't know if it is legal. But apparently there are people who figure that it is their cow and their iron and what are we going to do about it if they brand?

PRODUCTION TESTING AND FREEZE BRANDING

JOE JOHNSON
EXTENSION LIVESTOCK SPECIALIST
W.S.U.

We have some livestock specialists from other states so we are going to use free exchange among the various folks here.

In this state, the minute Keith Farrell put out his release and Glenn Lorang published it, we started getting inquiries. Roy Hostetler and I tried to answer some of the questions for a few weeks. Then we got smart and sent them down to Keith. He answered some 1,100 inquiries within a short period of time. Most of the inquiries related to using this system in production testing. Practically all of the folks were interested in that particular aspect of it. We have a lot of production testing in this state.

Our state law is quite specific, as Mr. Hull said this morning, and from the standpoint of the identification of ownership, only a fire brand is allowed. We have the regulation that these folks are allowed to use numbers in conjunction with their fire brand from the standpoint of identifying the animals in their own herd for their own production testing program, but not from the standpoint of legal ownership.

If I remember correctly, isn't it the shoulder only that is to be used for identification brands? Certain numbers have been reserved in the past by people as part of their ownership brands. So, consequently, certain numbers are not allowed.

Mr. Hull -- That is correct.

Mr. Johnson -- I didn't look up the records to see which of these numbers are not allowed. Gisela, do you remember which ones they are?

Gisela Turley -- 7, 14, 25, 60, and 77.

Mr. Johnson -- That's enough. That gives us an idea. These are either registered brands or parts of registered brands.

We have people who are doing freeze branding with varying degrees of success and they will probably continue whether we like it or not.

Various systems of identification are used. Many people are interested in freeze branding because you can use small numbers or combinations without blotching. The simplest system I know being used in the state is to brand in numerical sequence for individual identification. The age can be recorded by preceding the individual serial number with the last number of the year - (example 629 would be the 29th calf in 1966). Further identification of the sire could be by letter; either change letter or the position of the letter for each bull on the cattle.

Mr. Hull and Mrs. Turley -- It is not legal.

Mr. Johnson -- If not legal in Washington, how about Oregon?

Roy Nelson -- It's not legal in Oregon either.

Mr. Johnson -- This identification method is being used and interest is strong because they feel they can use letters without blotching.

Most of our folks, in production testing identification, are wanting to identify replacement heifers by sire, and then they will want to identify them by cow family. So, I think probably it would take a sire and dam group and then a year. One system proposes an A for one group of cows that are related. You could say AB; this would mean a calf from (cow family A and bull B); another group would be AC, same cow family different bull. Another system uses a combination of A's.

Mrs. Turley -- He might give his cows away. Somebody already has a triple A.

Mr. Hull -- Use numbers and we won't object in Washington.

Mr. Johnson -- Will using numbers instead of letters be legal?

Mr. Armstrong -- Right.

Mr. Johnson -- But, aren't you limited to three numbers?

Mrs. Turley -- No. Any number group you want.

Mr. Johnson -- Any number group will be satisfactory.

Mr. Armstrong -- All numbers on the shoulder, not using the five numbers that are old ownership brands.

Mr. Johnson -- The ones that Gisela knows by heart. All right. So this is a problem we have in this state already. Now there are such systems, for instance, where we can take a letter (and again I know this is used in Oregon even though it is not supposed to be) where the position of the letter around the group of numbers would start there and this would mean something one way in sire group, or we could put it up here and this would mean another sire group, or we could put it here and this would mean another sire group: or then we can lay it down on the side and go around and do other things with it.

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(A 10	10	10A	10)

In our state I find that we should prefer to use numbers and forget about the letters.

Mr. Armstrong -- We not only would prefer to, it is the only legal thing to do.

Mr. Johnson -- Okay. So Glenn, when you start writing up this story, be sure that you mention that in the state of Washington letters are not legal.

Mr. Johnson -- Dean (Dean Frischknecht, State of Oregon), I know that you are using this in Oregon. What are some of the combinations you are using?

Mr. Frischknecht -- We have about 250 herds, about 100 commercial and about 150 purebred, on our production testing program; but some of our commercial men will run about 1,000 cows and have them with individual identification. Anything born this year, 1966, would start out 601 and go on up. We like this combination where the first numeral designates the year. I think that makes sense and is handy. We have one man who runs about 1,000 commercial cows. Whenever a calf is born he tattoos it with the same number as the fire brand on the cow. (Her individual identification number is the tattoo that goes on the calf's ear.)

