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PROCEEDINGS HORSE IDENTIFICATION SEMINAR

December 8-9, 1972

Washington State University

Pullman, Washington

HORSE IDENTIFICATION SEMINAR

December 8-9, 1972

Wilson Compton Union Building
Washington State University
Pullman, Washington 99163

Conducted by the Agricultural Research Service, USDA and The Cooperative Extension Service, WSU, in cooperation with the Washington State Horse Racing Commission.

ORIGINATOR: Dr. R. Keith Farrell, Veterinary Medical Officer, ARS, USDA, Western Region

INTRODUCTION: Mr. Urgel Bell, President, Washington State Horse Racing Commission

CHAIRMEN: Dr. Stanley N. Brooks, Acting Area Director, ARS, USDA, Western Region
Dr. Joe B. Johnson, Extension Animal Scientist, Cooperative Extension Service
Dr. Roy I. Hostetler, Extension Veterinarian, Cooperative Extension Service

DINNER & SOCIAL HOUR: (For Speakers and their wives):

Sponsored by Mr. George Hatley, Executive Secretary, and Mr. Bob Blair, Racing Director, Appaloosa Horse Club, Inc., Moscow, Idaho 83843

DEMONSTRATIONS:

Lip Tattoo: Mr. Spencer Drayton, Jr., Secretary-Treasurer, Thoroughbred Race Track Protective Bureau (movie).

Freeze Marking: Mr. Ward Howland, Resident Officer, and Mr. Wayne Hipsley, Arabian Horse Club Registry of America; Mr. Jim Friedly, Y-Tex Corporation; and Dr. Marinelle Poppie, Alpine Arabians.

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SWEDISH EXPERIENCE IN HORSE IDENTIFICATION

Gustaf Björck
Royal Veterinary College, S-104 05 Stockholm, Sweden

The problem of identification of horses is the same in Sweden as in other countries. Experience has shown that a signalment does not suffice for establishment of identity. Methods of semipermanent marking, such as clipping of identity number in the coat or branding of marks in the hooves have been tried, but have not been found to be satisfactory. The same applies to the fixation of a tag to the mane or tail. The experience from cavalry and other military horse units during World War II indicates that these methods are of little value for large-scale purposes.

The desire for a permanent branding method became increasingly imperative. We had been informed in Sweden of the lip tattooing that had been performed in the United States since 1946, and in 1961 we contacted the Thoroughbred Racing Protective Bureau (TRPB) in order to obtain further information concerning the method and, if possible, to purchase the instruments used. In a very friendly reply our request to purchase instruments was turned down on the grounds that they might be re-exported to the United States and used there for illegal purposes. We were also informed that TRPB were elaborating an international system for identification of horses and that we should be notified in Sweden as soon as a system had been developed.

What, now, can a small nation do to acquire information about what a large nation is up to? It sends out spies, and in this way we succeeded in acquiring information about lip tattooing and instruments which enabled us to make our own in Sweden. In the autumn of 1963 we started the first trials in lip tattooing of Swedish horses. The result was not altogether satisfactory, as we used too large needles in the dies; the number of needles was also too small. When we thereafter made new instruments with exactly the same number of needles as in the American instruments, the results were better and comparable with the lip tattooing seen on American horses. The technique is also the same as is used for lip tattooing of American race-horses.

The interest in lip tattooing did not come from race-horse owners but from breeders of Norwegian fjord horses and Gotland ponies. These two breeds have uniform coloring and often lack distinguishing marks, so that there was considerable difficulty in distinguishing between animals.

The tables below show the results from the trials. Table 1 shows trials with large needles and, as will be seen, the result was not satisfactory. Table 2 shows the result of lip tattooing with dies copied as far as possible from American ones. The readability in this case is considerably better and only in one case was the tattooing judged to be entirely unreadable.

It has been of interest for us to analyze the reasons for poor readability. There have been no complications in the form of infection. In one case the lip of a small foal was compressed too hard with the twitch and it developed a necrosis in the outermost part of the upper lip, which made it difficult for the foal to

suck for some weeks. Bleeding was often observed with the first instruments, but ceased to be a problem when new instruments were made with finer needles.

Table 3 shows the result, taking into account the placing of the numeral in the row. It will be seen that in all series, the middle numerals are more readable than at the two ends of the row. This may have been due to differences in distension of the mucosa in the twitch.

Table 4 shows the result with regard to the age of the horse and the type of twitch used. Here, again, it was clear that the middle numerals were more easily readable than the outer numerals irrespective of the horse's age at the time of tattooing and of type of twitch. From this trial we learned the necessity of having the upper lip uniformly fixed in the twitch before starting to tattoo.

Even if the results of lip tattooing were acceptable, the horse-racing organizations would not accept it. They were mainly opposed to the necessity of taking hold of the horse and raising its upper lip to read the identity number. In the case of horses with pigmented mucosa, there was also a difficulty in reading the number, even if the actual tattooing could be said to be successful. Since the report on freeze-branding by Farrell, Koger, and Winward in 1966, therefore, our interest has been directed to this method rather than to lip tattooing. The first horse was freeze-branded in 1968. This was followed by further experiments and in Sepetember 1969, the first field trial was started.

We first used the method of freezing the branding iron in a mixture of alcohol and dry ice, but soon changed to liquid nitrogen, which we could obtain more easily than dry ice.

In the first field trial we branded 20 Standardbred foals aged 14-53 weeks. They were branded with their 5-figure registration number, i.e. altogether 100 characters. The results are shown in table 5 from which it will be seen that the optimal application time for these foals is about 20 seconds.

The result one year after branding is shown in table 5. At this time the horses had their summer coat and the readability was satisfactory without need to clip the branded area. A comparison of the results for 20 seconds and 25 seconds contact time showed that the characters with entirely white hairs were more numerous after a contact time of 20 than of 25 seconds. Using the longer contact time, areas in the centre were bald. This suggests, accordingly, that the optimal contact time is about 20 seconds; a longer time of contact also damages the hair follicles.

It has been of interest to study the readability of the various characters according to their placing in the row. They were found to be clearly more readable at the beginning than at the end of the row. This may be ascribable to the shape of the branding area, which was more even further down the neck than close to the head. The results are demonstrated in figure 1.

Apart from these horses, about 200 pony foals have been freeze branded. The results have been very satisfactory. The stamps used in this case had characters 30 mm high and 20 mm wide, spaced 3 mm apart. The stamps were placed in a specially constructed holder and the entire branding was done in a single

operation. A spacing of 3 mm was, however, found to be too little and has later been increased to 8 mm. The final result cannot be assessed, as not all of these foals have been inspected. The contact time has been 20 seconds on normal foals, 15 seconds on very small foals. Some white horses have also been branded, the contact time for these being longer, about 25 seconds.

The results were encouraging and the authorities on whom the ultimate decision rests concerning race-horses have therefore decided that freeze-branding shall be compulsory from the autumn of 1972 in order to preclude confusion between and substitution of horses in races. In the first place all foals of North Swedish horses born in 1972 have been branded, altogether about 300 foals. On the basis of the experience gained, all race-horses of all breeds will later be branded. About 2,400 Standardbred foals are born in one year in Sweden.

There is a great interest also on the part of the breeders of breeds other than race-horses, especially those of uniform coloring and lacking distinguishing marks. In the later case it is a matter chiefly of establishing ownership and of correct identification of breeding stock.

The experience gained from branding about 520 foals and 20 adult horses may be summarized as follows:

1. For branding of foals at least 4 months old with stamps chilled in liquid nitrogen, the optimal contact time is about 20 seconds. For branding of foals younger than 4 months, the contact time should be shorter.

2. Successful branding is conditional on firm fixation of the foal. The best result is obtained if the foal is placed against the wall of a box with its hindquarters in one corner and its head firmly secured to the wall. The foal should be twitched.

3. The stamps should be at least 30 mm high and spaced at least 5 mm apart. One year after branding of a weanling the size of the characters may be expected to have increased by 25-30%.

4. The time spent on branding depends entirely on how many foals are collected at one point. If a large number of foals can be collected, the time for clipping and branding is about 3 minutes per foal. If only one foal is to be branded at each place, the time is about 10 minutes. If a careful check of signalment and blood sampling is to be done, the total time is about 20 minutes.

In addition to branding, a paternity check by blood grouping is also used. This method has been of great value and has cleared up the situation as regards breeds in which an impermissible crossing can intentionally be carried out in order to improve the performance of the offspring. There is now a rule in Sweden that all horses starting in trotting races must have had their blood groups recorded. The method has been official since 1969 and hitherto blood grouping has been done on 12,000 horses.

SUMMARY

This paper describes the three methods used in Sweden in identifying horses competing in harness racing.

A. Checking the signalment

B. Freeze marking on the right side of the neck with the registration number in Arabic numerals.

C. Blood grouping.

In the future, we would like to work on an international basis with the breed and the country coded and marked on the animal. We also would like to start with the angle system introduced by Farrell, in 1966, in order to have uniformity.

*Bibliography for Björck, Farrell, Hooven, Bell and Padgett are combined at the back of this proceedings.

Table 1. Number of horses tattooed with instrument I and results of readability evaluation.

Age at tattooing	Site of trial				Number of horses	
	BOHUSLÄN (Norw. fiord horses)		GOTLAND (ponies)		Tattooed	Inspected
	Tattooed Sep.-63	Insp. Feb.-64	Tattooed March-65	Insp. Oct.-68		
Weanling	39	7			39	7
1 year	20	10	13	6	33	16
2 years	9	2	5	3	14	5
3 years and above			30	22	30	22
Total	68	19	48	31	116	50

Readability evaluation.

Grades 0-5 with 5 as highest grade.

Readability Grade		%		%		
Fully readable	5	37		60		
	4	31		21		
Partially "	3	11		12		
	2			3		
	1	21		3		
Altogether unreadable	0			1		

Table 2. Number of horses tattooed with instrument II and results of readability evaluation.

Age at tattooing	Site of trial								Number of horses	
	SÖDERMANLAND (Norw. fjord hors.)		GOTLAND (ponies)	WÅNGEN (North Swedish horses)						
	Tattooed Sept.-65	Insp. Nov.-66	Tattooed Oct.-68	Tattooed Dec.-65	Inspection June-66	Jan.-67	March-67	Apr.-68	Tattooed	Insp.
Weanling	15	7	50	14	14	11	11	10	79	21
1 year			22	17	17	13	12		39	17
2 years			14	18	18	14	5		32	18
3 years and above			22	5	5				27	5
Total	15	7	108	54	54	38	28	10	177	61

Readability evaluation.

Grades 0-5 with 5 as highest grade.

Readability Grade		%			%	%	%	%		
Fully readable	5	79			95	86	82	80		
	4				4	5	10	5		
Partially "	3	21			1	5	7	7,5		
	2					1	1			
	1					2		7,5		
Altogether unreadable	0					1				

Table 3. Readability of tattooes with respect to placing of numeral in the row without regard to age of horse at time of tattooing. Grades 0-5 with 5 as highest grade. Mean grade reported.

Site of trial	Period between tattooing and inspection	Number of horses inspected	Placing of number in row			
			1	2	3	4
GOTLAND (ponies) Instrument I Twitch: small	2 ½ years	31	3.5	4.7	4.7	
SÖDERMANLAND (Norwegian fjord horses) Instrument II Twitch: small	3 months	7	4.7	4.7	5.0	4.9
WÅNGEN (North Swedish horses) Instrument II Twitch: small and large	15 months	28	4.8	5.0	5.0	4.1

Table 4. Readability of tattooes in relation to age of horse at time of tattooing and to type of twitch. Instrument II used in all cases. Site of trial: Wången, North Swedish horses. Inspection 15 months after tattooing. Grades 0-5 with 5 as highest grade. Mean grade reported.

Age at tattooing	Number of horses inspected	Placing of numeral in row			
		1	2	3	4
Weanling Small twitch	11	4.7	5.0	5.0	4.4
1-year-olds Large twitch	12	4.8	5.0	5.0	4.0
2-year-olds Large twitch	5	5.0	5.0	5.0	3.8

of freeze brands

Table 5. Readability/and the prevalence of white hairs within different evaluation groups for different times of contact.

A. Evaluated 4 1/2 months after branding.

a. Readability before clipping. b. Readability after clipping. c. Prevalence of white hairs.

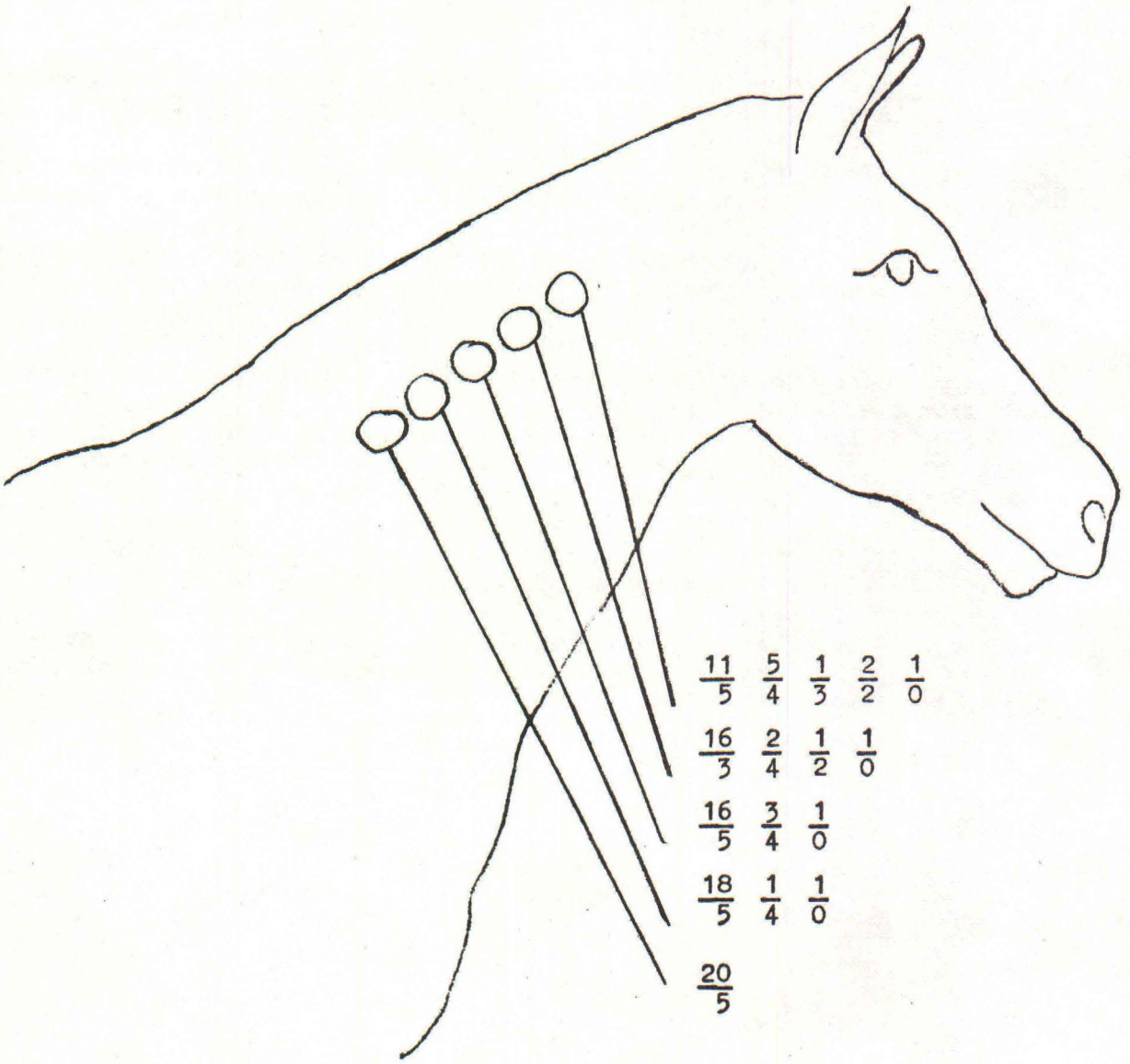
Code for evaluation (5 highest value, 0 unreadable)	Numbers of numerals readable for different times of contact												Total		
	10 sec.			15 sec.			20 sec.			25 sec.					
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
5	0	2	2	2	7	10	13	53	51	0	19	15	15	81	78
4	0	0	0	3	4	0	14	4	1	4	3	3	21	11	4
3	0	0	0	0	0	3	5	0	6	1	1	4	6	1	13
2	2	0	0	4	1	0	7	1	0	5	1	1	18	3	1
1	0	0	0	1	0	0	9	0	1	7	0	1	17	0	2
0	0	0	0	5	3	2	11	1	0	7	0	0	23	4	2
Total	2			15			59			24			100		

B. Evaluated 12 months after branding.

d. Readability without clipping. e. Prevalence of white hairs.

Code for evaluation (5 highest value, 0 unreadable)	Number of numerals readable for different times of contact								Total	
	10 sec.		15 sec.		20 sec.		25 sec.			
	d	e	d	e	d	e	d	e	d	e
5	2	2	10	10	53	46	19	16	84	74
4	0	0	1	0	3	2	3	2	7	4
3	0	0	0	1	1	5	1	4	2	10
2	0	0	1	2	1	6	1	2	3	10
1	0	0	1	0	0	0	0	0	1	0
0	0	0	2	2	1	0	0	0	3	2
Total	2		15		59		24		100	

Fig. 1. Readability of numerals according to their relative placement on the neck of the horse. The numerator indicates the number of checked numerals in each group, the denominator the code for readability evaluation, with 5 as highest value and 0 unreadable.



Dr. Farrell: In answer to the question arising on the use of 99% alcohol, the alcohol is more expensive than 95%. As soon as you take the cork of 99%, it sucks up water from the air and becomes 95% alcohol. So you are just as well off to buy the 95% in the beginning.

Mr. Hooven: I was wondering, Dr. Björck, if you had tried the approach with liquid nitrogen without clipping.

Dr. Björck: No, I have not. I have followed exactly the directions I got from Dr. Farrell, but we need to have more experience. We are satisfied with this method, and Dr. Farrell told me yesterday that he has developed a hair clipper that is not so noisy and is handy on the horse.

Mr. Urgel Bell: Is this freeze branding method that you have now been adopted by legal statute as a method of identifying horses in your country?

Dr. Björck: Yes. You can't start a horse without it. He has to be branded, but we have started marking the foals, so all the horses will be branded.

Mr. Urgel Bell: One other question. You mentioned blood typing. Do you do this for paternity purposes on the foals or also as a method of identification?

Dr. Björck: Yes, we have the horses branded and at the same time we take blood from the foal and also from the mother if she was not checked before. So when we do the marking, we can collect the sample. At the same time we will also check the signalment of the horse, so it is a thorough check. I think most of the horse owners are satisfied.

Mr. Urgel Bell: You use this in your sales? In other words, you can identify positively the parentage of the animals being sold?

Dr. Björck: Yes. We are discussing the Standardbred horses and native trotters only. We are not using pacers in Sweden. I don't know why, but this is the case.

PASSIVE ANIMAL IDENTIFICATION SYSTEM

Henrie L. Majeau
The Boeing Company
Seattle, Washington

First, I would like to thank Dr. Farrell and the sponsors of this seminar to provide Boeing with the opportunity to present its Passive Animal Identification System (PAIS).

Introduction

The presentation today describes a particular application of animal identification as defined by the requirements which I will discuss shortly.

It will be obvious to you that many more applications are possible if one allows his imagination to run loose. Perhaps we can identify a few of these later on.

Animal Identification

The purpose then of Boeing being here today is to present to you, what we believe to be a practical system based on a unique device. Actually, we are talking about a family of devices, each designed to suit a particular application:

-herd identification
-individual animal identification within the herd
-individual animal identification on a National/International scale

Furthermore, the reasons for identification are many, to name a few:

-disease control
-husbandry record keeping
-thoroughbred registration
-dairy and feedlot management
-other animal management (sheep, swine, etc...)

Requirements

Each of the above categories has some unique requirements and others have very special requirements such as tamper proof or easily interfaced with a computer system. The size and cost of such a device then is very much dependent upon the complexity of the requirements.

In order to bracket the multifarious requirements, the following table has been prepared, identifying the more important ones pertaining to an electronic implant.

Table 1

-small size	-interface with computer
-capacity for large numbers	-identify from a distance
-simple to implement	-long life
-difficult to modify	-low cost

The size was dictated originally on the Stilbestrol Injector (.2 x .7 in.). Generally speaking, the size could be approximately 1/2 in. x 1/2 in. and still not present any major problems. The implant should have a capacity for large numbers up to 10 digits and should be simple to implement. Depending on its application, the implant should also be difficult to modify and any attempts to do so should either render the unit useless (which would indicate fraud) or else leave obvious physical tampering evidence on the animal's hide.

Where large herds are concerned, we see the need for a computer assisted system in order to fully utilize the electronic concept. Where large or small herds are concerned, it should be a requirement that the animal be identifiable from a distance.

Further, assuming that the implant would be inserted at birth, its life should not be a limiting factor.

Finally, the cost of the implant should be low. Again depending on the application and the complexity of the requirements, the cost could vary from $1.00 to $10.00 or $20.00.

Boeing's Design

After several months of studies and considerations of many approaches, the following system is considered to be the most practical and the best candidate to meet all the requirements set forth in the previous section.

The Passive Animal Identification System consists of a small radar like interrogator/processor and an implant. The interrogator is aimed at the capsule in the animal and transmits microwave energy to it. This energy is received by the capsule and converted into a binary coded transmission back to the processor. The latter decodes this information and displays it on a visual digital readout. Where applicable, the decoded number can also be fed into a computer where the number is identified, recorded, compared, and/or processed further, together with other information already stored in the memory.

There are two sizes comtemplated at this time: 1/4 in. x 1.0 in. for six digits, and 1/2 in. x 1-1/2 in. for a ten digit capacity. The device is inserted subcutaneously by means of a simple tool which would make the incision, remove the protective cover and insert the implant without ever exposing it to the elements or without handling it manually.

The construction of the device is such as to make it extremely difficult at best to tamper with it. Its design is such as to require very sophisticated equipment for the coding of the individual capsule. The equipment required to make the basic capsule is also very sophisticated and found exclusively in large electronic houses making microminiaturized microwave components.

The probability of being able to remove it from the animal and replacing it with another is high, but not without some damage or scar evidence. For the simpler use of animal identification for management purposes, and even for ownership, the simple implant is more than adequate. For other applications, where fraudulent tampering can be big business, it is possible that a device can be designed to satisfy this special requirement.

PAIS is designed to operate in either fixed or portable installations. It can interrogate an animal from a distance of 5 to 10 feet. If and when removed from the animal, each implant has its numerical identification printed on the back side, in indelible ink, under the insulation material.

The implant does not require any power for its operation; therefore, it can be used for the life of the animal.

Marketing and price information is not available at this time, but a ballpark estimate would be around $2 a capsule for a 6 digit package in quantities of 100,000. When one considers the present cost of identification, using sometimes several techniques on the same animal, 2 or 3 dollars a head is not far from reality.

Summary

For comparison purposes, tables 2 and 3 show how the Boeing system meets the requirements established in table 1 and how it compares with other devices and systems of identification.

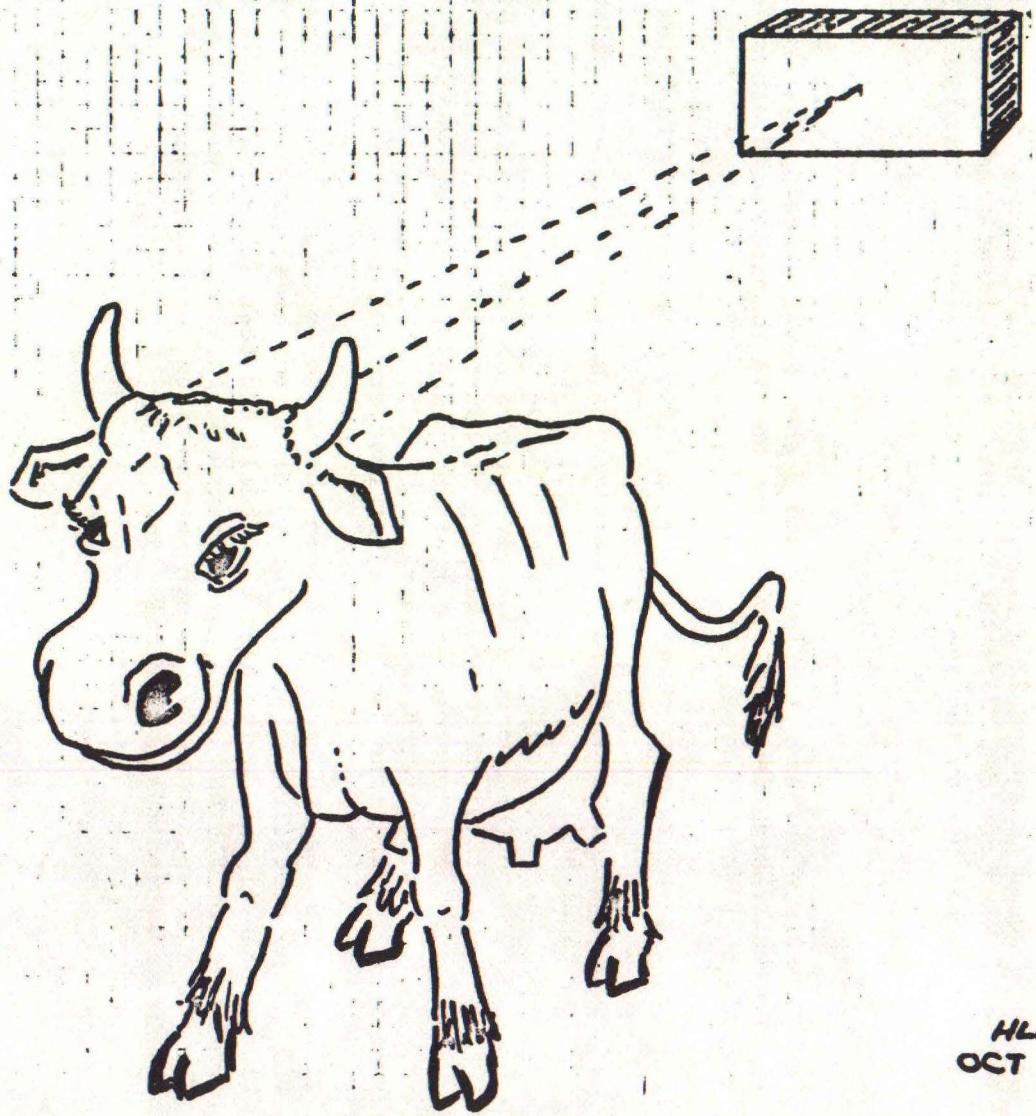
Finally, there are many advantages to a PAIS; a few are listed below:

-provides individualistic identification whether on a local, state or national scale
-when interfaced with a computer it provides:
  .better and more positive source of identification for disease controls
  .efficient record keeping of ownership on state/federal level
  .efficient management of dairy and/or beef lot operations
  .slaughterhouse records
  .deterring factor against rustlers

To date, studies and tests have been conducted to establish the feasibility of a PAIS. The electrical characteristics of animal hides have been cataloged, and breadobards of the device have been built and tested. Animal implant tests were scheduled for February 1973, but because of lack of development funds within The Boeing Company and not enough support from the industry, the PAIS will not be developed further at this time.

BOEING electronics

ELECTRONIC ANIMAL IDENTIFICATION SYSTEM



HLM
OCT '72

THE BOEING COMPANY

BOEING

BOEING'S PASSIVE ANIMAL IDENTIFIER

REQUIREMENTS	BOEING DESIGN
1. SMALL SIZE	1. & 2. 0.25 x 1.0 IN. FOR 6 DIGITS 0.50 x 1.5 IN. FOR 10 DIGITS
2. CAPACITY FOR LARGE NUMBERS	
3. SIMPLE TO IMPLEMENT	3. SUBCUTANEOUSLY INSERTED (SIMPLE TOOL)
4. DIFFICULT TO MODIFY	4. · REQUIRES EXTREMELY SOPHISTICATED EQUIPMENT · CAN PROBABLY BE REPLACED - (DAMAGING) · FOR TAMPER PROOF - SPECIAL DESIGN
5. INTERFACE WITH COMPUTER	5. EASILY INTERFACED WITH COMPUTER OR PRINTER
6. IDENTIFY FROM DISTANCE	6. INTERROGATED FROM 5 TO 10' VISUAL DISPLAY ON INTERROGATOR
7. LONG LIFE	7. LIFE OF ANIMAL
8. LOW COST	8. APPROXIMATELY $2.00 (IN 100K QUANTITIES)

COMPARATIVE MATRIX

METHOD	REQUIREMENTS 1	2	3	4	5	6	7	8
HOT BRAND	-	-	x	-	-	o	x	x
COLD BRAND	o	x	x	x	-	o	x	-
TAGS	o	x	x	-	-	x	-	x
TATTOOS	o	x	o	x	-	-	x	-
PASSIVE IMPLANT	x	x	x	x	x	x	x	x
ACTIVE IMPLANT	-	x	o	x	x	x	-	o

x = YES

- = NO

o = DEBATABLE

Dr. Farrell: Let me correct one thing on one of the charts, if I may. In this country, "cold brand" is the official state designation for a chemical brand (a strong acid or base), and is sometimes called a caustic brand.

Mr. Drayton: Henrie, give me some idea, if you can, how much the receiving device would cost for that setup?

Mr. Majeau: The transmitter receiver, yes, we would like to make it as cheap as possible. So far we have indicated a cost of about $1500 to $2000 in small quantities. By small quantities I mean no mass production. You have to buy parts or material in small quantities. In terms of 5 or 6 a month, it would cost you anywhere from $1500 to $2000. When you get involved with mass production of the circuitry, you can lower the cost, and I visualize that it could be down to $500 to 600.

Mr. Hooven: Henrie, could these be portable as well as stationary, or what is your thoughts on this?

Mr. Majeau: It could be both. We now have an additional concept. Those that I described here would probably be used for fixed installation. They would weigh about 50 lbs. Now 50 lbs., I'm told, is portable, which means that you can lift it or you can install it and use some quick installation such as putting an A-frame or something above the animal, and you could install it in the field as long as you had the DC power from an automobile. It could also be used with house power or battery power.

Mr. Hooven: One other question. Have you given any additional thought as to the possible site of implantation of these devices?

Mr. Majeau: No, these are the problems we have to identify, and we need the help of industry to determine that. Where we put it on the animal and what its affects will be, we don't know. I am an engineer by profession, I am not a vet. I don't even know what the difference between the poll area (of which I just found out not too long ago) and some other area. Field data will be necessary and judging from the experiments that were run for 2 or 3 years on freeze marking, I'm sure we will need at least a year or two.

Dr. Tom Bell: One of the questions that you have to ask yourself as an engineer before you think about location, at least as far as we are concerned, "is the device required to be in any spacial orientation with respect to the receiver?"

Mr. Majeau: I should hope not.

Dr. Tom Bell: In other words, can you read it from a flat side or from an edge?

Mr. Majeau: No, I'm sorry, I must qualify that. The signal originates from an antenna. You get the most efficiency by being perpendicular to it. As you move from the perpendicular signal, the projected area of the antenna gives you less and less efficiency. So, if you were to receive the signal from the side of the device, theoretically, you should have a very, very poor reception.

Mr. Drayton: Does this leave a slight bulge under the skin?

Mr. Majeau: Well, it is one tenth of an inch thick. You would have better judgment on that. I don't know.

Dr. Tom Bell: How about a scar, do you get a scar with this?

Mr. Majeau: Well, I presume you will because there is a cut. An incision is made in the skin and then it is pushed into it. The size is ½ or ¼ inch, depending upon the number of digits that you want, so the scar should be very small.

Mr. Sims: This only identifies itself, not the animals. Were I to have two chesnut horses, I could conceivably take the implant from one horse and put it in the other and visa versus, and still the machine would give me a recording that that was the right animal.

Mr. Majeau: That is right, it only identifies itself, but you have to register that number to whatever animal it is. But, of course, if you owned both animals, there is that possibility. I don't know what you have in mind, but it doesn't sound good.

Dr. Bergevin: With cattle in cattle chutes, would you have to have all of the metal out of the way?

Mr. Majeau: Negative. That is why this device is designed the way it is. Otherwise you couldn't do it.

Dr. Bergevin: It will read right through a metal sheet?

Mr. Majeau: It doesn't read through it, it just isn't affected by metal being around the animal. It does not read through metal. Just like a radar device, it must be able to see the object, but this particular design eliminates the background that you would get if you had an extraneous signal of the same frequency.

Mr. Urgel Bell: I was wondering just how substantial the readout device is if you were packing it around or carrying it from car to car in different locations. Is it substantial enough to withstand this kind of usage?

Mr. Majeau: You bet.

Dr. Brooks: There are other techniques, using electronics, I understand. We have Dr. Howard Baldwin from Los Alamos with us today. We don't have him on the program, but I would like to give him about five minutes to make any comments he might have. So, Dr. Baldwin, would you like to take over for five minutes.

Dr. Baldwin: Thank you. I am interested in the problem of physiology more than identification, so I don't wish to fly under false colors here today. We are investigating passive methods involving the animal temperatures and physiological measurements in animals. We envision control of disease problems; we look forward to the idea of using certain techniques to identify sentinal animals that would be placed in the environment to detect the spread of infectious diseases. This is the problem that my particular group at Los Alamos is primarily concerned with. I really don't know if I should go into this at all in five minutes, I don't think I really can, but I'd be glad to talk about it with those that are primarily interested in animal disease identification.

PERMANENT IDENTIFICATION CARDS FOR HORSES

Lee S. Garner, Director
New Mexico Livestock Board
P.O. Box 2048
Albuquerque, New Mexico 87103

The livestock brand and inspection laws of New Mexico are perhaps the most stringent of any other state in the United States. New Mexico statutes require "every person, firm, company or corporation owning horses, mules, asses or cattle, shall have and adopt a brand for such animals, said brand to be applied with a hot iron." In addition to the brand requirement, an inspection of all animals is required before movement from a designated district, whether for movement intra-state or inter-state.

Enforcement of these and other statutes pertaining to the livestock industry are and have been the responsibility of the former Cattle Sanitary Board (now the New Mexico Livestock Board) since 1887 and are used as a means to protect the livestock industry from theft and the spread of disease. Although the brand and inspection laws are strongly enforced with cattle and sheep, our department has responded in a logical manner to the needs of the horse industry in regard to hot iron branding. Even though most horses in New Mexico are branded, especially the ranch or using horses, there has been concern among the registered horse breeders and exhibitors about branding their class of stock; therefore, the hot iron branding of horses is not mandatory provided some type of permanent I.D. (tattoo, etc.) or official document declaring proof of ownership is in evidence.

New Mexico's inspection system in requiring an inspection of all livestock prior to movement has been a very costly operation as far as horse inspection is concerned because an inspector would often be required to drive many miles to inspect one horse for movement out of the district at 15¢ inspection fee with no other charge for expense incurred.

A survey was performed in 1967 on the cost of horse inspection in New Mexico. The results showed it was costing the New Mexico Livestock Board $50,000 annually, over and above the inspection fee for inspection of horses. In 1969 the New Mexico Legislature passed a bill presented by the Livestock Board which could allow the issuance of an owner's transportation permit on horses which would be valid as long as the horse described therein remained under the ownership of the person to whom the permit was issued. The procedure for obtaining the permit is made upon request of the horse owner. The application for the permit is completed by the inspector at the time of inspection, showing the owner's name and address, a complete description of the horse, i.e. class, sex, age, approximate weight, color, brand or tattoo, if any; all color markings, scars, etc. This information is also drawn on picture cuts of a horse printed on the application. The application is signed by the owner who received a copy of the application, which is valid for use until the permanent laminated bill-fold size card is received by the owner. The laminated card contains all the pertinent information in the application, including a picture cut showing color markings, brand information, scars, etc.

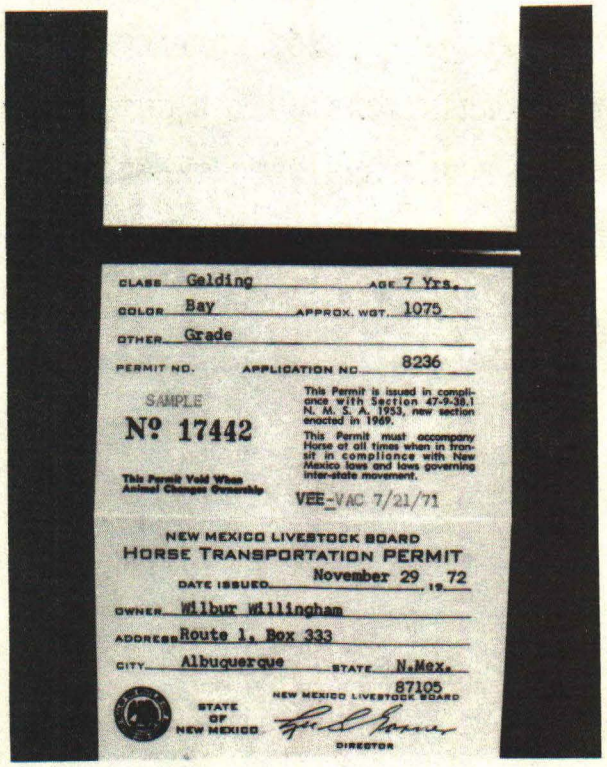
A permanent permit must accompany the animal at all times while in transit and is void when the horse changes ownership. The cost of the card is $1.15. Duplicate cards on each animal may be obtained for $1.00 each. Planned legislation for 1973 will increase the permit fee to $5.00.

The New Mexico Livestock Board pioneered the permanent horse transportation permit, and at this date has issued approximately 20,000 permits. It has been the answer to many of the problems encountered by the people of the industry in this state where inspection laws are so strict. As pointed out previously, it has also been the answer to a monetary deficit in the horse inspection department. When the new permit system was first presented to the International Livestock Brand Conference and other interstate brand meetings, the idea was immediately adopted by many other states and now seems to have spread internationally as well as nationally.

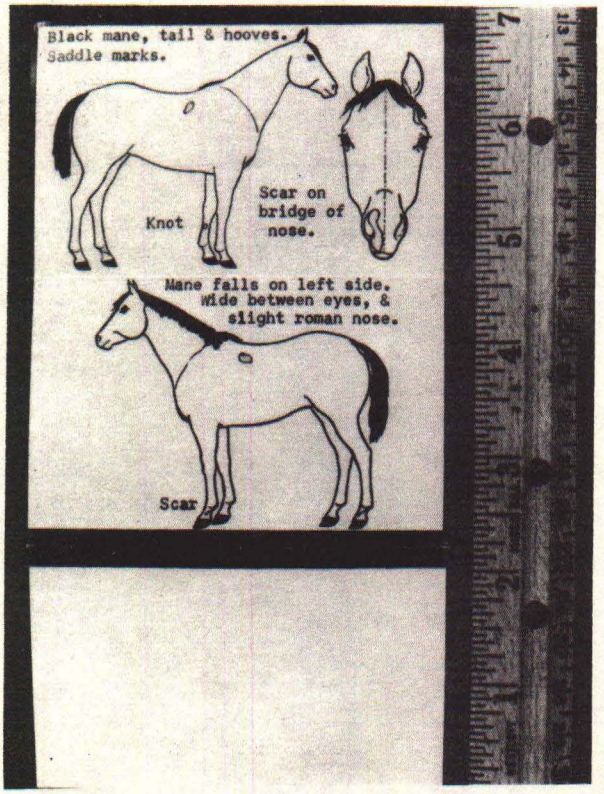
Although, the permit serving as an I.D. has been very popular among horse owners in this section of the country, we feel there is room for further improvement. We are considering modifying the original card to provide for additional information entries in regard to health.

EXAMPLE: Punch out for disease immunization and date administered.
(Encephalomelitis, Equine influenza, Distempter)

The Livestock Board will continually stress and improve our overall program. We will be pleased to furnish any additional information or anything we might develop.