He doesn't like to identify the calf any other way until weaning time when he picks his replacement heifers. Then each heifer will get her own number with the year designated. When she has her first calf, that calf gets the same tattoo as the cow, with the exception of the year. I should point out that the year designation goes into the calf's tattoo.

He can then identify the calves with the cows for generations. It makes a good system which works well for him.

Mr. Johnson -- Excuse me, is he branding on the shoulder, at that time?

Mr. Frischknecht -- Yes, when he picks his replacement heifers.

Mr. Johnson -- He takes the tattoo and brands it on the shoulder with the year?

Mr. Frischknecht -- The tattoo is what is on the cow. The tattoo on the calf's ear is the same as the cow's number. The calf never has the same brand on it as that which is tattooed on his ear, but that tattoo is just to tie it in with its mother. This is his individual system which he likes. We have a combination of letters; being used legal or not, using the position of letters such as A over B or as Joe said, Lazy A or B, the position meaning the same as one numeral.

Roy Nelson -- This is all right. It doesn't say they have to be used in any consecutive order, or up and down, or across.

Mr. Frischknecht -- This is the system Bob Stewart uses in Baker. He runs over a thousand cows. They don't like to brand anything until they pick their replacement heifers. If they have about 500 heifers, they aim to keep and identify the best 250.

Then they will breed them and pick out the top 150 that they want to go into their own herd and offer the other 100 head as production testing replacement heifers. There is a weaning weight and a yearling weight on every heifer. She is pregnancy tested and sold. This creates an excellent market among the commercial cattlemen in Oregon. I know that there are other combinations. It is very simple to use the last digit of the year and start out the individual number this way.

Our problem right now is the county agent's time. In Baker, for instance, there are 16 more commercial herds that would like to go on this program; and it is just physically impossible for the county agents to weigh all of them.

The same is true in Grant County. These agents are working with 12 to 15 herds already and people see the good results and participate.

We think this freeze branding will help us a great deal on identification of cattle. We have had men asking for this for years. I hope it works well. We must have several thousand branded already since you men from Washington came down and put the demonstration on in March. We have some county livestock associations that have purchased the copper irons and have them on a rental basis available to cattlemen. From the several thousand that are already branded, we should have some results to pass on to you by fall. It's been nothing but a pleasure.

Mr. Johnson -- What do you think about that, Mr. Nelson?

Roy Nelson -- It's all right for identification.

Mr. Frischknecht -- Yes, strictly just serial numbers within the herd -- not for ownership.

Mr. Nelson -- It's all right, because we don't record them anyway. It's purely identification for the herd. What we are worried about are the people who don't understand that we put on a freeze brand and in addition we have a recorded brand. If we make this legal, somebody is going to be in trouble. This is our problem.

Mr. Frischknecht -- In Oregon, we are recommending that every commercial cow should have her own individual serial number. It is costing these men maybe \$100 a year to run a commercial cow. They go through the chutes several times for different shots, medical treatment, pregnancy testing, and so on. We figure that it is time now that every cow be individually identified and this looks like it will be a great step forward.

Mr. Johnson -- Are they willing to use this where they wouldn't use ear tags or neck chains?

Mr. Frischknecht -- They have been willing to use all of those things. We have experimented with many types of ear tags, but we have them pull out or freeze and break in the winter. The plastic ones especially will break when it gets cold. Anything that would make it easier to identify your cow, is, we think, a step in the right direction. We have many men who are using the fire brand on the shoulder. Ordinarily in the fall of the year all of these cows will have to be clipped on the shoulder to read the brand. If freeze branding will save clipping, and help identify cattle from a distance while they are on the range, it should be very helpful.

Mr. Johnson -- Morris Hemstrom, have you any problems in your state?

Mr. Hemstrom -- We have lots of problems, but I would like to make one comment about this. I personally am very much enthused about the potential for freeze branding in Idaho. You have problems in Washington as Dean mentioned. Identification of individual cows in the cow herd has been our big problem, and is the thing that has been holding back progress in herd management improvement programs.