CLASS Gelding AGE 7 Yrs.
COLOR Bay APPROX. WGT. 1075
OTHER Grade
PERMIT NO. APPLICATION NO 8236
SAMPLE
Nº 17442
This Permit is issued in compliance with Section 47-9-38.1 N. M. S. A. 1953, new section enacted in 1969.
This Permit must accompany Horse at all times when in transit in compliance with New Mexico laws and laws governing inter-state movement.
This Permit Void When Animal Changes Ownership
VEE-VAC 7/21/71
NEW MEXICO LIVESTOCK BOARD
HORSE TRANSPORTATION PERMIT
DATE ISSUED November 29 19 72
OWNER Wilbur Willingham
ADDRESS Route 1, Box 333
CITY Albuquerque STATE N.Mex. 87105
STATE OF NEW MEXICO
NEW MEXICO LIVESTOCK BOARD
DIRECTOR

Three-fold version of New Mexico's Horse Transportation Permit. Third area is used for vaccination data, etc.



Reverse side of New Mexico's Horse Transportation Permit gives a full description of signalment.

CLASS_____ AGE_____

COLOR_____ APPROX. WGT._____

OTHER_____

PERMIT NO. APPLICATION NO._____

This Permit is issued in compliance with Section 47-9-38.1 N. M. S. A. 1953, new section enacted in 1969.

This Permit must accompany Horse at all times when in transit in compliance with New Mexico laws and laws governing inter-state movement.

This Permit Void When Animal Changes Ownership

NEW MEXICO LIVESTOCK BOARD

HORSE TRANSPORTATION PERMIT

DATE ISSUED_____, 19____

OWNER_____

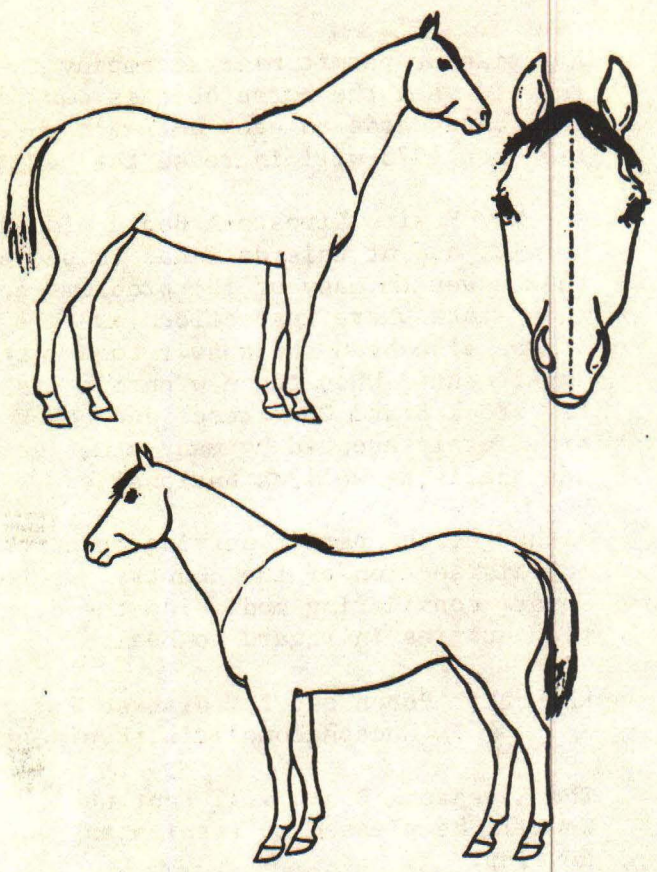
ADDRESS_____

CITY_____ STATE_____

STATE OF NEW MEXICO

NEW MEXICO LIVESTOCK BOARD

DIRECTOR



IF THE INFORMATION ON YOUR PERMIT IS NOT COMPLETE, PLEASE MAKE THE NECESSARY CORRECTIONS ON THE CUTS ABOVE, AND RETURN THIS WITH YOUR PERMIT TO THE NEW MEXICO LIVESTOCK BOARD FOR A CORRECTED COPY.

THANK YOU.

Mr. Magnuson: Is registration compulsory, and if so, what age?

Mr. Garner: It is compulsory in New Mexico to have that horse inspected prior to movement, regardless of the age. Now, when the inspector goes out, he will make an inspection and issue a transportation permit. But, should they want to avoid having to call him each time they move this horse, then they get the permanent card.

Mr. Magnuson: That would be moving or showing?

Mr. Garner: Moving or showing, this is correct.

Mr. Hipsley: I was wondering, what do you do on these foals that will change color and markings if you have a permanent card applied for. What type of procedure would you go about in making the change?

Mr. Garner: We have had this come up quite often. Many of our show horse people will have a colt and they take it to several shows. We will go out and make an inspection of this colt that is six months old, or nine months old, whatever it might be, and two years later, of course, you can still identify this horse from the original description. They do call and we make a second inspection. Of course, if you inspect one horse three years later, it is three years older, so the age doesn't match, but by looking at the horse and checking the teeth you can still identify the horse.

Dr. Bergevin: Regarding out-of-state horses that pass through, do you require an inspection on those horses just passing through?

Mr. Garner: The only thing we require on out-of-state horses, transit horses that are going through, is that they have some sort of document that shows that they did come from out-of-state and that they are going through. If they have nothing, we hold them until they get something.

Mr. Urgel Bell: What is the cost. Do you charge for these inspections, and the second inspection, etc., and what is your charge, or is there a charge?

Mr. Garner: At the present time, we charge 15¢ for the inspection. We charge a dollar for the card. Presently, we have a bill drafted that will raise, give our board the right to charge up to $5.00 for this card, so we can offset the cost.

Mr. Urgel Bell: One other question. How many people do you have out in the field checking transit horses moving on the highways?

Mr. Garner: We have 70 full-time livestock inspectors and we have another 150 part-time people. The 70 inspectors are the ones that check the animals. Of course, they are hired to make inspections of all animals, not just horses. When we started this system, believe it or not, we hired one extra person. We have used our same personnel for the rest of it. One extra person in the office. The cost of this card, as it is, is 7¢, not counting the labor.

Mr. Fisher: I'd like to add one thing to your system of identification I think you might find helpful. Cowlicks (little swirls on the forehead) I think if you start looking at them a little bit and the way they blend in the forehead or in the star, you'll help your system of identification quite a bit.

Mr. Garner: We have recently found out about this. Since I was a little kid I was identifying horses, because I better get the right horse to ride or my brothers would have shot me. But, I didn't realize or didn't even think about the cowlicks, or swirls, or what have you, until Dr. Farrell brought this to my attention. And, it is something that we can look at. It is an additional identification. To try and improve our system we are going to a three-part card that includes vaccinations, coggins test, etc., to be added to the identification card.

Mr. Lilley: It is almost exactly the same as the system we are using in Australia in creating the ability to identify the horse back from the description. And, I'd like to get some of the data on exactly how you code the identification and the reading back. The whole general setup is almost exactly the same as we are using in Australia.

Dr. Knowles: Mr. Garner's identification system is very nearly like what the Irish and English have been proposing to us as an International Horse Passport. It would seem that when he gets certain three-part cards here that it would be so similar. I'm wondering if we can cross the bridge and maybe come up with an International Horse Passport.

Mr. Garner: Well, I certainly think we can. We have the possibilities of eliminating any problems. When we started, they laughed at us in New Mexico. They said, "you can't do that", but we are doing it in New Mexico. Colorado is an example, they are doing it, Arizona is, so there is no reason why we should limit it to one small area.

Dr. Bergevin: Is the State Patrol involved with the brand inspectors as far as being sure animals have a transportation permit?

Mr. Garner: Yes. All of our state officers, state police officers, in fact all the police officers, sheriff's departments, and city police all work with us very closely. They are all on the same radio frequency and when we had the VEE outbreak, all I did was pick up the phone and we had every state police officer, every sheriff and every city police officer, constable, etc., out stopping horses. It is a great help, and we help them, also.

Mr. Magnuson: Do you consider instituting compulsory identification of horses, and what problems - this is asking for an opinion, but would this be practical?

Mr. Garner: I think it would be practical. You know when you start talking about "compulsory" you are stepping on people's feet. You are taking their rights away from them. We have compulsory branding. Our law states that a horse must be branded with a New Mexico recorded brand. But, I do not want to have to go to Supreme Court with that because, should we do this, there would be a ruling that we are unconstitutional, and this is why we don't say

"compulsory" on horses. We have compulsory branding on sheep and cattle. I do think that for animal health reasons, a horse should be identified, making some type of permanent identification on this horse. That is my opinion.

Dr. Farrell: At the meeting of the U. S. Animal Health Association, Identification Committee, they did two things. First, they gave a commendation to Mr. Lee Garner for fostering individual horse identification. It takes a great deal of courage, in the face of 4,000 years of thinking only of an ownership brand, to make the big step and start identifying a horse as an individual, and that's exactly the way they should be identified. This year the U.S.A.H.A. suggested that each state be approached with the recommendation to start legislation in each state to institute a program of individual identification similar to what we now call the New Mexico or Lee Garner system of horse identification. We are going to need a lot of help from a lot of people and a lot of you people are sitting right here today.

Mr. Urgel Bell: Mr. Garner, one more question. What do you do with your racing horse population? Do you make out cards for the race horses?

Mr. Garner: A lot of our racing horses stay in New Mexico and most of them have one of these cards. Now the out-of-state horses that are moving in and out, many of them have one of these cards. They like to have them so they can come into Raton, New Mexico and race for two weeks and then move down to some other race track and they do not have to have an inspection. Any time they check a horse into a race track, the number of this transportation card is entered into the book work at the track and when they leave it shows number so and so left.

Mr. Urgel Bell: I think Cal Rainey will probably tell you that we have fraudulent duplications of certificates in Thoroughbred registrations and even duplications of cards, etc., and we have had some problems in that area. I was just wondering if this was helpful to have one of these cards along with the other cards, for instance the other certificates, for identifying.

Mr. Garner: Of course, I realize that anyone can take that card and duplicate it, but should you duplicate that card in New Mexico, it is a felony, so this discourages any duplication.

TATTOO BRANDING OF THOROUGHBREDS

Spencer J. Drayton, Jr., Secretary/Treasurer
Thoroughbred Racing Protective Bureau
Five Dakota Drive, Suite 211
New Hyde Park, N.Y. 11040

The Thoroughbred Racing Protective Bureau was established on January, 15, 1946 and given the mandate: "Clean up racing and keep it clean." It was organized by the Board of Directors of the Thoroughbred Racing Associations as a security and investigative force which would serve as an effective deterrent against malpractice in flat racing. Financed by the TRA, our primary function is to conduct investigations in regard to violations of the rules of racing and those individuals connected with the sport.

Perhaps even more important is the service the TRPB is able to render to the State Racing Commissions which are seldom provided with the budgets necessary to do a thorough job of investigation of applicants for licenses.

In 1946 during our preliminary study of the problems which confronted racing, the TRPB found that the methods of horse identification commonly used at the time were grossly inadequate. In some instances, the Identifier was presumed to "know" all the horses that came to the paddock, or, failing to know them himself, it was his duty to have the horse "identified" by some reputable horseman. In other cases a "clocker" was employed as identifier on the theory that he could recognize every horse on the grounds by sight. Both of these methods proved to be completely inadequate. In fact, there are many instances where a trainer cannot identify the horses in his own care. Consequently it is foolhardy to expect an identifier or clocker to be able to unerringly identify the twelve to fifteen hundred horses that race during one meeting.

Mistakes were made and unscrupulous horsemen took advantage of the situation to run "ringers," that is, the substitution of a fast horse running in the name of a slow "lookalike" for the purposes of a betting coup.

In the year prior to the development of the lip tattoo system of identification, now in use at all TRA tracks, there had been no less than twenty-six cases under investigation by the TRPB, several of which proved to be blatant frauds with the result that the principals involved were ruled off. No one knows how many more ringer cases had been run prior to the inauguration of the lip tattoo system.

The solution was to find a system that was broad enough to permit the individual identification of all Thoroughbreds active in racing, yet simple in its execution. The system had to be fast, permanent, unalterable and compatible with The Jockey Club system of horse registration. Not the least important, the system had to be resonably priced.

The TRPB set about studying all the various methods of identification of animals, such as hot iron branding, whorls in the hide, hoof branding, as well as various types of animal photography. We came to the conclusion that a modification and refinement of a system of tattooing used by the United States Army Remount Service would be the answer.

The Remount's system involved a slow and tedious process done with a single needle. After a year of careful research and testing, the TRPB designed a completely new set of tattoo instruments to apply letters and numbers on the inside surface of a horse's upper lip.

One instrument called the lip clamp or "twitch" is used to expose the lip area to be tattooed and to steady the horse's head. The twitch is fabricated from cold rolled stainless steel and is designed to block the nerves in the lip tissue when it is applied. This instrument makes tattooing about as painful as a mosquito bite.

The TRPB tattoo die which represents a number or letter consists of two parts: the die head and the corresponding numbered or lettered handle. The die head is made of a chrome plated block of brass which is template drilled to contain an average of 300 high carbon steel needles. The specific number of needles depends on the particular number or letter involved. The die head is affixed to a chrome plated handle by four machine screws which permits easy changing when an old die becomes worn out. Consequently all the needles representing one number or letter are applied simultaneously. Before each use, the entire die head and handle are carefully sterilized.

While the multi-needle die provided a figure that would reveal any attempt at alteration, the TRPB made doubly sure by developing a special Polaroid camera with a built in electronic flash and three lenses so that a photograph could be taken of each tattoo brand immediately after it was completed. Photographs of each tattoo applied by our technicians are carefully tabulated and filed in our New York office.

There is no complicated code involved in tattoo branding. The first two numbers on a Jockey Club Certificate of Foal Registration designate the year in which the horse was dropped or born. Take as an example a foal certificate bearing the number 701234.

The first two digits, seven and zero, indicate the animal was born in 1970. If the foal certificate had the number 691234, we know that the horse was foaled in 1969.

To save an inch of space on the surface of the lip, we abbreviate the first two digits with an alphabetical letter which we call the prefix letter. Each successive foal year is designated by the next letter of the alphabet.

Now let's go back to our first example: We have a foal certificate bearing the number 701234. The first two digits, seven and zero, will be abbreviated with the letter Z followed by the numbers 1 2 3 4.

If the foal certificate number is, for example, 695678, the tattoo number will be Y5678.

I brought with me a film showing the entire lip tattooing process in a continuous sequence. I understand I will have the opportunity to run this film for you sometime tomorrow. I think it would be worthwhile, however, to briefly explain the process ahead of time so that the film will be more easily understood.

In preparation for tattooing, the TRPB Tattoo Technician must have in his possession the Certificate of Foal Registration. The identity of the horse must first be certified by the owner, trainer or authorized responsible person.

The card which you are looking at now is called a Tattoo Branding Report, commonly referred to by our specially trained Technicians as a "P-30." It is designed as a guide or check list in the preparations which precede the tattooing of the horse. It is on this card that all important tattoo branding information is recorded and later filed at our New York office.

The person who certified the identity of the horse must sign his name in the space provided. The Tattoo Technician then designates the owner and trainer of the horse in the spaces provided for these items.

The next step to be taken in tattooing is the careful examination of the horse. He is first checked for sex. His age is verified by careful checking of his teeth. The horse's color and markings are then examined. The sex, age, color and markings must all agree with the descriptions set forth on the Certificate of Foal Registration. When it is found that a horse does not conform to his description on the certificate, the tattoo branding card is marked void and a notation is made on the reverse side to describe wherein the horse failed to conform. The TRPB will not tattoo brand a horse if there is any discrepancy between the horse and his description on his foal certificate.

If the Tattoo Technician is satisfied that the horse presented to him is in fact the horse described on The Jockey Club certificate, he then enters the horse's name, sex, year foaled, Jockey Club certificate number, date and location on the Tattoo Branding Report.

A circle is drawn around the prefix letter denoting the age of the horse from the table of prefixes at the bottom of the branding report.

The prefix letter is then entered as the first digit in the space provided for the tattoo brand number. The Technician then enters the remaining four or five digits from the certificate number.

Using the foal certificate as his reference, the Technician then writes the indicated tattoo number on a small blackboard which is part of his equipment. He also selects his dies, which have been previously sterilized, and puts them in an instrument tray in the order they are to be used.

At this point, the certificate is compared with the Tattoo Branding Report, the Tattoo Branding Report is compared to the blackboard and the blackboard is checked back with the certificate to make certain that in all cases the tattoo brand number agrees. The Tattoo Branding Report and the blackboard are then compared with the tattoo dies in the instrument tray to verify that the correct dies are in the proper order.

After the Technician is satisfied that everything checks out, he will apply the twitch to the upper lip of the horse and ask his assistant to hold the handles. The lip is then wiped clean of mucus and other particles with Zephiran Chloride. As each individual die is removed from the tray, it is again checked against the number appearing on the blackboard to insure that it is the correct letter

or number. Each individual die is then dipped in ink and applied to the lip with a rocking motion.

When the application of the dies is completed, the lip is then wiped with Merthiolate and the tattoo is checked against The Jockey Club certificate. The Technician takes a Polaroid photograph of the completed tattoo. Our specially designed tattoo camera enables us to have an immediate photographic record of each and every tattoo brand. The Technician then applies a special seal to the certificate indicating the horse now has a permanent lip tattoo.

Following this, the Technician completes a form called a Jockey Club Notification Slip, inserting the name of the horse, the brand number and the date he was tattooed. This particular form is later sent to The Jockey Club for inclusion in their files.

This process may sound somewhat complicated, but I would like to point out that once the actual lip tattooing has begun, the entire job takes about one minute.

Each individual Tattoo Branding Report and respective photograph is forwarded to New York where they are cross indexed and filed. In this manner, we have a ready alphabetical and numerical reference should a question of identity arise in the future. We know where the horse was tattoed, on what date, the name of the Technician who did the branding, the original Jockey Club certificate number and we can produce a picture of what the tattoo brand looks like.

The TRPB lip tattoo system of horse identification has been officially approved by The Jockey Club and was officially recognized by the National Association of State Racing Commissioners when they recommended to their members that a uniform rule requiring lip tattoo identification be adopted in all States. I would also like to point out that our procedure is registered with the United States Patent Office.

Now we come to the question of how the lip tattoo is used after it has been applied. Prior to the running of a race, the track Identifier pulls the foal certificates for each horse entered in a given race. Immediately prior to the running of a race, while the horses are being saddled up in the paddock, the Identifier carefully checks each horse against his description on his foal certificate to determine if they agree. The lip of each horse is rolled back and the Identifier checks the tattoo number against the corresponding number appearing on the Certificate of Foal Registration. In this manner we can be absolutely certain that the horse brought to the paddock is in fact the horse that is entered.

The lip tattoo proved to be of invaluable assistance in the solving of a rash of forged foal certificates which occurred in the New England and Miami areas this year.

Investigations by the TRPB determined that a total of eight individuals were involved in the forging of twelve foal certificates. The counterfiet certificates were of excellent quality. The forgery was performed on the same type of paper used by The Jockey Club, and the documents bore the counterfeit seals of both The Jockey Club and the TRPB. I am not at liberty to discuss all the details of this case as the matter is still pending Federal prosecution, but it

is important to note that without lip tattoos and back up records maintained at our New York office, it would have been impossible to crack this case.

I would like to make special mention of the fact that during the twenty-six years that the TRPB lip tattoo system has been in effect, there has never been a case of an altered lip tattoo.

Most of you know that immediately after the running of each race at a Thoroughbred track, urine and saliva samples are taken from the placing horses and sometimes a random fourth. Here again, it is the lip tattoo that is used to properly identify each horse with the respective samples taken. The lip tattoo helps to avoid a possible mix-up of the samples en route to the analysis laboratory.

The tattoo brand has also proven extremely helpful from the standpoint of positive identification during the shipping of horses inter-state or to foreign countries, and in many other situations where continuity of possession can not be maintained. Some years ago a race track in West Virginia suffered a disastrous fire in the stable area. Several hundred horses were led from their stalls and turned loose in the center-field. The next day it was a comparatively simple matter to return each horse to his rightful owner by checking the tattoo number of the horse.