I have often told our cattlemen that if someone came up with a simple, sure-fire, and fairly economical method of identifying these cows, he could make a million overnight. I don't know whether Keith has come out that well or not, but we all, of course, have our own personal interest. The regulatory people are interested in this identification from the standpoint of ownership, the tanners and hide people are interested in branding from the standpoint of more money in hides. Personally I am interested in it from the standpoint of identifying individual cows, and I think it will do that.

We are certainly going to look into it and probably once the technique is clear, we will be using it quite a bit in Idaho, just from the standpoint of individual cow identification.

We have tried everything -- all kinds of ear tags, neck chains, and we even used dye on the udder of the cow: marking the udder of the cow and turning the calves back so they would mark themselves. This works fine on the whiteface, but it wouldn't work too well on Angus. Identification has been a real problem and I have a lot of enthusiasm and hope for freeze branding.

Dr. Erickson -- We have an interest in this from the standpoint of disease--the traceback problem with disease. That hasn't been mentioned at all today. I think this is a real need from the standpoint of tracing diseases found at livestock markets or at packing plants back to the source, and we certainly would encourage anything at all that would help this program because there is a tremendous need for it.

Dr. Wood -- We are primarily interested in identification. The American Angus Association has spent money along these lines in research to find some way to change the hair follicle. Actually, this has been done -- turning the hair white on black cows. I like to see it, whether it is legal or not. I am quite sure many of you are contemplating using it. One reason I am here is to find out the problems and whether this will work or not. I think we will see a lot of this strictly for identification purposes.

Dr. Farrell -- There is one thing I want to bring out in regard to the use of letters that hasn't been mentioned. If we use letters for identification, ignore legality, think about it from the livestock man's point of view, if you turn the letter A upside down it looks like an upside down letter A, but a number 1 upside down is still a number 1. Our herd problems are going to be a lot easier if there is some method of utilizing letters in the freeze branding technique.

Dr. Howard Johnson -- I would like to comment of the regulatory problem of disease control. We have a system for 100% identification (I am not talking about method; I'm just talking about identification) on each and every animal and a card system to go along with it. An animal that moves in any way can be traced. This may sound a little bit rough to industry, but actually I feel rather strongly that this is going to bring a good dividend once industry accepts the idea of each and every animal's being identified.

Mr. Joe Johnson -- Just to get back to your point, if we had them all identified, we wouldn't have to worry about back-tagging any more would we?

Dr. Erickson -- Another thing I wondered about. I hear comments that this freeze branding has been used. I think the gentlemen over here said several hundred animals -- and one thing we would be real interested in is getting some sort of reporting system to evaluate the result. This question I had in my mind when I came here, but I don't have it answered too well.

We would still like to know the practical application of this, how it actually works in the field. If we could get back some reports on even several hundred animals, this would be a terrific thing. In other words, indications are that it works experimentally, which is fine. We would certainly be interested in any report at all on several animals, or better, hundreds of animals. We would be in a position then in the Department of Agriculture (I work in animal identification) to actually get out and do some missionary work on this idea. We will be very interested in receiving reports.

Mr. Johnson -- I think our State Department of Agriculture is interested in the same thing. Are you?

Mr. Hull -- You are right.

Mr. Johnson -- I would like to ask Jack Tippet, President of our Washington Cattlemen's Association, if his association has discussed this at any of their meetings? Have they seen something that we have overlooked here?

Mr. Tippet -- It has been discussed numerous times, but I think they are all watching, waiting and hoping something useful will come out. Dave might know more about this than I. I don't know anyone who has actually tried it, but I know it has generated a lot of interest.

Mr. Johnson -- Dave, have you heard any grumblings from the State Cattlemen's Association?

Dave Foster -- Not a bit.

Mr. Armstrong -- I believe that production record testing is the ideal place to test from the practical field standpoint. This way we will learn enough to know what we can do with it on an ownership basis. We need to have practical field application, not experimental results obtained by an expert.

Mr. Frischknecht -- When the calves are being weighed and graded for their normal weaning time, they haven't been branded. Most of their mothers will have been in the spring or summer. By fall when they come through we will have an opportunity to see how well the technique has worked. This would be the earliest we can gather information.

Mr. Hemstrom -- One other point, I could get 10,000 head of cows to brand tomorrow. But, we would need to have some advice from Keith on controls, methods, etc. So maybe we could work out something between the states. This should be a good proving ground.

Dr. Erickson -- I have the feeling that there could be a lot of unreported trials going on. That is one of the worst things that could happen in this

program because your results won't mean as much as if they are hit and miss from a lot of sources. One of the things that this group needs to do is to set up guidelines for actually reporting controlled trials. Otherwise, we will be in a real rough position to recommend this method.

Mr. Johnson -- I think in the State of Washington we can get most of our county agents to cooperate. We have been holding them off until this meeting was held. We have had a few, but very few, cattle branded and our county agents know where they are.

Mr. Hooven -- The point is, though, that there has to be a control program for your testing with a control herd and another control herd to keep using whatever they are using now, so we have something to compare.

Dr. Erickson -- This is fine. I feel very strongly that this is what should be done.

Mr. Frischknecht -- I think, out of this meeting, we should come up with some recommendations, in addition to what we have now, for use this summer. In our State, our boys are using it. We have tried to get them to hold off, but they think it is something they want to try. It is legal in our state and is being tried. We do know where it is being done and we can have some observations this fall on every one of these herds. We asked them to hold off until this fall, but they are too eager.

Dr. Erickson -- The way to kill something is to appoint a committee. But I do feel there is a real strong need for a committee group that is interested in setting up guidelines, methods of reporting, and so forth, so that the reports we get back will be uniform and therefore mean something.

Dr. Hostetler -- Dr. Erickson, would you suggest that we do this within the states or should it be a national committee?

Dr. Erickson -- The difficulty in a national committee would be attending committee meetings. We would like to maintain contact with any committee and would be happy to do anything we can from the national level to assist.

Mr. Joe Johnson -- I would suggest state regulatory people and specialists; both livestock and dairy, be on the committee.

Dr. Hostetler -- In three states or in one?

Mr. Joe Johnson -- I would like to see people from Idaho, Oregon, and Washington working together.

Mr. Hull -- I agree with that.

Dr. Hostetler -- That sounds good. This is one of the problems that needed discussing. Dr. Erickson, you brought up something in which the group is interested and should know a little more about it. It is not freeze branding, but related to identification, "the market testing program of which the people in this area are aware and using." We know you are working with this. Would you explain the literature displayed.

Dr. Erickson -- I have some literature that tells something of the current progress of the program. I would like to show you one of these in particular. In the State of Washington, and in Oregon as well, you are very aware of this program; but you can see that it has grown from less than one million (head) in the calendar year of 1961 to almost five million in the calendar year of 1965. We are anticipating that it will probably add another million to that this year.

Previously, I commented on the part that identification plays in animal disease eradication, I think you have to be close to this to realize the tremendous increasing importance of identification in all animal disease eradication work. Actually, down-the-road testing for brucellosis or tuberculosis in cattle is about out. We are moving into the direction of identification in swine and collecting blood samples at slaughter as a screening method for brucellosis. So as far as the need is concerned, we just lie awake nights trying to think of some foolproof way to identify livestock at markets and packing plants. It is a tremendous problem. One thing I want to emphasize again: is the hope that you will come out with some sort of advisory group that will set up the approved systems, with approved record keeping and reporting, so that we would be in a position to evaluate your reports and to help as much as we can in promoting this activity.

There are four different kinds of pamphlets here for you to pick up. This one on livestock identification is on herd testing and eradicating bovine tuberculosis. I am sure you will be interested in this. If anyone has any questions about our work, I will be glad to answer them.

Dr. Hostetler -- I would like to bring up a question that has occurred to me.

With this method of branding, perhaps you could change the size of your numbers without blotching and blurring. Does this open up a new field whereby we can change the size of one number, which would indicate the year for identification, and use another size for the serial number?

Dr. Farrell -- One thing I would like to bring up that I think is rather important; the freeze brand will grow as the animal grows. For example, in November we branded young swine and there is a 300 per cent growth in the size of that brand already. So we would have problems in that calves branded young will have much larger brands, eventually, than those animals branded as adults.

Dr. Hostetler -- I was thinking of a simultaneous application of, say, a 2" and a 4" brand.

I am sure these details, though, are things that could be worked out and recommendations made by the committee suggested by Dr. Erickson.

Mr. Potter -- Actually, we are very interested in the size. Having a minimum size will help us quite a bit as far as the leather preparation is concerned. I would also like to say that we would like these cows that you have branded traced to slaughter so we could have the hide samples for the tanners.