On the lighter side, there was a case of the "lost" horse. Trainer Harold White complained to track management at Waterford Park that he had been feeding an extra horse for the past week. The TRPB Agent at the track teletyped New York headquarters and found that tattoo No. L3279 was a colt named "MORE JACK" whose arrival Trainer Charlie Totty had been nervously waiting. A check of horse van records showed that "MORE JACK" had been delivered during the night and the driver had mistaken Barn H for Barn R. The TRPB was unable to solve the problem as to who was responsible for "MORE JACK's" "board bill" during his stay at Mr. White's barn.

I should make mention of the fact that during our initial research in horse identification, the TRPB found that many people purchase horses in much the same way they buy automobiles, and rightly so since both represent a sizeable investment. Certainly when buying a care some consideration is given to its looks as well as its power. We found that horse owners consider the power and looks of a horse too before they buy. Since the lip tattoo is applied to the inside of the upper lip, it is seen only when needed. Consequently this method of identification does not mar the aesthetic quality of the horse to which it is applied.

A "volunteer" from the Alfred Gwynne Vanderbilt stable named "YANKEE DOLLAR" was the first horse tattooed at a demonstration in the Fasig-Tipton Sales Paddock at Saratoga in August in 1946.

Each year, specially trained tattoo crews are sent to the major racing centers where the new crop of 2-year-olds are lip tattooed. Because of the fact that many states have made it mandatory that all Thoroughbreds be lip tattooed, the TRPB sends its technicians to non-member tracks at the request of the Racing Commission or track management.

During the current year, better than 18,500 horses have had their identities permanently applied to the inside of their upper lips. Since the program was

introduced in 1946, 245,609 horses have been lip tattooed with their Jockey Club Registration number.

The average cost of lip tattooing which includes equipment and administrative costs is about $16.50 per horse.

The lip tattoo system of horse identification has over the years proved very effective for its intended purpose. Nevertheless, we conduct periodic research to make sure that our methods are in keeping with the latest equipment and modern technology available. At this moment we are experimenting with the use of ultrasonics to clean our die heads. We have successfully modified an ultrasonic cleaner to operate from an automobile electrical system. Preliminary tests indicate ultrasonics will clean our instruments twenty times better in one-tenth the time.

We are further experimenting with the use of plastics in the manufacture of die handles. We expect to be able to make these handles cheaper, faster, and so durable they will last indefinitely.

Research is also going into our tattoo camera. This piece of equipment has served us well over the years, but we hope to make it more durable and still easier to use.

I am very pleased to have the opportunity to be here today, and I thank you for your attention.

TATTOO # Z 1234

CERTIFICATE # ^701234

TATTOO # Y 5678

CERTIFICATE # ^695678

TATTOO BRANDING REPORT

Date OCTOBER 9, 1972

Tattoo Brand No. (print)	Z	1	2	3	4		
Jockey Club Certificate No.	70	1	2	3	4		

Name of Horse (print) CURLPAPERS Sex FILLY

or

Breeding (if unnamed) _____ year Foaled 1970

Owner or Stable J. D. MC DONALD Trainer P. KINZER

Identity Certified by Peter Kinzer Checked by DOUGLAS VAN HEST

Tattooed by Douglas Van Hest (Signature) at PENN-NATIONAL

INSTRUCTIONS

All checks must be physically made at the time form is prepared.
At least two persons must check on all numbers for accuracy.

PREFIX LETTERS INDICATING YEAR OF FOALING.
CIRCLE PREFIX USED.

1971 - A	1969 - Y	1967 - W	1965 - U
(1970 - Z)	1968 - X	1966 - V	+Foreign Bred - *

† Applies only to animals not bred in the U.S., Canada and Cuba.

P-30

Use Reverse Side For Remarks

TRPB

REJECTED FOR TATTOO

BECAUSE OF:

☐ COLOR ☑ MARKS ☐ AGE

Date_____ By_____

Track_____

TATTOO BRANDING REPORT

Date_____ 197_____

Tattoo Brand No. (print)

Jockey Club Certificate No.

Name of Horse (print)_____ Sex_____

or

Breeding (if unnamed)_____ year Foaled_____

Owner or Stable_____ Trainer_____

Identity Certified by_____ Checked by_____

Tattooed by_____ at_____

(Signature)

INSTRUCTIONS

All checks must be physically made at the time form is prepared.
At least two persons must check on all numbers for accuracy.

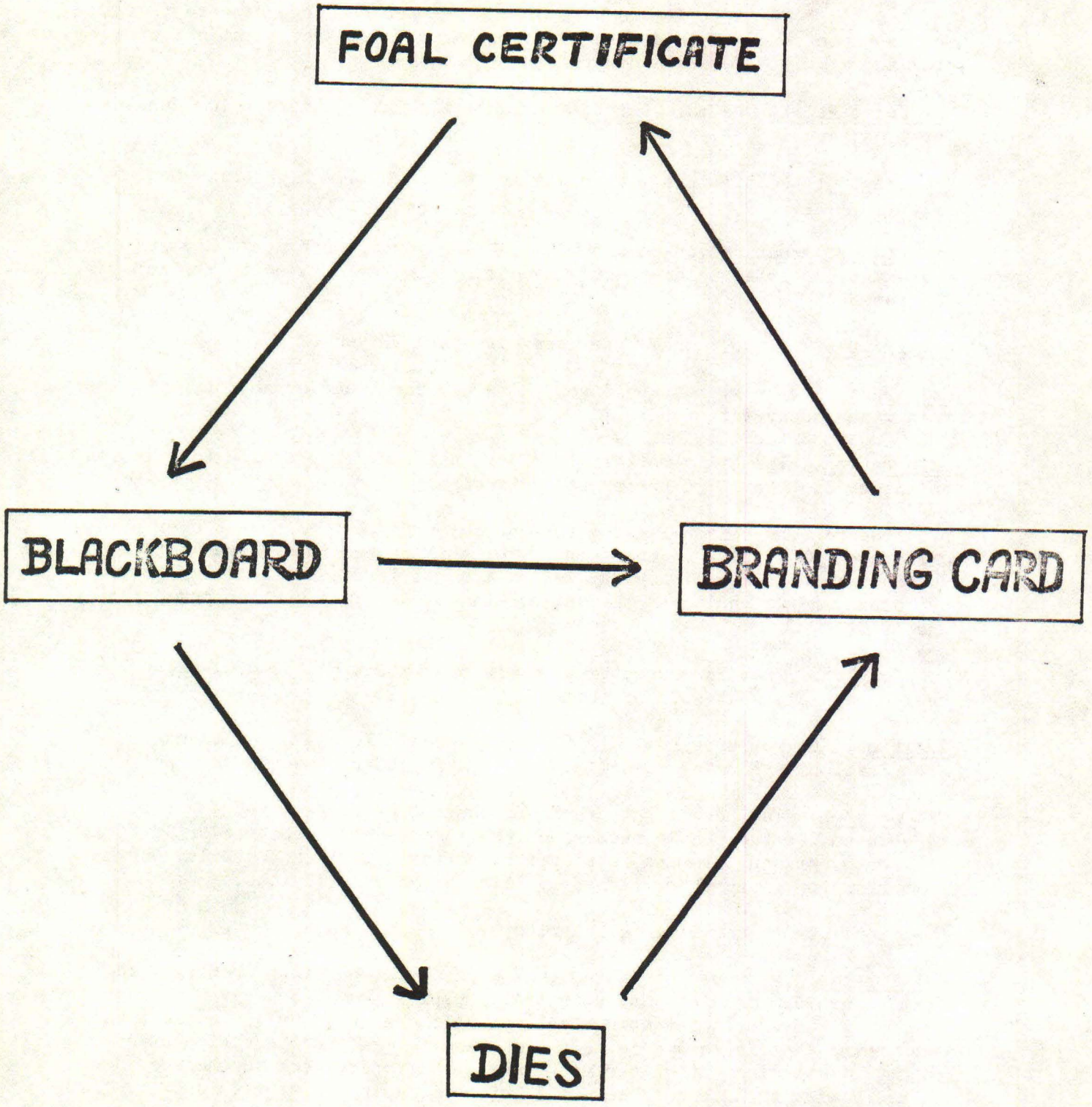
PREFIX LETTERS INDICATING YEAR OF FOALING.
CIRCLE PREFIX USED.

1971 - A	1969 - Y	1967 - W	1965 - U
1970 - Z	1968 - X	1966 - V	+Foreign Bred - *

† Applies only to animals not bred in the U.S., Canada and Cuba.

P-30

Use Reverse Side For Remarks


FOAL CERTIFICATE
BLACKBOARD
BRANDING CARD
DIES

Mr. Peltz: You gave the cost. Is that what you do it for, $16.50?

Mr. Drayton: We do it for members of the TRA for nothing, because that is in our budget. On other tracks we charge them $15.00 and sweat the other buck and a half. We are a nonprofit organization.

Mr. Urgel Bell: One more thing, are you still making those nylon handles for those dyes?

Mr. Drayton: No, it is a product called Celconcopolymer which is not a nylon.

Mr. Franks: What do you do about protecting your patent now? Say our organization wanted to do this, what cost would be involved to protect the patent?

Mr. Drayton: I don't know. We renew it every 20 years.

Mr. Franks: I know, but would you allow another breed organization to use this without payment of a fee?

Mr. Drayton: That is a matter of policy, and I'm not prepared to give you an answer on that. I'd prefer that you direct your question to the TRPB.

Mr. Franks: The reason I asked that question is that there has been some difference of opinion on the accuracy of this tattoo in my organization, and one of the reasons they say we can't do it is because it is protected by patent and we can't get the waiver that or we would have to pay for the use of it.

Mr. Drayton: That is correct. We do have a patent on the dyes and the handles and all that sort of thing.

Question: Do you know how far it is protected? I know other breed organizations are using these. I'm not trying to put you on the spot.

Mr. Drayton: The needle pattern is of course, protected; you would not be able to use the needle pattern or the same shape of numbers or letters. We spent years on this and developed it so that you cannot overlay one number on top of another without it being very, very obvious.

Question: Can't you license the rights?

Mr. Drayton: We would rather not. I might point out to everybody here, just to avoid a problem, maybe this will explain why. You have to understand that we are an investigative agency, therefore, our whole slant on everything that is said here today is going to be from a security standpoint. I'm taking notes, because I've got to report back to the president on everything that is said here. Also, he is going to want to know my opinion of it, and my opinion will have to be from a security standpoint. Now, there is only one man in the United States that makes our dyes for us. One man, and he is up to his eyeballs in making these things. A dye is good for about six months to a year, depending upon the number of horses that are done. If the technician is walking into a new area, a brand new

track, or let's say a track that is opening for the first time, and you have two-year olds, he is going to be marking 30 horses a day (28 to 30). Consequently, there is a certain amount of wear and tear on these dyes and, of course, we have to replace these things as soon as they get dull or dirty. We also provide them for the United States Trotting Association. We have had that going for years. But, because one man makes them, we just cannot make anymore at this point for other organizations. The prime reason, we just don't want to farm this off to any other corporation or company to mass produce these dyes is that we are very security conscious on this point. The equipment is not for sale, it is primarily used by our people. The Ontario Racing Commission is one of the few exceptions. I think also the Montana Racing Commission--we loan it to them, we do not sell it. They are responsible for its maintenance, and if the items get worn out, they must return those items before they are replaced. Most of you have seen that there is a serial number on everyone of those dyes. We keep track of everyone throughout the country. When they get worn out, they must be returned to New York or they will not be replaced.

Mr. Brown: In the beginning of your presentation you said that you were in charge of sending the crews out to tattoo. Could you tell us how you allocate these crews so that all member tracks get proper attention?

Mr. Drayton: I'll tell you one thing, to be very honest with you, the state legislature sure doesn't make my job very easy, because they keep changing their minds. They put out a schedule at the beginning of the year, and I'm lucky if that is what is actually followed. So, in other words, I cannot schedule these guys much more than a month ahead of time, because, for example, one track lasted two weeks and the racing schedule was canceled. I don't know whether it was for business reasons or what, but what I'm trying to tell you is that I cannot plan it a year ahead, or six months ahead. I can only plan it one month ahead, because there are so many variables. If you feel that your track is not getting the proper service, I guess, I'm the man to talk to. The other problem that we have had in connection with scheduling, is that we had four states this year that made it mandatory that a horse be tattooed prior to entry in a race. They don't warn us that this is going to happen and it takes sometimes two to three months to collect all the equipment that makes up the tattoo set or tattoo kit. The parts come from many different sources. Take the Poloroid Corporation, for example. I ordered some new cameras last June to make up the difference, because we are now tattooing in states that we were never required to before. We do it at the request of track management or the Racing Commission. We provide the best service we can, but we cannot buy equipment that is not going to immediately produce for us. We don't try to stock too many sets in the office to just sit there. They have to produce. The complete set runs us about $2300 and the only replaceable items in that set are the dyes and handles, the rest of it is guaranteed to last a year. But, they are expensive, these particular sets. Consequently, we do not schedule these things unless we know that there is a need. Once it is established, we will go out and order the equipment, but it takes several months to get it in. Take, for example, Pennsylvania. They went mandatory this year. They had three tracks running at the same time. That tied up three sets of equipment in one state, and that's unheard of for us. We usually keep that equipment moving. This was entirely unexpected, so we just made the best of it. For next year we have equipment on order to cover it. I don't know if that answers your question.

Question: We have a few unmarked ten-year olds running up here, what about them?

Mr. Drayton: Ten-year olds? We get very reluctant to do a horse that is ten years old, because it is so hard to verify age once they get past even five years old.

Dr. Baldwin: How do you specify the ink that you use in the tattoo?

Mr. Drayton: That is a high carbon, acid-base ink and it is available at any art store. You can't use any other. I know that there are some people here that are going to disagree with me, but I can tell you, you can't use any other ink. In other words, green is not in.

Mr. Snoddy: Do you use color coding? For instance, do you determine years by changing from red to green?

Mr. Drayton: No, it is done with the letters of the alphabet.

Mr. Snoddy: But, what happens when you run out?

Mr. Drayton: We start over again. There are 25 or 26 now. You have to understand that our purpose for tattoo branding is to be able to identify without any question, horses that are entered in races. If I'm not mistaken, a horse cannot race after 13 years. This varies from state to state, in some states it is 12 and others 13. So, we really are not that concerned about it for our purposes. Once a horse gets to be 13 years old, we could technically start over at that point, but we prefer not to. We would rather go the full 25 years or so, and then start over.

Mr. Hayes: Two things. One, the structure of your organization regarding funding, and then how wide spread are your technicians. In other words, location-wise, and how many of them are there around the United States?

Mr. Drayton: There is an organization which, I think most of you are familiar with, called the TRA, the Thoroughbred Racing Association, and I equate it to a trade organization, if you will. There are about 54 tracks right now that are members of that organization. We do background investigations. We are primarily an investigative organization. If they want us to, we will supervise their security policing for them as well. In other words, we will hire and fire the guards, make detective assignments, hire and fire the detectives, and all of that sort of thing. It is a package deal, or it can be. We offer investigative services. We investigate the violations of the rules of racing and we do background investigations on anybody who applies for a license to race a horse in that state, or groom's license, hot walker's license, it makes no difference. Our operating budget comes entirely from the Thoroughbred Racing Association. We do not operate in any tracks that are not members of the TRA, with the exception of tattooing, and we charge the nonmember tracks a little less than our actual cost just so we do not wind up losing money. We do it as a service. As far as the extent of our operations, we are licensed in 23 states, but we have the capability to conduct investigations anywhere in the United States and Canada.

Question: How many technicians are there?

Mr. Drayton: Thirty, it varies from time to time, but there are about 30. There will be 34 next year, with the good Lord willing. This thing has increased dramatically, we did 2,000, or better than that, 2,500 more horses this year than last year. That's a pretty good jump for just one year, so we have to keep up with the trend and hire more people and get more equipment to do the job.

Mr. Lilley: How many horses did you do last year?

Mr. Drayton: In 1972, we did 18,519. The year before was 16 thousand, something.

THE JOCKEY CLUB UNIVERSAL SYSTEM OF HORSE IDENTIFICATION

Calvin Rainey, Executive Secretary
The Jockey Club
300 Park Ave.
New York, N.Y.

Prior to 1937 there was no real system of horse identification in the United States. A somewhat halfhearted attempt was made to have "CLOCKERS" check any horses which were not known or which the paddock judge was suspicious of. Of course, this method was not at all satisfactory and quite a few "RINGERS" were run.

To improve the public image of racing and to protect everyone concerned against this malpractice, The Jockey Club decided that something should be done to prevent "RINGERS" and suggested that Marshall Cassidy, who was then a Steward, look into the matter and institute a positive and practical system of Horse Identification.

During this period of research many experiment were conducted and finally it was decided that a system similar to the one designed by the famous French anthropologist, Alphonse Bertillon, which was then used by the F.B.I. as its primary identification of criminals, should be inaugurated. This would include taking a front and side view photograph and a complete written description of each horse. The description would include the measurements of the horse at the withers, notation of characteristics, all markings, scars and so forth.

In the fall and winter of 1937 and 38 a crew of expert horsemen, under the direction of Dr. James G. Catlett, set out to gather all of the necessary information and the Pinkertons were engaged to supply the photographs. During this period a great many photographs were taken and much information was recorded. By spring is was possible to inaugurate the new method of identification with the opening of the 1938 New York racing season at old Jamaica. It might be noted here, that prior to that time, it was not even necessary to have on file at the track, the certificates of foal registration of horses racing at the meeting. In time a rule was adopted requiring The Jockey Club certificate of registration of each horse to be on file in the Racing Secretary's office before the horse could race. This took several years to enforce because most certificates had either been lost or destroyed.

During those early years, the identifier noticed how the "Night Eyes" varied in shape and began to make note of the ones he considered different such as V shaped, check shaped, elongated, round and so forth.

All this drew attention to the value of the "Night Eye" as a means of identification and we began taking photographs of the odd shaped ones.

Eventually, upon advice from several experts on identification in the human field, a camera was developed which would take photographs of the "Night Eyes" in life-size, which made it possible to measure each one and to place each set in a given category or classification.

This made the system comparable to the fingerprint system in humans, because these "Night Eyes" vary greatly and we have never in all these years found two horses whose "Night Eyes" were even close when using this method.

Here, we have a natural marking which cannot be changed without detection, and because each horse can be classified this system is fool proof.

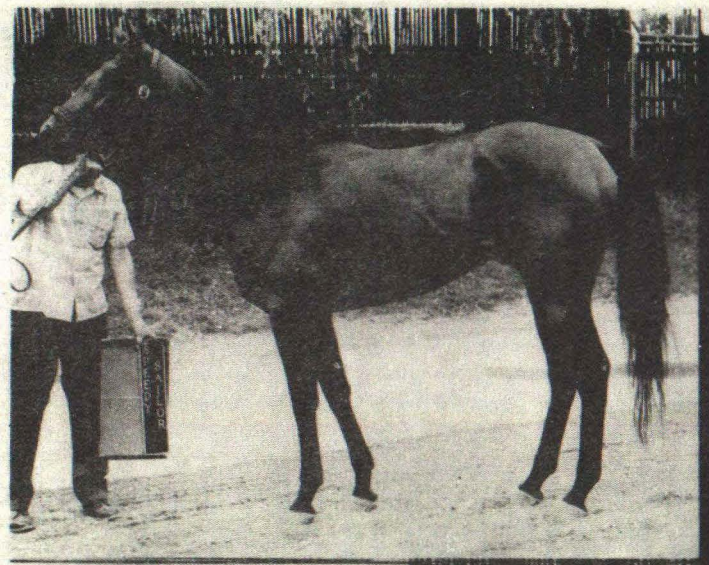
The photographs are taken by a crew using a 35 MM camera which has a calibrated gauge attached so that after having first taken a head-on and side view, the life-size pictures may be taken of the "Night Eyes" beginning with the left fore, going to the left hind, the right hind and finally the right fore.