Dr. Hostetler -- In other words, you would desire complete evaluation of the hide as well as the visibility of the brand?

Mr. Potter -- Yes.

Dr. Erickson -- Have you ever tried it on a newborn calf?

Dr. Farrell -- We have tried it on a few young calves. We do not have large numbers of very young calves. We don't have an operation here that lends itself to that. This is a hobby project and I don't have the money to finance a large scale hide study. I think the testing program of greatest value would be to take cows and calves and study them for one full year. We must keep our eye on the melanocyte. The easiest way to do this is to have a number of brands on each individual animal. By this I mean a 5-, 10-, 15-, 20-, 25-, 30-, 35, 40-second brands and brand them the first of every month for a year. We can then follow the melanocyte by microscopic study and evaluate the hides when we are done. We must start studies to determine anatomical brand site differences in the same way. To evaluate melanocyte destruction on a single animal, like we are suggesting here, is going to be difficult and less meaningful than a group of animals of different ages that are branded simultaneously under the same conditions. I think that this is the research approach of the greatest importance now.

Dr. Hostetler -- Thank you, Keith. I think we should bear that in mind. Any other suggestions?

Bill Kelso, will you kindly make some comments about freeze branding in dairy cows?

Dr. Kelso -- I was invited to sit in on some of the discussions that Dr. Farrell and Dr. Hostetler had about a month or so ago in discussing the application of freeze branding to dairy cattle. I have tried to look at this from the standpoint of branding any of my own cattle because I don't have any, but what the potential use might be for dairymen in Washington and other states who desire to use freeze branding for identification. If this has a good potential use, certainly we need to get more information out to our dairymen.

In the dairy business we would be concerned only with freeze branding from the standpoint of individual cow identification rather than ownership brands. It is real important that we have a permanent means of identification in dairy cattle because we do have an extensive production testing program going on across the nation whereby the individual cow's milk is weighed twice a day and once each month and records must be kept on an individual cow basis. Presently we are using neck-chain numbers, ear tags, tattoos, and so on. I voiced some of our concerns about freeze branding to Dr. Farrell and Dr. Hostetler and was invited to be on the program today to point out some of the problems that may dampen the enthusiasm for freeze branding by dairymen over the country.

I think first of all we have to consider the type of dairy cattle we have. Approximately 75 to 80 per cent of our cattle are Holsteins. They are black and white. As you know, their color pattern is inconsistent. They may be mostly white or they may be mostly black. They do have white underlines, white tails and white legs. The next largest number of dairy cattle are Guernseys. They carry the same type of color pattern but with a different color; that is, orange on white. The next breeds in order of numbers are the Jerseys and Brown Swiss. These two breeds may be suitable for freeze branding. But there are some disadvantages when considering these two breeds. In general, our herd size is small when we

think of Jersey or Brown Swiss herds. When you think of big herds, you usually think of Holsteins. Thus, the proportionate number of dairymen who would be interested in this, may be small. There are a large number of grade Holsteins; but when you get into Jersey and Brown Swiss herds, there is a higher percentage of them that are registered. In most cases the people who own registered animals don't like to deface their animals with brands. They may be taking them to shows or fairs, etc., so some dairymen would exclude freeze branding for these reasons. At least their interest in it would be less.

As an example of herd size according to breed in the State of Washington, the average Holstein herd contains 64 cows. But when we are dealing with Brown Swiss, the average is only 31 cows. So again, we are dealing with small herd size in those breeds most suited for freeze branding. When we get down to the small herd, these dairymen know their cows by name. They don't need to have them branded in order to identify them. They are a little bit different from the livestock man. They milk cows twice a day and are in intimate contact with them daily.

In the dairy business, too, I would guess that we might have more transfer of animals from one herd to another. There are many dairy cattle that are sold from one herd to another for various purposes. If we are dealing here strictly with identification numbers of say one, two, three and four digit numbers, we can get into some duplication for these animals that move from one herd to another.

Another problem with freeze branding is that we are dealing with a white brand. Holsteins, Guernseys, and Ayrshires all have white underlining. We need to locate a brand, if we are going to use it, where the milker or dairyman can see it when the cow goes through the milking parlor. In general, he is standing in a pit below the cow while milking, so the brand would have to be located on the lower portion of the body so that he could see it easily. Again, we are dealing with cows that have white bellies and white legs, and you can't put white on white and be able to see it. If we had a purple color, maybe this would be the answer to fit all the breeds, as most of us have never seen a purple cow.