These pictures are all on one negative strip and never separated, which prevents the possibility of a mix-up. The horse's name, or if unnamed at the time the picture is taken, the name of the dam, is on the head-on picture.

The description, which has been taken by an identifier, is typed on the reverse side of the composite print and, of course, one of the important features of this method is that these photographs are always under the control of the officials and never in the hands of the horsemen or their representatives, as the certificates are.

As the horses come into the paddock before each race, the identifier compares each horse with its photograph, which he has in a book containing the photograph of each horse in that race.

This has simply been a general outline of the system and if you have any questions I shall be very happy to attempt to answer them.



Universal Horse Identification System
Patented In U.S.A. and Canada

Name SPEEDY SAILOR

Foal Ctf. No. 6917880

Tattoo No. Y 17880

Color 1 Sex C Head 2

Leg Marks: LF LH RH RF

	LF	LH	RH	RF
(Outside)	0	0	0	0
(Inside)	0	0	0	0

Body Marks: W1 C1 B1 B3

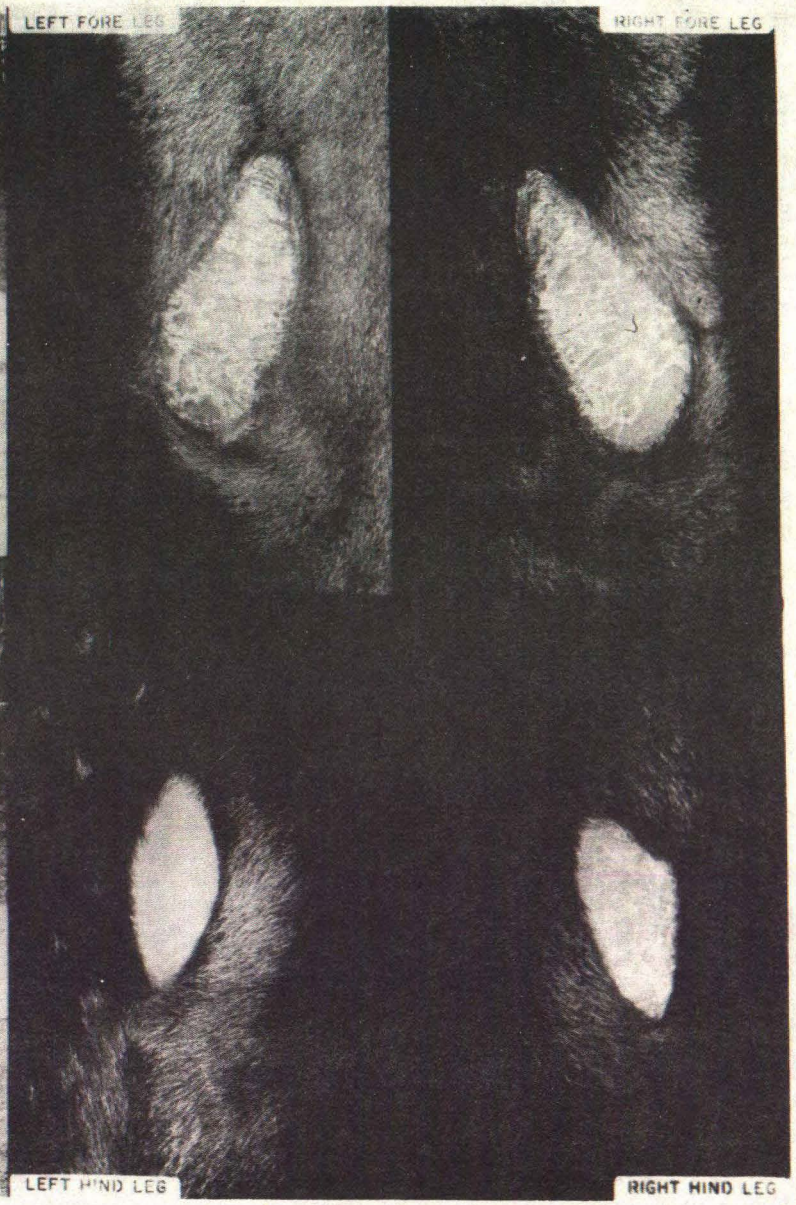
Track: Aque. 3 7/26/72

Identifier RK Photographer RB

Chestnut Classification •

8B	9B
4D	4F

Pinkerton's, Inc.
COPYRIGHT 1968



PINKERTON'S N.Y.RACING SECURITY SERVICE, INC.

Cert. # and Dam
Verified By J. C.
On 7/15/72 By NYRA

NAME SPEEDY SAILOR NO. 72-1- COLOR Bay SEX Colt CERTIFICATE NO. 6917880

FOALED 4/21/69 SIRE Sailor DAM Fast Worker TATTOO NO. Y 17880

OWNER TRAINER S.Di Mauro BREEDER Mrs. J.Walker, Jr. BASIC CHECK SATISFACTORY X

MARKINGS TAKEN 7/15/72 IDENTIFIER L.Yuknek AT Aqueduct IDENTIFIER JJW
PHOTOGRAPHED 7/15/72 PHOTOGRAPHER R.Berke AT Aqueduct DATE 7/15/72

HEAD Small irregular vertical mixed star--Cowlick 1" below star between bottom of eyes--

LEFT FORE LEG Shin and ankle fired--

LEFT HIND LEG Hock fired--

RIGHT HIND LEG Hock fired--

RIGHT FORE LEG Shin and ankle fired--

BODY Cowlick left and right side of neck near mane--Fanning cowlick below jugular grooves near base of neck extending onto chest--Dimple below jugular grooves--

CHARACTERISTICS Lop eared--

REMARKS
WTS-X720 NORMAL

Mr. Sims: If I came to New York, how long would it take me to learn this method of identification from start until I would be ready to go into a paddock and go to work?

Mr. Rainey: That would be pretty difficult to answer, but I'm sure that with your knowledge of horses---

Mr. Sims: Say the average person.

Mr. Rainey: It wouldn't take too long if they knew horses.

Mr. Sims: I'm talking only about the night eye method.

Mr. Rainey: It wouldn't take long. I think you could probably learn a good bit about it in two days or probably you would know it in one day. And, you are welcome to come to New York if you ever want to, anyone who comes to New York and has the time to see this, they may.

Dr. Farrell: I'm really interested in identification of the very young animals. Have you done any work in regard to the growth of the night eye. Is there a possibility that we might add to the foal certificate, for example, the basic types of Chesnuts.

Mr. Rainey: Yes. We have done a great deal of work on young horses. I have a whole file on them in my office in New York. We started taking photographs of them at various stages from the time they were a few days old. We would wait a couple of weeks and photograph them again. We even did it using the stereo-realist photography. The night eye in itself, I don't believe, varies a great deal. There is a little growth in the size from its early days. When first born, they tend to be a little more jelly-like and not hardened up like they get later on. They do vary slightly. I don't know what the percentage in the change is, but it is not a great deal. The other part of the question was, have we thought of including this in the certificates. We certainly did, we thought or hoped to have the night eyes of every horse included on the foal certificate, but it was an almost impossible job for us to take on the cost of this. At one point we had the idea of having a group of identifying crews, two-man crews, go around the country. We even went so far as to pricing and getting the price of trailers. This was about 15 years ago and to have a crew with its own trailer, its own laboratory, and go around and take all of these pictures and markings, etc., to cover the country adequately, the cost would have been prohibitive and this seems to be the stumbling block in everything that we try to do. Everybody has a different idea of identifying methods and each is supposed to be better than the other. As I said earlier, if you could get them all together, it would be good, because when you are trying to be sure that you have the right horse, it isn't easy.

Dr. Farrell: You likened the night eye to a finger print. This may be a little bit misleading in that you do not actually take a pattern of the surface.

Mr. Rainey: No, it is not an impression. It is a photograph and the reference to finger printing was because of its classification possibilities. All of the information that could be gained from this could be put into

computers too. We have hopes that someday we will get to this, but I wouldn't want to get to it unless we have it nationalized.

Question: Where would we get the finances to nationalize it?

Mr. Rainey: The Jockey Club couldn't afford to do it, because there are race horses in every state in the union, Hawaii, Alaska, Cuba, and Canada, and it is only the last few years that the Mexican people have established their own stud book. Up until ten or twelve years ago we registered all the Mexican horses and we still do all the Puerto Rican horses.

Mr. Franks: Has there been any thought given of standardizing the procedure by congressional action on horses that were moved in interstate commerce.

Mr. Rainey: I don't think we have ever done this, but it may be something to look into.

Mr. Lilley: If you have all this, could information fed into some system, if somebody picked up a horse that was straying in the street and notified the office, you could make positive identification from the description?

Mr. Rainey: Yes, just like Mr. Spencer's organization, if the horse has been tattooed or if he is in our system, we can do that.

Question: Without having to rely on the tattoo number?

Mr. Rainey: Either one. Absolutely.

Mr. Lilley: Can this be extended to brood mares, is there any check?

Mr. Rainey: Of course, not really, but we do have many brood mares and many stallions in our system. In many instances it has come in handy, but there are some cases where the horse is not identified with our system.

Mr. Lilley: Some of the older mares.

Mr. Rainey: That is right.

Mr. Lilley: Is there any annual check on the descriptions of brood mares returned to the stud book?

Mr. Rainey: Do you mean identifying the mare each time, each year? No, unless the mare changes ownership. If it changes ownership the new mare owner must reidentify the mare, otherwise no, not after the first one.

Mr. Hooven: Do you do any blood typing of the stallions and brood mares in the Association?

Mr. Rainey: Yes. I know Dr. Stormont is supposed to be here tomorrow. He was supposed to have been here today. Yes, the Jockey Club sponsored blood typing of the horses, as you may know. We gave grants for quite a few years to get this work underway, and Dr. Stormont has had the advantage of studies by our man Dr. Gillman (a pathologist from New York) and Dr. Sparks.

They wrote up a paper that was passed onto Dr. Stormont. Dr. Stormont is best known in this country for that type of work and he has been doing our work for quite a few years. We started with him some ten or twelve years ago and went out to his laboratory in Davis, California and met him and his able assistant Miss Suzuki. Unfortunately, we haven't done as much of it as I would like. Anytime there is a question of double parentage involving our breeders, this is a service with a fee of a $100. We will have the blood work done and try to eliminate one of the stallions. I guess in perhaps 80% of the cases we have been able to make positive identification. We have just recently had a situation where someone saw a horse sold at an auction and this horse was not the right horse. They presented this to us and we got in touch with the man who bought the horse at the auction, the sales people, and the owner, and got permission to do the blood work. It was thought at that time that there might be another stallion involved. We did the work on the other stallion and strangely enough it just wasn't the right horse, it wasn't by either one of the stallions and there was a question of whether he was out of that mare or not. I don't believe that this was anything intentional. I think it was a mix-up somewhere along the line. It just happened the poor breeder bought the brood mare in foal. He had several horses on his farm and he trusted them to a caretaker. He also had a full blooded, or it might have been a Quarter Horse foal or half Quarter Horse on his farm at the same time, which I think he sold for a couple hundred dollars, but he isn't sure. He doesn't even know where the horse is, so we can't go and do any blood work on that horse to see if it fits in the pattern and so he's a lost soul. He sold the horse for $15,000 and had to give the $15,000 back, plus he had to pay the man who bought the horse several months keep on the horse. It hurt him a great deal. I personally believe the man is honest and I don't believe he intended to do this, but it happened, and I'm afraid it happens more than we like to admit.

Mr. Hayes: Is your service available at the race track and, if so, what is the cost? Or, is it part of the identification system?

Mr. Rainey: The cost would simply be for you, or any state or track who was interested in this system, to employ a photographer, who could take the pictures and develop them and an identifier who would read them in the paddock along with the description. So, you be the judge of the cost there. The camera equipment that we use--I say "we", I really shouldn't say that, because I have no part of the operation--the New York Racing Association contracts with the Pinkerton organization to supply them with photographs. The New York Racing Association, itself, employs the identifiers. The cameras which the Pinkertons use with its rig, usually comes to around $600 or $700, and it is quite possible that it could be done cheaper.

Mr. Fisher: We have a horse now racing down in California, and on its foal certificate three sires are listed.

Mr. Rainey: That is because three sires covered the mare and the only way they could have eliminated one or possibly two of these, would have been to have the blood work done on all of them and hope and pray that it would have eliminated these horses as possible sires.

Mr. Fisher: Would it have been possible in this case for you to have asked for a blood sample from these horses to eliminate sires?

Mr. Rainey: No, we have never done that. It may come to that eventually, but we have not done it yet. The stud book rule has been for years that whenever more than one sire covers a mare, they must be listed and until we had the advantage of the blood work, they were listed. Since we have the blood work, if anyone wants to do the eliminating on them, try to eliminate, they have to pay to have it done.

Dr. Bergevin: In regard to the ruling, is it possible to cover a mare with another stallion in the same cycle?

Mr. Rainey: We have a rule that isn't exactly in line with what you are saying, but close to it. The get of a mare that has been covered by two stallions in one heat period is not eligible for registration. That has been in effect for the last four or five years, and we have turned some, a good many, down because of this.

Dr. Bergevin: Are these people taking a risk in getting a blood test to verify the stallions, and then in the eyes of the test, neither stallion is the sire?

Mr. Rainey: I'm not sure I understand the question.

Dr. Bergevin: To eliminate the papers having both sires listed, can the owner submit for the blood testing, then suppose neither horse appears, in the eyes of the test, to be the sire.

Mr. Rainey: We have never had such a case, except the case that I just mentioned, and that wasn't a double parentage case. We have never had a double parentage case where neither one of the sires qualified. It may be, but we just haven't had it.

CONTRACT FREEZE MARKING

Norman J. Hayes
Y-Tex Corporation
P.O. Box 1450
Cody, Wyoming 82414

Y-Tex Corporation is a privately owned company whose purpose is to develop and market various means of livestock identification. We have been successful in the manufacturing and distribution of plastic ear tags for temporary identification of livestock. We have developed record keeping systems for the beef, swine and dairy industries. One of our current interests is development of a tattoo system for the swine industry.

Purchase of patent rights to freeze marking and to the angle system have brought us into the field of permanent identification of livestock. These patents, when issued, were assigned to Research Corporation, a non-profit organization. In purchasing patent rights from Research Corporation, it is now the responsibility of Y-Tex to put the ideas to work in a profitable manner. We have taken part in the development of and have implemented a system for international identification of horses.

Extensive studies were done on design of the marking device and methods of application. Field use of the system was instituted with the marking of a large number of Arabians at Al Marah Arabians in June 1972.

It appears that some blood registries will wish to assume the job of marking their registrants. This can be done by sub-licensing by Y-Tex. We have established a training school and will train and certify your technicians, provide the proper marking device and imprinter, and the knowledge necessary to do the job. Y-Tex has its own certified technicians available if you prefer to use them.

The Arabian Horse Registry has adopted the "Y-Tex System" and, as Mr. Howland has told you, the program is working well for them. In addition to programs for breed registries, we are also developing a program for grade horses with records to be kept in a central location.

The angle system and the Alpha angle system, which we use in our marks, have already been described at this meeting. These systems are compatible to modern data retrieval and such a program will be available for breed registries and grade horses. I believe it is desirable to aim at establishing a centralized point of records for all horses.

Freeze marking with the "Y-Tex System" will not interfere with existing identification systems. However, I believe that as people become aware of its advantages, it will gradually become a predominant method of identification. The equine industry can benefit from the "Y-Tex System" of freeze marking because it provides a painless, permanent, readable and unalterable means of identification. It will provide positive proof of ownership for the owner, buyer and registry.

Persons unfamiliar with an animal can identify it easily and insure a buyer of the correct horse. The "Y-Tex System" will provide identification for vaccination and medical records and will always provide easy access to those records. The "Y-Tex System" will provide positive identification for all insurance purposes.

Mr. Lilley: What is the fee charged for freeze branding?

Mr. Hayes: The fee charged for the actual marking of the animal is up to the registry. In the case of the Arabian Horse Registry, they charge $15.00 for marking an animal, of which $1.50 to $2.00 goes to us.

Mr. Lilley: And, would your Y-Tex men or racing officials be able to do the branding?

Mr. Hayes: They would do the actual marking. It is the same thing as is being done now in the Arabian Registry in the United States. Your field men go to Y-Tex school and after they have completed it and are certified, after two weeks they are on their own.

Mr. Lilley: Then you don't have to employ technicians?

Mr. Hayes: Yes, or we will train your technicians.

Mr. Franks: You talked about the percentage of errors and it seems to be quite great. Have you lowered that?

Mr. Hayes: Our percentage of errors? Now, let me discuss that. We had marks that we could not read, because the horse got away from us. Let's say we were supposed to have a contact time of fifteen seconds, the horse got away from us and we didn't stay on the fifteen seconds. We will go back and remark that animal. All we have to do is refreeze him, and he will have his mark in that same spot.

Mr. Howland: I just wanted to comment on that question. With the controls in the way that mark goes on, of the 800 and some horses we have marked since June, there has been one mistake, and you might tell them how we correct that mistake.

Mr. Hayes. A mistake is when a mark is put on an animal that does not belong on him. Y-Tex guarantees to Research Corporation that every mark that is put on is legible and correct. It is a guaranteed mark. If not, we come back and put that mark on correctly for you, at no cost. If there is an error we have a correction "Z". Let us say that we put the wrong number on. We go back and mark the animal with a "Z" as a suffix to the mark. This "Z" means "check the papers", as this is not the actual registration number as shown on the papers.

Mr. Drayton: I have two questions. Why couldn't you put the "Z" on the foal certificate as well, or do you?

Mr. Hayes: We do, it is shown on both places. The mark also goes on the certificate and on the animal.

Mr. Drayton: After you apply the freeze brand, as I understand it, there is a period of time before it shows up. Is the freeze brand immediately visible?

Mr. Hayes: The mark is always legible. It is true that you get white hair only in the hair growth cycles, when the horses shed off and their new hair

grows in, but because we have clipped the area, and created some irritation on the surface, it is always visible. We have actually stopped hair growth when we froze that area. The hair falls out of the frozen mark and when we get a re-growth of hair, it comes in white. I think I'm getting over into Dr. Farrell's ball park there and he is going to explain that.

Mr. Majeau: You show five digits there, is that the limit?

Mr. Hayes: Our basic system is setup for six digits for the actual serial number by using the year designation you can go 100 years without duplication of the year symbol. You can serially number one million animals each year.

Mr. Majeau: I feel that you did not show that you positively identify--that these are the only numbers you have for that animal. If you left it the way it was you could easily add some more digits to it.

Mr. Hayes: By registry specifications, there are six digits. It is pre-set. There will always be six digits, period.

Mr. Majeau: But, what is to stop you from having seven, or someone putting an additional digit on there?

Mr. Hayes: Anyone seeing seven digits on an animal would automatically know that this is not an official registry number.

Mr. Majeau: But, eventually you will go to seven?

Mr. Howland: After you and I are dead.

Mr. Hayes: No. Let's say that you number one million horses in any one year, for anyone registry. The largest registry is the Quarter Horse Association which has close to 100,000 foals a year and that means we would have to have a ten-fold increase in Quarter Horses before they would even get---

Mr. Majeau: I'm trying to establish the maximum numbers that you think you will need.

Mr. Hayes: The six digits, along with the combination of the year is adequate. If you estimate horse populations higher than this, we might have another pollution problem.

Mr. Majeau: I've been given the number of ten digits. I prefer eight digits to ten.

Dr. Farrell: Henrie, the thing here that you don't understand is that we use a separate symbol for each registry. We have eight separate positions for each letter, so there is a lot of things you can say with your alpha angle symbols. We can have up to 208 registries so you could actually register 208 million horses yearly for 100 years without a repetition of a number. [A proposal arising from discussions at this seminar appears for the international identification symbols allowing less than six symbols following the year designations provided that the last symbol be an alpha-angle alphabetical designation for the country of origin--see proposal (Farrell-Björck).]

Dr. Bergevin: If a person is out to counterfeit and went to great lengths and produced a similar device and took a second horse, as in an insurance case, and marked him with a duplicate mark, in three or four months you could have a mark probably that would qualify for insurance examination. Would this counterfeit be able to take place?