Another problem is that many of our dairy milking parlors are constructed or designed so that the cows can come in on two sides of the pit. There is no real control as to which side an individual cow will go from one milking to another. She may end up on the left side one milking and the right side the next milking. The milker would see one side at one time and the other side the next time. This would mean that in order to identify the cows while they are being milked and tie this in with production records, we would need to brand them on both sides. So again, this would have to be considered.

I think that most of you here today are more interested in beef cattle or types of livestock other than dairy, so I am going to conclude by saying that in spite of certain disadvantages, there are some dairymen who are facing certain situations for which freeze branding will have an application. If so, I would hope that freeze branding would be available for those people who choose to use it.

Mr. Cheney -- I'm like Gordon Potter--I brought my hide. I would like to show my hide. I am sure most of you people are aware of the problem of the hide and the reason for the ownership of the hide. This brand on this hide is a reverse

B bar K, and it shows here reverse B bar K. It is kind of blotched, but there is a reason for it. If you turn the hide inside out, I am sure most of you can see the original brand on this hide. Of course, it is in reverse, you understand. This original brand is an E bar Y. The other brand is put over the top of it to make a reverse B bar K. This is our problem in branding the hides. This is the reason we have a hot-iron brand and it will take something real good to replace this.

We have a brand like this --Ks (^SY). You wouldn't believe in the world that this could be changed to an EB sitting in a quarter circle (EB). But it can be. You have to be pretty good with a branding iron. He tips this thing a little, makes an E, blotches this up a little over here, and makes an EB in a quarter circle. The only way in the world that you can prove it is to butcher the animal and determine what the original brand is, as in this case, so you can show the original brand to the jury. In this case, we took 163 head of cattle away from this guy. So the guys are still altering these brands. You had a similar case in Oregon, didn't you?

Mr. Nelson -- Yes.

Mr. Cheney -- So that was one of our reasons for interest in this thing. That is the reason I brought this hide along. Now I have a few questions to ask, as long as I'm up here.

Mr. Hull, as I understand these gentlemen who have been talking--Mr. Johnson, etc., they are contemplating some experimental work on these identification brands. Can that legally be done in the State of Washington?

Mr. Hull -- I will have to go home and find out and then we will work from there.

Mr. Cheney -- Of course, these are the things that are interesting to the live-stock industry and are the things that we came here to find out. I think you have got an answer to the problem which, as you said this morning, we have had for a long time; and we certainly appreciate it. I think this identification thing is real good. I can see where we can use it on the individual identification or we might even use it in our feed lots in an ownership deal. But until such time as your experiments are worked out in detail and are studied further, I think our publicity on this thing--should be from the angle that we have to have a lot more work done on an experimental basis.

Mr. Potter -- Bill, may I ask one question. When you correct the brand, why doesn't it go all the way through?

Mr. Cheney -- This brand on this hide? I will tell you what happened. You will look at this hide, and you will find that this is an indentation in this tanned hide. But on the flesh hide, on the hide before it is tanned, this is a ridge. The tanning process takes the scar tissue out of there and leaves an indentation. That original brand will always show, or practically always. You can't see any of the bar of this B right now, but in time, say a couple of years from now, it will start to show through as a scar tissue. But this scar tissue will gradually build up more than this will as the animal goes along in years.

Mr. Potter -- You mean in five years you couldn't tell the difference?

Mr. Cheney -- In five years you might have quite a time. But as one scar tissue grows, so does the other up to a certain point. So you can tell a worked-over brand anytime within two or three years, if you can get the hide off and look at the flesh side.

Mr. Potter -- I would like to make one observation. It would seem that with all of the interest you have had in freeze branding there is definitely a need for an improved method for livestock identification.

Dr. Erickson -- I would certainly like to emphasize that point, too. I think there is a real interest. We have an interest and would like to follow this very closely and as I said before, we will do everything we can to cooperate with you.

A.J. Erickson -- I have looked at most on those 1,100 letters that Joe was talking about, and the term "painless" is the one that stands out in almost every letter that came in.

Mr. Becker -- That is debatable too.

Mr. Hull -- Possibly this group will go on record as suggesting the discontinuance of random use of freeze branding out in the country because when this becomes legal the brands that they have applied may then be legal. If we make it known that we are working on it this may cause them to stop their own experimentation.