Mr. Hayes: Yes, if a man is going to sell an animal for the amount of money you are thinking of, which is going to be up in the dollars. Otherwise, he isn't going to go through all the contortion you were talking about. He's going to check with the registry on that animal. In the case of the Arabian Registry, they also have a visual appraisal of that horse on record, so you had to duplicate the horse. You had to duplicate the number on the animal and then I think you had to kill him, in order to collect from the insurance company. I just think you have a lot of problems. I'm not saying it can't be done, but it would be so far out.

Dr. Bergevin: Have you read about the Jet Deck case?

Mr. Hayes: No, I can't say I know all about it, but I have heard of it though.

Dr. Bergevin: I don't think it was an identification problem.

Mr. Hayes: But, the majority of them that we know of are identification problems, that is why we are here.

Mr. Knowles: Did you explain why you selected the right side of the neck?

Mr. Hayes: I don't think we did. Dr. Farrell, would you answer that?

Dr. Farrell: Horses are predominently right-maned, like people are predominently right-handed.

Mr. Hayes: This decision came out of a meeting a year ago, so we did reserve the right side of the neck for this mark, or any official mark.

Question: How many horses did you check to make this determination that they are right maned?

Mr. Hayes: This morning I heard a figure of 60%.

Dr. Björck: We checked about 200 Standardbreds, but Standardbreds only.

Dr. Farrell: There was some work done with the Arabian Registry and this check was done only on pictures of horses that appeared in the Arabian Horse News. So some of these horses might possibly have been trained to the right and not be naturally right-maned, but it really makes no difference. They are still hiding the mark as far as Arabians are concerned. In Arabians, we have a percentage quite a bit higher than stated by Dr. Björck in his study with the Standardbreds. Dr. Manuel Gillman, NYRA, discussing the mane (As the Mane Lays-Western Racing News Magazine) of Thoroughbreds says "The fact is that 85% of horses' manes grow toward the right (off) side and 10% grows to the left or wrong side. In the remaining 5%, the mane hair grows in both directions, as though parted in the center. There are good and inferior horses in each group."

Mr. Howland: I just wanted to make one point. We say the right side of the neck is the normal place where we will put the mark, however, the breeder or owner will have the choice of having it on the left or right, depending upon which side the mane goes on. Keith and I went around and around about this for awhile, but we have an asthetic problem in Arabians and this is what we had to do.

Question: Do you intend to kill the hair growth when you brand, or just color the hair?

Mr. Hayes: It depends upon the color of the animal. If the animal has dark hair, other than grey, we stay on just long enough so that it will grow white hair. If the animal is grey or has a tendency to be that way, we stay on longer and kill the actual hair growth, so you have a balding area.

Mr. Franks: If a person has two identical black horses, one of them branded and he wanted to switch, it would be no problem if he had this instrument to put the same number on the identical black horse.

Mr. Hayes: Yes sir. You can always duplicate the mark if you had the instrument, but distribution of the instrument is tightly controlled.

Mr. Peltz: What happens if you live in a state that does not recognize freeze marking as proof of ownership?

Mr. Hayes: Because the registries can adopt this system, such as the Arabian people, they can put the registration number on the neck of that horse without interfering with the state problem. There are eighteen states with brand laws, and all of those pertain to brand laws as registered in that state. This system here is patented and is protected.

Mr. Peltz: It still doesn't prove that I own the horse in my state.

Mr. Hayes: It would prove that you own the horse if he was freeze marked.

Mr. Peltz: Not under the laws of Montana.

Mr. Hayes: Okay, but if I had to go to court and prove that that horse is mine and there is a freeze mark on it, you would have a lot of problems, whether you recognized it or didn't. Legislation has been passed that says that they do not recognize freeze marks as an official mark, is that correct?

Mr. Peltz: Proof of ownership. Correct.

Mr. Howland: On proof of ownership, how do you prove ownership in Montana?

Mr. Peltz: By a hot iron brand.

Mr. Howland: That's the only way?

Mr. Peltz: That's right.

Mr. Howland: I think in proof of ownership cases that we have run into, you must come to the registry to determine who owns the horse. Once you identify the horse, then you go to the registry records and determine who owns the animal. This is not legal ownership, this is registry ownership. But, freeze marking, as we are using it, certainly would have a great deal to do with identifying the horse and once you identify the horse, then you worry about proving ownership.

Mr. Hayes: I think what Ward is saying also is that if the registry recognizes the animal as a purebred and he is indeed that animal, and he is registered to you, I think someone has a lot of problems if they have your horse.

Mr. Franks: How do you compare this with photographing the Chesnuts?

Mr. Hayes: I would have a hard time saying that if I wanted to know the age of that animal and I don't know anything about horses, and I want to know his registration number and I want to know if that is the animal that I'm really buying, I'd have a pretty difficult time, wouldn't you? I'm not saying it doesn't work. It does work. For instance, if the registration number of this animal was on his neck and you showed me the registration papers, the ballgame is over.

Mr. Franks: Would the same thing be true with the Chesnuts? If they were made a part of the certificate?

Mr. Hayes: You can't read Chesnuts, nor I can't, I'm not saying you can't, I can't.

Mr. Franks: I can't either.

Mr. Hayes: I'm talking about the average layman. We are trying to identify horses by the best method that we know how, so we should try to come up with a system that lends itself to identification by the majority, not by four or five percent of the people. I'd like to know when I buy a horse, how old he is, I would like to know that the registration number here is exactly the same.

PERMANENT INTERNATIONAL HORSE IDENTIFICATION

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SUMMARY

A system for the individual identification of horses has been devised. The system utilizes a mathematically derived alphabet plus a Gestalt design numerical angle symbol to be applied by the freeze mark, laser or tattoo method. The system is designed to prevent alterations of official identification symbols representing a registration number.

The following is made as a specific recommendation for the establishment of a horse identification system. The title of this report deliberately includes the word "international". It is my recommendation that identification be considered on the international level. The need for adequate identification and records does not stop at state lines or national boundaries; this is evidenced by the present outbreak of Venezuelan Equine Encephalomyelitis in the United States. The role that better identification plays in disease traceback, certification of immune status and movement control in outbreak situations is obvious at a time of emergency, but probably more important over a long period are the less glamorous jobs such as proof of ownership to prevent theft and settle insurance claims, breeding programs, etc. The population explosion in horses that resulted in nearly a 100% increase in animals in the last 10 years brings a corresponding increase in problems. There have recently been several recommendations for an individual horse registry at the state or federal level.

The New Mexico System of Identification

In the past it has been the responsibility of the state to handle problems associated with ownership. New Mexico, Wyoming, Arizona and Colorado recently started to register individual horses within the state; it issues them horse passports which allow free movement within the state without the necessity of a brand inspection. This is a very exciting development because, for the first time, states are recognizing horses as individuals. The men who serve as

identifiers become skilled. All marks of identity recognized by the major breed registries are used, including color, cowlicks, color patterns, saddle marks, brands, lip tattoos, chestnuts (night eyes) and blemishes such as wire cuts. We should all push for similar programs within our own states and encourage the French programs for horse passports which encompasses similar individual identification on an international level.

Most present state brand registries fail to meet the requirements of interstate livestock movement. Each state has its own ownership registry, and in Texas, a county registry prevails. Thus one ownership brand may be used in several states or counties, and most brands are used again within one state or county when placed on a different anatomical site. The individual livestock man legally owns his brand on a given site. Attempts have been made to design systems utilizing firebrands to accomplish the aims of interstate livestock ownership but the magnitude of such an attempt seems overwhelming. Most important, these programs, even if successful, do not identify the horse as an individual.

An animal identification technique should have the following theoretical attributes to be effective:

(1) The mark must be a permanent part of the horse.
(2) The mark should be inexpensive and easy to apply.
(3) The mark should not damage the horse unreasonably.
(4) Application of the mark should be relatively painless.
(5) The mark should not interfere with existing identification marks.
(6) The mark must be adaptable to modern data retrieval systems.
(7) The mark should be visible from a distance of at least several feet.
(8) The mark must be unalterable.
(9) The mark must positively identify the horse as an individual.

It has been suggested that we use the alphabet and numbers previously described in the paper entitled "An International Freeze-Mark Animal Identification System".[13] I have chosen another route to recommend for the following reasons:

(1) The International Alphabet is not readily adaptable to tattoo techniques.[1] The system to be described subsequently is adaptable to both tattoos and selective depigmentation or depilation by freeze mark and laser mark.

(2) There are certain advantages to keeping symbols for ownership and for individual identification separate.

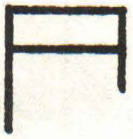
(3) There are problems encountered in number assignments of individual animals not found in owner symbol assignments.

The Angle System

We have now developed unalterable symbols for the alphabet and the numbers which meet the needs of individual animal identification. The new alphabet is referred to as the alpha angle alphabet. The symbols for numbers are referred to as angle number system.[14]

The Alpha Angle Symbols

The alphabet is designed to permit eight separate positions for each letter. Each letter in any of its eight positions is distinctive from any other letter in any of its eight positions. To increase readability, right angles are used whenever possible.

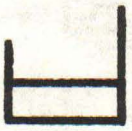


Position 1.
Upright

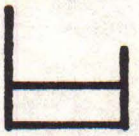
Position 5.
Reverse

Position 2.
Right

Position 6.
Reverse Right

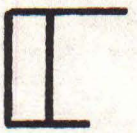


Position 3.
Inverted



Position 7.
Reverse Inverted

Position 4.
Left



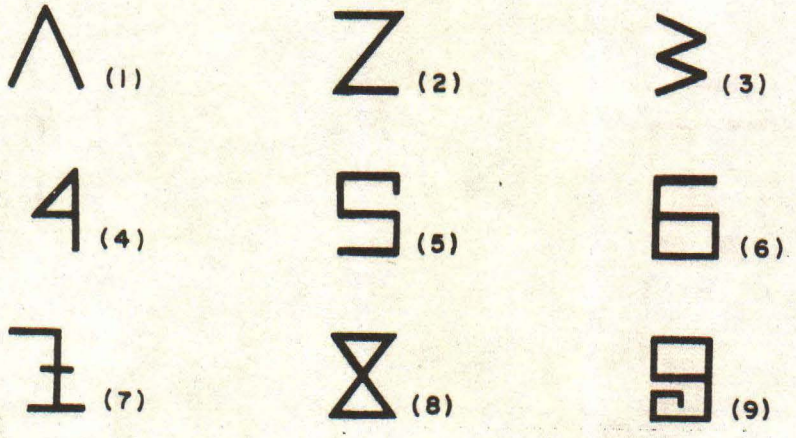
Position 8.
Reverse Left

FIGURE 1. The Eight Primary Positions of Letter Symbol "A"; An Example of an Alpha Angle Symbol.

The Angle Number Symbols

When the Arabic number system developed in ancient times, straight marking devices were often used on clay tablets to tally grain supplies and other commodities. It is believed that our present Arabic system developed in this way, and that the Ancient who conceived the Arabic system was simply evolving a method to depict numbers of animals or units of grain. A symbol that contained only one angle represented the number 1. By adding one angle at a time, a simple set of symbols was developed as in Figure 2.

FIGURE 2.



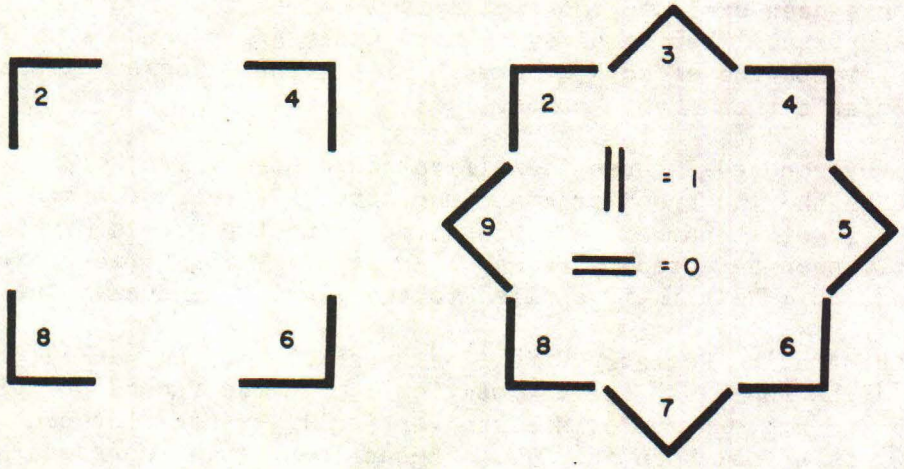
If you examine each symbol and count the angles, you will see he had a good thing going until he got to 9. We can imagine the poor fellow scratching his head to account for the last figure he needed. It looks like he had pretty well used up angles to make it. We would like to think he noticed at that time a round piece of bamboo (or the stalk of a poison hemlock), and by accident picked it up to make the impression that revolutionized the game, 0, with no angles at all.

This description may be far from the truth, but it does bring us to the point that straight lines are easy to make with crude instruments. It also allows me to violate the Arabic system with less feeling of reverence than we had as a child.

The Angle Number System can be easily remembered if one visualizes a basic square which represents the even numbers (Figure 3). The only memorization necessary is that 2 occurs in the upper left-hand corner, and that you count clockwise 2, 4, 6, and 8. With this in mind, odd numbers are obtained by shifting the basic square 45 degrees. To find the angle representing 3, you visualize the basic square and find 2 and 4; the 3 falls in between. The number 1 is represented by two vertical lines; in this case we use a double

row to avoid confusion with an angle or possible alteration to an angle. A one on its side (=) represents 0, which is easily correlated with a negative sign (-).

FIGURE 3.



With very little practice the Angle System becomes more logical than the original Arabic system. If we were to use the system on a clay tablet, for example, we would need only one stick with a right angle carved in one end and a straight line on the other end. Each symbol could then be applied with one impression. Forty-five degree rotations of the stick would produce numbers 2 through 9. Zero and 1 could be made by inverting the stick. This, in effect, is what was done to produce adjustable marking devices.

The Marking Device

In tattoo and freeze marking devices, each digit is reversible, end to end, with a right angle on one end and a straight double-line bar on the other end. The digit may be rotated through eight positions, allowing the right angle to represent numbers 2 through 9. As the digit rotates the straight line bar becomes 0 in the horizontal position and 1 in the vertical position.

In a similar manner, the Alpha Angle symbols are rotated to produce positions 1 through 4 of a letter on one end of the plug and positions 5 through 8 on the other end.

This results in a device which is self-contained, has all the necessary symbols and is without extraneous parts. If we were using Arabic numbers instead of Angle numbers, we would need ten digits available for each number

position. The program is based on the assumption that whether freeze mark or tattoo techniques are utilized, all symbols are to be applied simultaneously, with the marking device also capable of marking official registration papers to exclude mistakes by the operator.

No individual letter or number can be modified or altered without revealing that an alteration has taken place. Reversal or inversion of any character has been excluded and each symbol can be distinguished from any other. A horizontal bar is always placed under Angle numbers to give orientation and minimize the effects of growth distortion. These angle numbers are much more usable than Arabic numbers.[15,16]

We have proposed a horse identification system which, with eight symbols, will indicate the (1) breed or state registry, (2) year of birth, and (3) an individual six-digit number. This system, using the freeze marking technique, has recently been accepted by the Arabian Registry for official registry identification. The mark is applied to the right side, under the mane.

For the Arabian Registry, the first position in the marking device is filled by Alpha Angle "A" in its position 1. In the second position in the device are two angle numbers, stacked vertically, which represent year of birth. Y is a foal born in 1971. The angle symbols representing numbers are used to fill positions 3 through 8 of the marking device, and these six symbols are underlined by a horizontal bar. If the official registration number is 125, the 125 would fill the farthest right hand positions, and three positions to the left of the official number would be filled with zeroes. This prevents fraudulent introduction of numbers.

The design of the marking device allows the number being branded to be read in Arabic from the top of the device. This is a visual check for accuracy prior to application of the mark. Immediately before marking the horse, we apply the iron directly to official registry papers which contain descriptive material on the horse. We have developed techniques, using a machine which resembles a credit card imprinter, for making an official mark on the registration papers at the time that the mark is placed on the horse (Figures 4 and 5). This is an attempt to reduce the 3% human error that creeps into all techniques. Coded identification of the freeze marking technician may be impressed as an inconspicuous mark on the horizontal bar.

The major controversy to utilizing freeze marking and official symbols for individual identification of horses has been concerned with the possibility that the marks may be too obvious for some people's personal preference. In New Zealand, where freeze marking is the official marking technique for Standardbreds, this controversy has lessened as the program progressed and the significance of the mark becomes apparent to the owners. There has also been a question about freeze marks functioning on a pure white horse. Pure white horses are easily marked to produce a bald mark with a darker appearance of the bald skin. In many instances, however, the mark must be clipped to

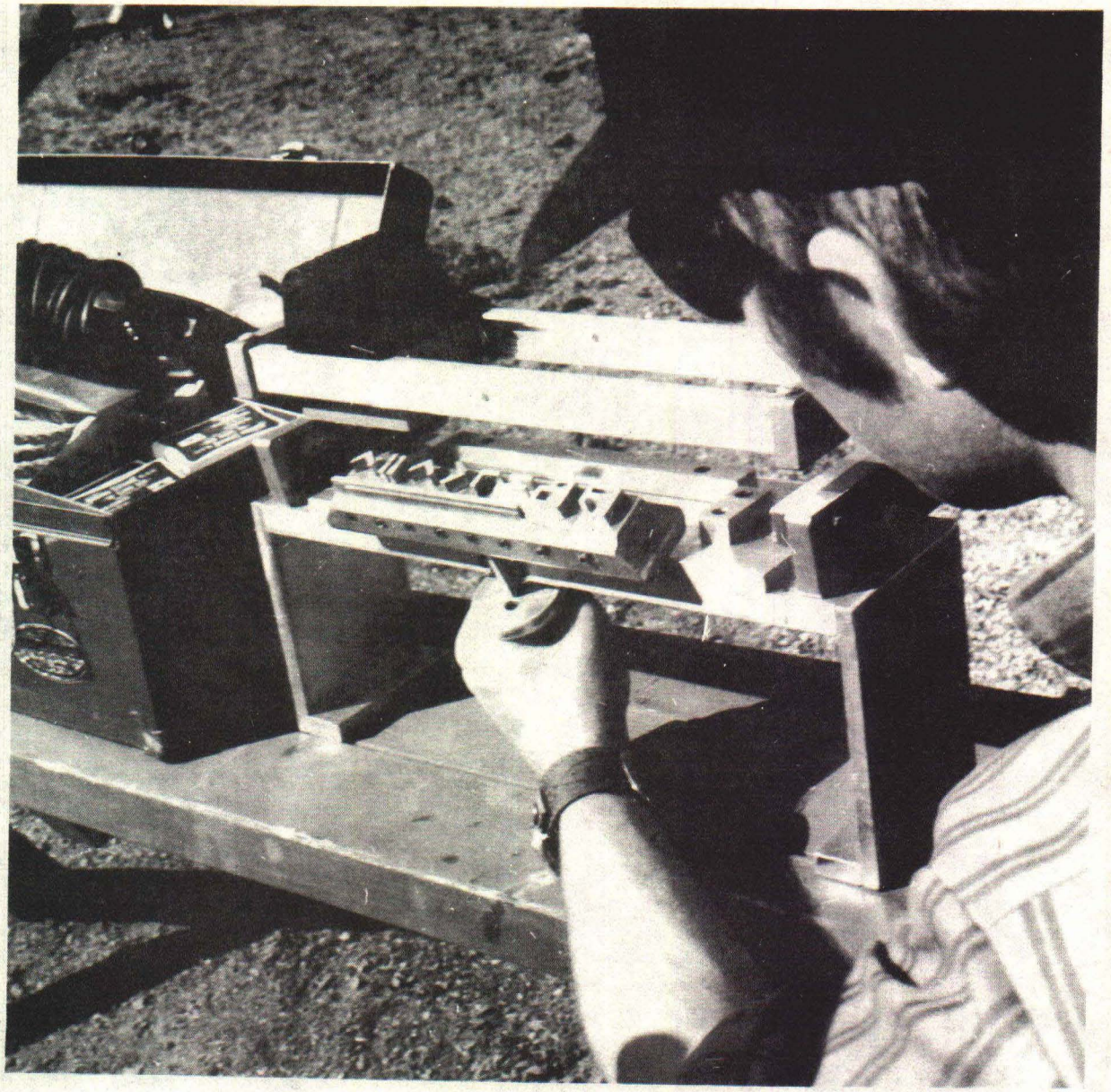


FIGURE 4. Marking device fits into imprinter similar to credit card operation.

FIGURE 5. Official registration number imprinted on freeze marking application.

assure confirmation of symbols. Experimentally, we have been able to produce marks with practically no white hair at all. We have not determined whether this could be achieved consistently enough to assure marks visible only after clipping in the darker animals, but it would seem a likely possibility if the demand is great.

We have chosen not to include extensive charts in view of the great amount of material occurring in this proceedings that is largely repetitious. We feel that available charts on freeze marking echo, in general, the observations we have made. We have under surveillance a bay, a sorrel, and a blanketed Appaloosa which have been freeze marked for four years and ten months. These three horses have a total of 468 freeze marks. These horses were marked with a one inch, face to back, copper iron which is 1/8" in thickness and has a rounded contact face 1" in diameter. Both dry ice with 95% alcohol and liquid nitrogen were used as refrigerants. All horses were clipped with an Oster 40 or a Sunbeam EA1 SUR blade (very close clip) and scrubbed briskly with a stainless steel sponge before application of the marking iron. A pressure of at least 30 pounds was used to apply the marks.

Of the 468 marks, 1/2 were made with the iron chilled in dry ice/alcohol and 1/2 were made with an iron chilled in liquid nitrogen. Timing increments of 5, 10, 15, 20, 25, 30 seconds were all tested. We could read all marks on all animals from 10 to 30 seconds application time. We failed to read eight of the 132 CO_2 marks made with 5 second application time. We failed to read 2 of 132 marks made at 5 seconds with liquid nitrogen. Neck brands were easier to bald than ribs. Ribs were easier to bald than the rump.

Anatomically, the animals were more easily branded ventrally. Poorer results occurred in the area behind the ribs because the irons sank into the abdominal wall and it was difficult to push hard enough to cause blood flow cessation at the site. Smooth, well-muscled sites were more easily marked. Figures 6 and 7 is one of the horses on this experiment which should be adequate to represent the results of this experiment in general.

The inset in Figure 6 depicts G-30 and H-30 on the horse's left side. G-30 (dry ice/alcohol was evaluated as 90% white and 5% bald). H-30 (liquid nitrogen) was evaluated as 30% white and 70% bald.

It is interesting to observe the obvious difference in the 5 second contact time when starting at the bottom on the left side of the horse and starting from the top on the right side of the same horse. Examine the close-up of the 30 second brands four years and ten months after branding. It is apparent that the bald portion has not grown new hair. They are both bald in the center and white at the edges, just as they were four years and ten months ago.

The oldest freeze mark on a horse, that I know of, is now seven years old and is still bald in the center and white at the edges.

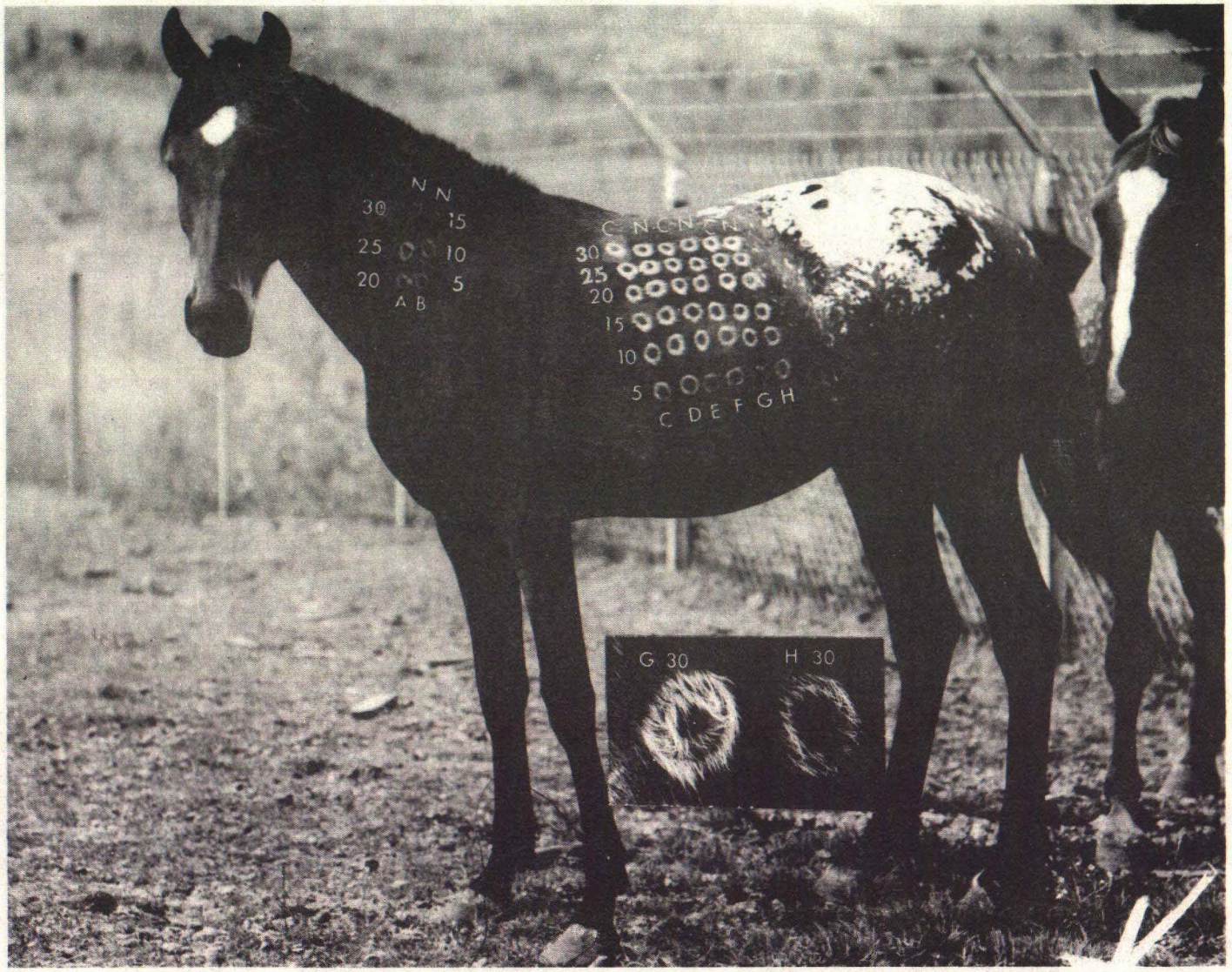


FIGURE 6. Freeze Marked Horse--Left Side With Inset: N denotes that the iron was chilled in liquid nitrogen, C that the iron was chilled in dry ice/alcohol. Alphabetical symbols identify the row and the numbers denote seconds of application. The inset is a close-up of the marks described 4 years and 10 months later.

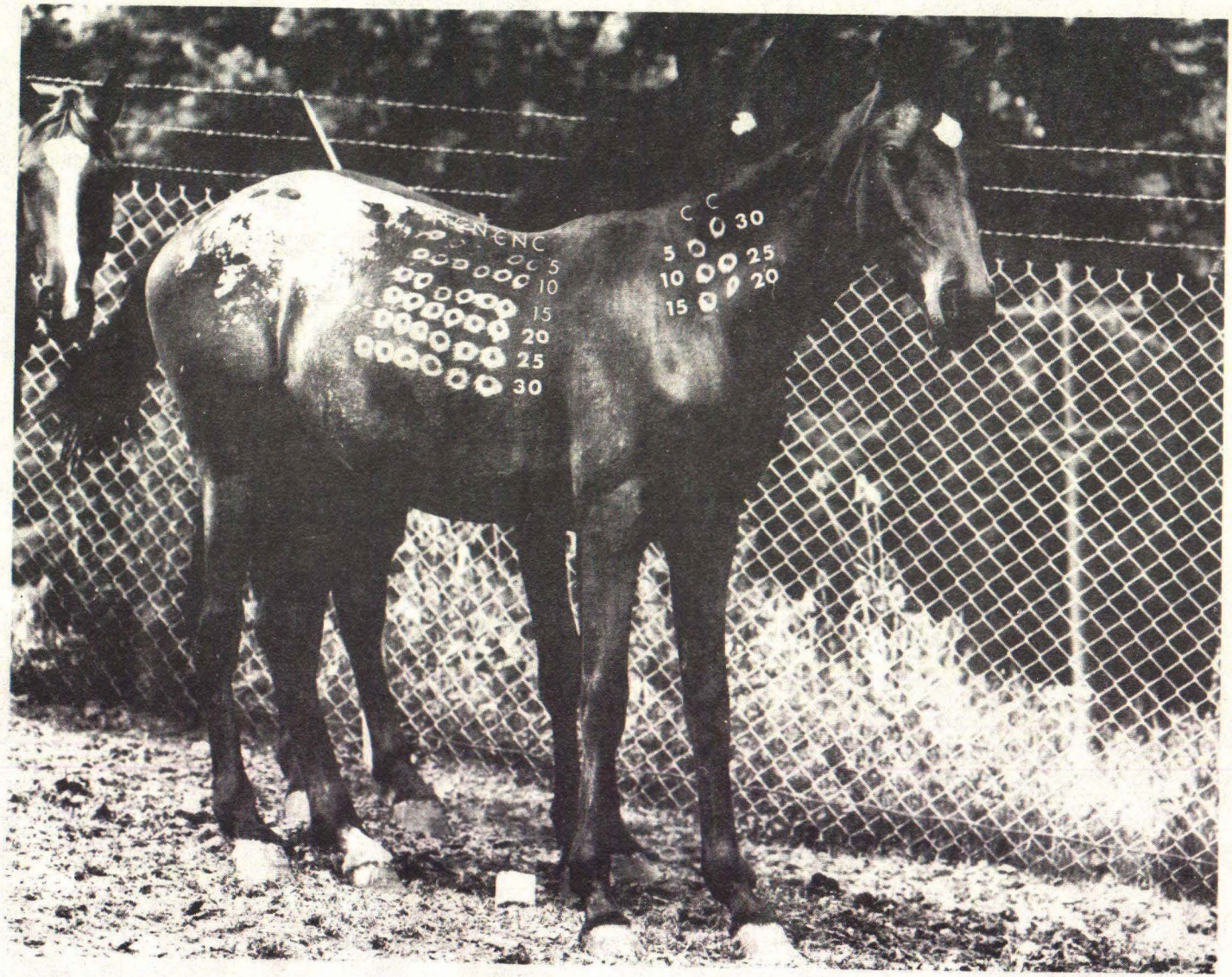


FIGURE 7. Freeze Marked Horse--Right Side

Tattoos

Recommendations on tattoo techniques have been requested. At the present time, we have devices that will accomplish the introduction of tattoo ink in 0.26 seconds in the form of the symbols previously described. Our major concentration of effort has been to develope techniques to prevent transmission of disease by the tattoo method, to make an instant mark that is painless, and to design a device in which all symbols are applied simultaneously. We have been successful in developing techniques that are more simplified than those presently utilized. However, we lack data on very young foals and on growth distortion patterns. Our present feeling is that more study is needed on tattoos. Tattoos fade badly on young animals and there is a strong indication that some of the fading observed follows a familial pattern. In general, we are not prepared to make definitive recommendations for utilization of simultaneously placed tattoos. Although, our studies using the Angle System on other animals show greater clarity than Arabic symbols on fading tattoos. Further, the freeze marks are working on the younger animals.

Laser Marks

Laser marks are receiving a great deal of attention at the present time. Any recommendations on laser marks would be premature at this time. We do have evidence that warm blooded animals will retain the marks permanently. We have not been able to produce bald marks consistently without producing a lesion similar to a firebrand. The technique could be adapted to the program under question. However, at the present time, economics would exclude it as a reasonable approach to problems in the field. We are continuing studies on other animals in which the laser mark is economically feasible. Its use for marking horses in the field will be dependent upon major changes in the cost of the basic equipment to be used by the operator.

In general it would appear that the time is ripe to recommend systems for horse identification. The need is great.

Freeze marking is being used extensively on horses in other countries--most notable, New Zealand, which has an official program for Standardbreds. Sweden has accepted freeze marks for Trotters and Australia has approval for its use on Standardbreds and Thoroughbreds.

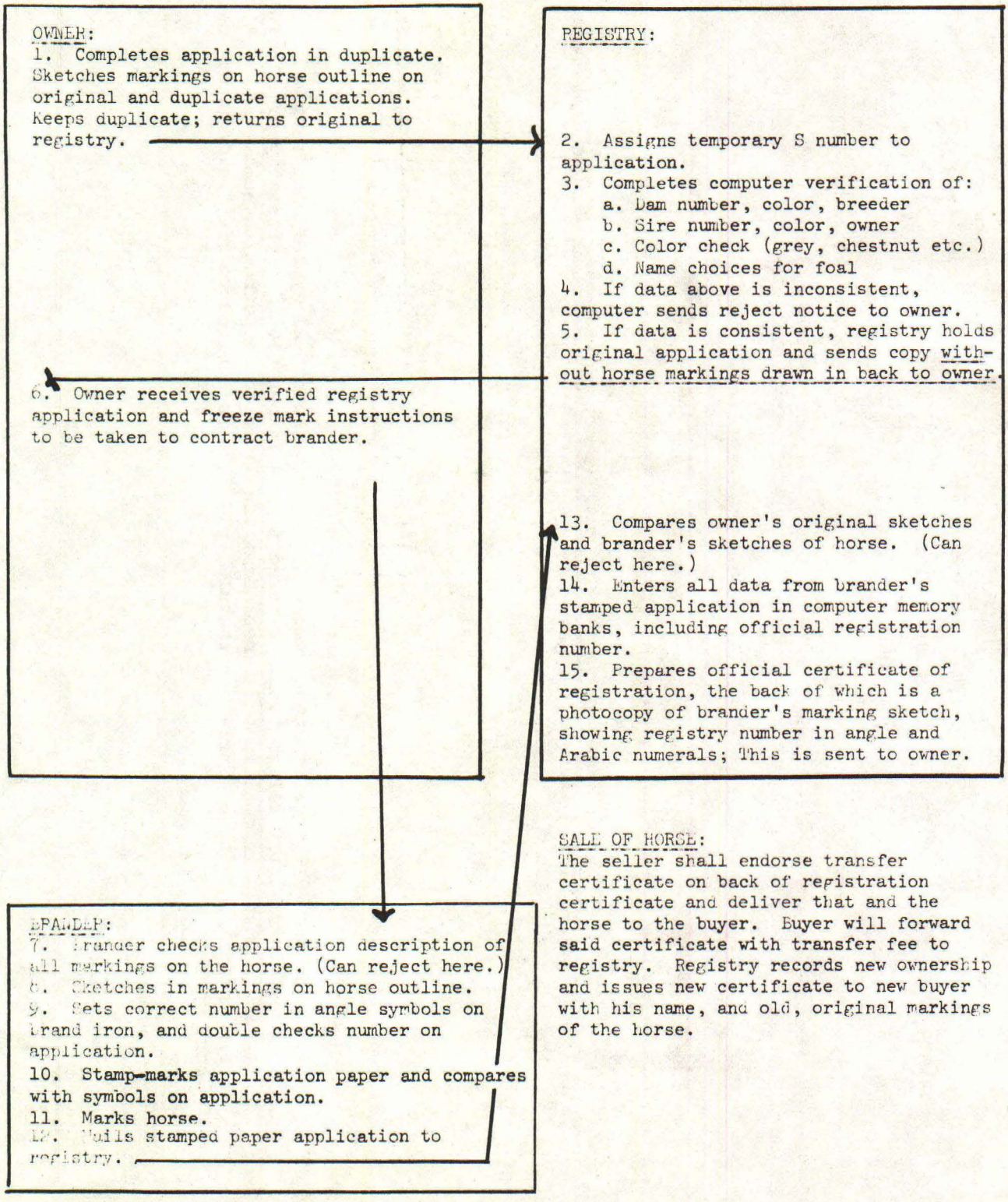
I envision the program to advance stepwise with acceptance by the Arabian group, then other horse registries, and then, hopefully, technicians serving these registries function in registering the block of horses not covered under existing specific breed registries.

A flow sheet on procedures is included as a general outline of registration (Figure 8). A completed mark is shown in Figure 9.

Figure 10 is a proposed form for future computer input utilizing a simplified binary program of identification to prevent fals numbering.

FIGURE 8.

HORSE REGISTRY PROCEDURES



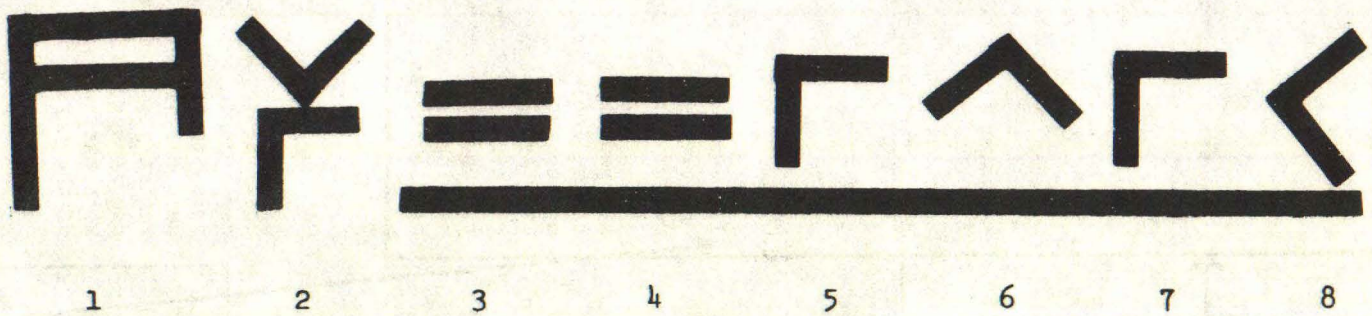


FIGURE 9. Arabian born 1972, registration number 002329. Alphabetical symbol in position 1 represents registry designation. Stacked angles in position 2 represent year of birth. Symbols in positions 3-8 represent the animal's registration number and are underlined with a single horizontal bar. Mark is applied to right side under the mane.

FIGURE 10.

ARABIAN HORSE STUD BOOK

S Number 575
Reg. No. Angle AAr=117V7
Reg. No. Arabic 201474

If turning grey, show grey instead of birth color
Color Guide—Bay has black mane, tail and legs; Chestnut does not

REGISTRATION APPLICATION

Please Use Typewriter or Print With Ink

Published by The Arabian Horse Registry of America, Inc. One Executive Park, 7801 E. Belleview Ave., Englewood, Colorado 80110

NAME

1st Choice																			
2nd Choice																			

(Mare or Stallion?)

Color _____ Sex _____ Date Foaled _____
one only

Sire of Foal _____ No. _____ Color _____ Dam of Foal _____ No. _____ Color _____

I hereby certify that the above pedigree and particulars are correct to the best of my knowledge and belief.

☐ Early Breeding

Date _____ Signature of recorded owner of Dam at time of foaling _____ Address _____

BREEDER'S CERTIFICATE

I hereby certify that I owned a mare named _____ No. _____ of the above mentioned pedigree and particulars and bred her by natural service to the stallion mentioned as the sire of the animal for which registration is now requested.

Date _____ Signature of recorded owner of Dam at time of service _____ Address _____

SERVICE CERTIFICATE

I hereby certify that my stallion named _____ No. _____ was bred by natural service to a mare named _____

No. _____ on the _____ day of _____, 19____.