Dr. Erickson -- I certainly would second that, because there is a real need for what Mr. Hull suggested.

Dr. Hostetler -- I think this group has only the power of suggestion.

Mr. Hull -- I was speaking from a news media standpoint.

Dr. Hostetler -- The object of this seminar is to get the various ideas presented this afternoon into published form so that they become part of the information about freeze branding.

Dr. Erickson -- I would like to make one other comment. I am not sure whether this group wants to have a steering committee or a committee to set up guidelines or not. I kind of lost my way on this. Is this still to be done, or are you just going to have a committee to set up a release?

Dr. Hostetler -- I would like to call on Dave Foster.

Mr. Foster -- I would just repeat the suggestion made earlier that we leave this in the hands of our state regulatory people and the extension people in at least the three Northwest states. We can't very well go beyond that. I think these are the most responsible hands to leave it in.

Dr. Howard Johnson -- Actually, I would have to discuss this with the people in the administration to determine whether or not this detailed research is in fact a function of this particular division. If that is determined, I think it would be up to the administrator of the college to determine what funds might be available in order to get on with this job. I didn't want to leave this group with the impression that everything was all set and that all Keith needed to do was go on and get all the answers. I don't think this is quite fair to Keith.

Mr. Cheney -- Am I wrong, or did I understand Mr. Potter to say that the USDA is making some study or is putting some money into research on hides and tanning and things like that? Didn't we hear that in the meetings in San Francisco?

Dr. Johnson -- I think this is true in several different ways. The Animal Husbandry Research Division undoubtedly is doing just what you are speaking of. Also, this division, that both Keith and I belong to, is working on certain other problems that affect hides, such as lice and so on. In many ways the USDA is trying to improve the situation both in the hide industry and returns to the rancher for good sound value.

Mr. Armstrong -- It seems to me that the most effective and painless place to field-test this program would be for production record testing, which would not involve severe risk. From this observation perhaps in a few years we could come up with something that would work infallibly for ownership records.

Mr. Frischknecht -- I think out of this meeting we do have to make the latest recommendations as to time, and age for branding the various breeds. We have people who are going to go ahead and do this branding regardless of whether we are in favor of it or not. So we might just as well put out what is considered to be the best possible recommendations with necessary precautions. We need to say that it is still on a trial basis, but if they wish to go ahead, we feel it would work best using this particular product, this type of iron, and then also give them a idea of where they can obtain the materials to do it.

Dr. Howard Johnson -- A very sound discussion was given by Dr. Farrell this morning. I would like to suggest that a lot of attention be given to those recommendations in order that we don't have a great deal more confusion. It would be better to get the sound answers from controlled research despite the recommendation that routine production testing be utilized. I think that what Dr. Farrell said, is that field testing will not get all the answers that are needed.

Mr. Frischknecht -- Whenever we get a USDA news release people are going to believe it. They have a great deal of confidence in that type of release. And, if the release says that up until now the best procedure has been to cool these copper irons in alcohol and Dry-Ice to 152 degrees with 30 seconds contact on the animal, this is the procedure the layman will consider correct.

Mr. J. Johnson -- I still like Bob Armstrong's idea. In the State of Washington, we have about a dozen county agents who will work with from one to twelve live-stock producers in their county on individual identification. If we tell them that we want a certain number of cattle branded this way and certain number of cattle branded that way, or if we want some cattle left out in a particular

group, they will do it. If we designate these as field tests, I think we are going to get some of the answers that will help with identification back in Washington, D.C.; I think we will be remiss if we don't move while we have the enthusiasm of the people out in the states where we can do it.

Mr. Hull -- I think this is the only answer at the present time in order to get permission to do this as far as legal branding is concerned and the places where it can be done.

Mr. Hoover -- I don't think Dr. Hostetler would disagree with your comments, Mr. Johnson, because this was just the thing that he would point out--that you have to have a control program in order to evaluate the results.

Dr. Erickson -- Can you brand-people visualize a system whereby you code a brand to a state? This would be tremendous if you could do this.

Mr. Hull -- We are working on it. We figure it might be ten years though.

Dr. Hostetler -- If freeze branding becomes popular, the regulatory departments in most states will need to alter their brand laws. Perhaps the discussion plus the work that was suggested here today will prove helpful to them.

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