Date _____ Signature of recorded owner of Sire at time of service _____ Address _____

DESCRIPTION: Body Color: __Bay __Black __Chestnut __Grey

Mane/Tail: __Black __Brown __White __Combination (Specify: _____)

Head: __Star __Mixed Star __Snip __Stripe __Bald

	White Coronet	White Half Pastern	White Pastern	White Ankle	White Half Cannon	White Full Cannon	White Heel	Black Legs
Right Fore Leg								
Left Fore Leg								
Right Hind Leg								
Left Hind Leg								

Body Markings: __tattoo (Specify symbol and location _____)
__brand (Specify symbol and location _____)
__other (Specify symbol and location _____)

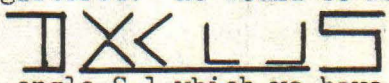
THIS DESCRIPTION MUST MATCH SKETCH OF HORSE"S MARKINGS APPLIED TO OUTLINE ON REVERSE SIDE.

Individual identification is of utmost importance in disease control. There have already been proposals to freeze mark "EIA", a mark of stigma, on reactors without first assuring individualization of the animal. We are opposed to applying any such mark of stigma without prior official, positive identification of the animal. This official identification can then be used in all disease programs.

This project financed in part by the Appaloosa Horse Club, Inc., Moscow, Idaho.

Addendum

In a meeting on December 10, 1972, Dr. Gustaf Björck and Dr. Keith Farrell agreed to recommend to the International Animal Identification Association, and related international groups, the following two changes in Dr. Farrell's original proposal for an international animal identification system. (1) That the alphabetical symbol indicating the year of birth be replaced by two angle symbols, one above the other, to represent the last two digits of the year of the foal's birth. This change was suggested by the Arabian Horse Registry. (2) A second change was recommended to accommodate registries marking fewer numbers of horses, and to add a symbol which we felt was essential for breeds without a world-wide registry.

To explain these changes, let's assume a breed that registers less than 1,000 horses a year and obviously wants to use fewer numbers than six. The registry can do so simply by adding an alpha-angle alphabetical symbol for the country as the final symbol. The breed has been assigned the symbol, alpha angle A-2. The horse was born in Sweden in 1973, and is the 986th horse to be registered. He would be marked on the right side of the neck with the mark 

The alpha angle S-1 which we have assigned to Sweden would block the fraudulent addition of extra numbers and also establishes the fact that the horse is registered in Sweden. This additional symbol eliminates the necessity of having to number the horse 000986 and gives the registry more latitude.

The importance of a uniform, international symbol system cannot be over emphasized. A haphazard approach to establish symbols, even of an unalterable nature, would end in chaos within official registries. We feel that permanent marks adaptable to rapid data retrieval, unalterable, and capable of early application on the foal are of prime consideration.

*Bibliography for Björck, Farrell, Hooven, Bell and Padgett are combined at the end of the proceedings.

Mr. Franks: Will freeze brands change?

Mr. Hooven: Yes, the brands will change in size if they are applied to a young animal. We have applied them all the way down to a day of age, using a two inch iron, for example, on a day old calf and by the time that animal was a yearling that brand will be nearly four inches in size. Now, we have also found that if it is applied on the rump area, the difference in size is not nearly as pronounced, as if you applied it on the rib cage. But, there is a very definite increase in size and I would have to agree with Dr. Björck in his remarks concerning the magnitude of this change.

Dr. Farrell: I wanted to add one thing here. A horse's neck does not grow that much at all. Dr. Björck says about a 25% increase in size on the neck. In the cow, in the middle of the side, sometimes we have about a four-fold increase, and you put a four inch mark on a few day old calf and it will cover the side of the cow when it grows up.

Mr. Hooven: This is why in our recommendations for cattle, birth to six months, we recommend a two inch iron, six to twelve months, a three inch iron, anything over 12 months of age you can go to a four inch. Now, of course, this is up to the individual that is applying the mark, but the larger the mark, the further you can read it.

Mr. Franks: In the horse people of the breed I represent, there is considerable resistance to the freeze brand.

Dr. Farrell: This is an interesting problem. We saw this same resistance in New Zealand when freeze marking was first proposed. I had a chap in New Zealand that was sure that he was not going to have one of those marks put on his horses, so I chose him to write to a year later to see what his feelings were, and he informed me at this time that it was his idea in the first place to start freeze marking in New Zealand. I think that once it starts that it is less objectionable. That is one of the reasons I chose the Arabian Horse Registry. Because, the Arabian Horse Registry is filled with nice little ladies that don't like disfigurement. If we can sell the idea to the Arabian Registry, I think we ought to be able to sell it anyplace.

Mr. Hooven: I'd also like to make a comment in respect to registered dairy cattle which I'm very familiar with. We had the same objections from breeders of purebred cattle. However, if you have been to many cattle shows recently, you will find that there are a few of them beginning to creep in. In our area on the East coast there is a considerable number of cattle now that are being shown with freeze marks. And, I think that it is just a matter of time until people begin to accept this and it really all boils down to what they want to do with this mark.

Mr. Drayton: In the distinction between clipped and unclipped, which did you say was better?

Mr. Hooven: I didn't.

Dr. Farrell: I'll answer that. The horse differs a great deal from the cow on this clipping and unclipping before you freeze mark. The variables that you bring into an unclipped program in the horse are very much greater.

than you see in the cow. The program in New Zealand, in fact, they even shave it with a razor to get as close as they can. We've noticed up to ten seconds contact difference by just having the clipper out of adjustment on a small Shetland, which has a real dense undercoat. The horse has a real dense undercoat. In the winter time it is fantastic, so this unclipped bit is really not to be recommended at the present state of the art as far as horses are concerned, I'm sure. In answer to another question, there is about three million Holstein cattle freeze marked in England. It has now been accepted very well in England, and freeze marking is very common in England on cattle.

Dr. Johnson: I don't want any of you to ask Dr. Farrell tonight about branding elk. Please don't ask him that.

Mr. Price: Do you prefer dry ice or do you prefer liquid nitrogen?

Mr. Hooven: I think, at the present time, in terms of what we know about freeze marking and what we know about the ability of people to do this job, it would be my recommendation that the dry ice/alcohol procedure should be the one that is adopted. We still need to find out a lot more about liquid nitrogen. You must remember that the temperature differential between dry ice/alcohol and liquid nitrogen is about a 200° difference, and its not difficult to make a very serious mistake with liquid nitrogen--we still need quite a lot more work. So, it is my recommendation, at least for the present time, that the dry ice/alcohol procedure be used, and that the clipping approach be followed. However, as far as dairy cattle are concerned, with the repeatability that we are getting on the unclipped approach using liquid nitrogen, we are fast approaching, I think, the time when we will be able to make a recommendation in cattle, using liquid nitrogen on an unclipped basis. I'm not prepared to say that as far as horses are concerned, because we just have not done that much with it.

Dr. Farrell: I think as we are going to be having a freeze mark demonstration tomorrow, there will be a chance to get to a lot of your questions and the witching hour is almost an hour away.

Dr. Johnson: Quite a number of you folks have asked some questions about some of the material Henrie Majeau presented, and I'm going to give him a few minutes to clarify one point that he had a lot of questions on this morning.

Mr. Majeau: You can call me Magoo, if its less offensive. The question was concerning the easy removal and replacement by another capsule. I wasn't trying to picture it in the sense that what we are doing with this device is fullproof or anything like that. Maybe it is my own fault that the emphasis was placed on the removal and replacement, but that is possible with the present design that we are looking at. The approach and application of the device is not intended to be used as a fullproof, tamper-proof type of application when we are talking about the horse identification. That doesn't mean it can't, but for the $2.00 that we are trying to do the job with, its a mass produce item that will be available by registration too. It is not going to be sold to everybody that wants to buy it. I presume that again some controls will be placed on who has these devices and what number is

registered to a particular area or particular person. Again, the year, I did not go into the detail, but the ten digits were to provide the following identification. The first digit was to be used for year of implant, the next two digits were to identify the state of origin, and then the next seven digits were to identify the animal itself. There is a tremendously large number that you can have. You can have ten million numbers per state per year. If you changed the capsule from one animal to another animal, you have to match several things on that animal in order to make it the same. I don't know whether this confuses more than answers, but if there are anymore questions about that, I will take a couple of seconds.

GENETIC MARKERS IN THE BLOOD OF HORSES

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In 1958 the author was approached by representatives of several equine registry organizations in U.S. concerning the possibility of developing blood typing tests which might be used to solve problems of questionable parentage arising in the breeding of horses and to check the veracity of equine registrations. At that time very little was actually known about genetic markers in horse blood and no one had yet applied equine blood typing in parentage analysis. Our experience in the development and application of cattle blood typing tests led us to believe that it would be possible to develop effective equine blood typing tests but we knew that the approach then in vogue, namely, reliance on naturally occurring isoagglutinins as the chief or only source of equine blood typing antibodies would not be satisfactory.

The Red Cell Antigenic Markers

Therefore, we sought to develop a supply of blood typing antibodies from two sources: 1) isoimmune antisera produced in individual horses by injecting them with red blood cells from other horses and 2) antisera produced in rabbits by injecting them with red blood cells from individual horses. Moreover, we decided to employ hemolytic blood typing procedures along with the more conventional agglutination procedures in screening the antisera for blood typing antibodies. The latter decision was particularly fortunate because, as it turned out, the majority of the blood typing antibodies acted much more effectively as hemolysins than as agglutinins.

Now, to make a long story short, we were able to develop some 16 specifically different antibody reagents (anti-A_1, anti-A_2, anti-C, anti-D,...etc.) and to show that the 16 corresponding antigenic determinants (A_1, A_2, C, D,...etc.) on the red cells belong to 8 independent genetic systems of blood groups (Stormont, Suzuki and Rhode, 1964; Stormont and Suzuki, 1964). The blood group systems so defined were named A, C, D, K, P, Q, T and U, some with two or more antigenic markers as the A, D, P and Q systems and others (C, K, T and U) with only a single marker, as shown in Table 1. Thus, eight possible blood types were distinguished in each of the systems A and Q, four in each of the systems D and P, but only two in each of the systems C, K, T and U. The number of theoretically possible blood types definable with the use of those 16 blood typing reagents is 16,384, which is simply the product of the number of blood types definable in each of the eight independent genetic systems.

Although that number (16,384) of possible equine blood types was then unprecedented, we were able to show (Stormont, Suzuki and Rendel 1965; Stormont and Suzuki, 1965) that those tests alone would not be capable of excluding the incorrect stallion in more than 50% of the paternity cases involving two stallions (the true sire and one other stallion).

Our goal was the development of blood typing tests which would be able to exclude the incorrect stallion in at least 70% of the paternity cases arising in the breeding of horses. Accordingly, and during the course of our studies on the elucidation of the red cell antigenic markers, we sought to discover electrophoretic variants in serum or plasma proteins by means of the technique of starch-gel electrophoresis which was introduced by O. Smithies in 1955.

The Electrophoretic Markers

This was a fortunate decision. We were soon rewarded by the detection of multiple forms of serum albumin and serum transferrin (a beta globulin which binds and transports free iron). Two electrophoretic forms of albumin were brought to light (Stormont and Suzuki, 1963). The faster migrating component was named Alb A and the slower Alb B, and these were observed in three types A (the A zone alone), B (the B zone alone) and AB (both zones present). The two electrophoretic forms of equine serum albumin were shown to be controlled by a single pair of codominant allelic genes, an ideal situation from the standpoint of utilizing such tests in parentage analysis.

Six electrophoretic forms of equine serum transferrin, each being controlled by one of a series of codominant alleles, were described (Braend and Stormont, 1964). These six electrophoretic forms of equine serum transferrin were named TfD, TfF, TfH, TfM, TfO and TfR in decreasing rate of electrophoretic migration. With six codominant alleles 21 types are theoretically possible (DD, FF, HH, MM, OO, RR, DF, DH, DM, DO, DR, FH, FM, FO, FR, HM, HO, HR, MO, MR and OR) and all 21 types were subsequently encountered (Stormont, Suzuki and Rendel 1965; Stormont and Suzuki 1965).

Thus, with the use of the electrophoretic tests in conjunction with the serological tests it would be theoretically possible to define 1,032,192 blood types in horses. This figure is simply the product of the 16,384 red cell antigenic types, the 3 albumin types and the 21 transferrin types. But our main interest then was the efficacy of the combined serological and electrophoretic tests in solving problems of questionable parentage rather than using these genetic markers as a means of identification. Utilizing information on the gene frequencies of the red cell antigenic markers, the albumin markers and the transferrin markers we were able to show that these tests should be able to solve at least 70% of all paternity cases involving two stallions (Stormont, Suzuki and Rendel, 1965; Stormont and Suzuki, 1965). Thus, our primary objective had been consumated.

Naturally, news of those developments attracted the interests of blood group workers in other animal blood typing laboratories throughout the World. Today, investigators in at least 12 different laboratories (mainly those in European countries) are actively engaged in studies of equine blood groups. As a result, much progress has been made and will continue to be made. Most of the attention has been devoted to the elucidation of additional genetic systems of electrophoretic markers. These include a system of serum esterases (Gahne, 1966; Scott, 1972), a system of serum prealbumins (Gahne, 1966; Braend, 1970), a system of serum postalbumins (Suzuki and Stormont, 1968), a system of red cell carbonic anhydrases (Sandberg, 1970; Suzuki and Stormont, 1968), a system of red cell phosphogluconate dehydrogenases (Sandberg and Bengtsson, 1972) and a

system of red cell catalases (Kelly, Stormont and Suzuki, 1971), as summarized in Table 2. Moreover, each of these systems is potentially capable of further expansion on the discovery of additional alleles, as, for example, Gahne's observation (1966) that TfF is divisible into two forms TfF_1 and TfF_2.

An Estimate of the Number of Possible Equine Blood Types

New blood typing reagents have also been developed since the time of our 1964 report (Stormont, Suzuki and Rhode) but these will not be considered here in arriving at the theoretically possible number of blood types in horses simply because the job of classifying the more recently detected antigenic determinants with respect to blood group systems has not been completed.

Nevertheless, when we consider only the 16 classified isoantigenic markers (Table 1) and the electrophoretic markers (Table 2) we arrive at an estimate of some 125 billion possible blood types in horses. However, one must keep in mind that the occurrence of each of those possible types is not equally likely. On the contrary, many have an extremely remote probability of occurrence. Nevertheless, it is most unlikely in blood typing say 1,000 or 2,000 horses that any two horses would have identical blood types.

Advantages Over Fingerprinting

Thus, a blood type record of identification on horses can serve in lieu of fingerprinting but has many advantages over fingerprinting when it comes to considering other ways in which blood type information can be used. Foremost among the additional applications would be the use of the blood type information in solving problems of questionable parentage and checking the veracity of registrations. Another important use of such information would be planning matings so as to avoid hemolytic disease (neonatal isoerythrolysis) of newborn foals. Thus, a mare with a history of one or more such foals could be selectively mated to a stallion lacking the critical isoantigenic determinants. Embryo transplantation is perhaps a thought in the somewhat distant future insofar as it might pertain to horses. Nevertheless, it is likely to come, and when it does blood typing information can be used to assure that the resulting foals were derived from transplanted eggs rather than from eggs that might have come from the "host" mares.

Disadvantages of the Blood Typing Tests

The chief disadvantage of blood typing is that the tests are tedious and somewhat costly to perform especially in view of the highly trained personnel involved in this work. Moreover, the performance of the serological tests requires years of work in banking an adequate supply of blood typing antibodies. At the moment, my laboratory is in good position with respect to the present volume of equine blood typing but our supplies of blood typing antibodies could become dangerously low should we embark upon a much more extensive program of equine service typing work.

Relevance of Blood Typing to other Marking Methods

In closing this account I want to point out that blood typing is no substitute for the physical means of identification such as freeze marking, tattooing and fire branding being discussed during the course of this seminar. On the other

hand it is a useful adjunct to those methods and can always serve as a follow-up method in the event that the physical marks are removed or altered. In view of the fact that the blood types cannot be altered there is perhaps no surer way of identifying the ringers including those masquerading with erroneous registration certificates.

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TABLE 1

The Eight Recognized Genetic Systems of Red Cell Isoantigenic Markers in Horses (1964 data, Stormont and Suzuki)

Genetic systems	Isoantigenic markers	Minimum no. of allelic genes	Number of recognized blood types*
A	A_1, A_2, A′ & H	5	8
C	C	2	2
D	D & J	3	4
K	K	2	2
P	P_1, P_2 & P′	3	4
Q	Q, R & S	6	8
T	T	2	2
U	U	2	2

* The number of possible blood types when considering all 8 systems of red cell isoantigenic markers is simply the product of the figures in the last column, which is 16,384.

TABLE 2

The Eight Recognized Genetic Systems of Electrophoretic Markers in the Blood of Horses

Genetic systems*	Electrophoretic markers	Minimum no. of alleles	Number of possible blood types**
Alb	A & B	2	3
Tf	D, F_1, F_2, H, M, O, & R	7	28
Es	F_1, F_2, I & S	4	10
Pr	1, 2, 3, 4, 5, 6, 7	7	28
Pa	F & S	2	3
CA	F, M & S	3	6
CAT	F & S	2	3
6-PGD	D, F & S	3	6

* Decode: Alb = serum albumin; Tf = serum transferrin; Es = serum esterase; Pr = serum prealbumins; Pa = serum postalbumins; CA = red cell carbonic anhydrase; CAT = red cell catalase and 6-PGD = 6-phosphogluconate dehydrogenase.

** The number of possible blood types when considering all 8 systems of electrophoretic markers is simply the product of the figures in the last column, which is 7,620,480. Now, when considering the combined figures represented in Tables 1 & 2, the number of theoretically possible blood types in horses is 16,384 x 7,620,480 = $1.248539443 \times 10^{11}$ which is approximately 125 billion. This is a gross underestimate when we take into consideration the fact that none of the more recently recognized isoantigenic markers were used in deriving this estimate.

Dr. Baldwin: How long can you store blood and still make these distinctions?

Dr. Stormont: We can store it a long time, but it is costly. You can take whole blood and glycerate it and take it down to very low temperatures and keep it in the freezer indefinitely. Then, thaw it out slowly and recover red cells for these blood typing tests I told you about. When you take the serum off, which is very easy to do, you can just freeze the serum and keep it indefinately, thaw and run it on starch gel electrophoresis, albumen type, transferrin type, etc. But, the main problem is the storage of red cells and a lot of these tests are done on red cells. This problem came up recently in a case where a calf had been tossed in a freezer in Rapid City, South Dakota and kept there a year and a half. A lawsuit was pending between the United States government and a rancher who claimed that one of the bison bulls had gotten out of a National park and had bred one of his Hereford cows to produce this so-called cattle-o, which is a cattle-bison cross. I was approached in this thing two or three months ago by the United States attorney. Could we do anything with that carcass? I said that if you can get some blood, frozen blood, out of the heart and keep it frozen intransit, we will see what we can do. We were able to use this very ancient blood, not properly frozen, of course, not glycerated or anything, put it in solution and do the electrophoretic tests for the red cell enzymes, like carbonic anhydrase. We had previously done studies on these enzymes in buffalo blood, and the ones we found in this calf were 100% domestic. They had nothing to do with buffalo and I think that solved the case.

Dr. Baldwin: What other species, like buffalo, have you looked at?

Dr. Stormont: A variety of species, the antelope family and wild species of sheep and goats, but not nearly as extensively as the American buffalo. That is the one we studied. I try to keep up-to-date on the buffalo, I'm very interested in it by virtue of the fact that it will hybridize with cattle. I'd like to know something more about evalutionary history.

Dr. Farrell: There is a great amount of activity in automating biochemical techniques, etc. What do you see in the future as far as being able to automate this program to get the cost down to a point where we can use this as a practical method of identifying individual foals on the farm?

Dr. Stormont: That very question has been tossed around a lot the past year, especially as it relates to cattle blood typing. There are machines that have been developed. There is one in the Netherlands which I saw in the 1950's. It was developed primarily by Dr. Yakabo, a Dutch veterinarian, and it is an elaborate pipeting machine which can do most of these blood typing operations. It requires one full-time technician just to keep the machine going and they take photographs of the blood typing results and then read the tests from those photographs. But, I noticed that when I was there--I spent three days in his laboratory--that there are usually three or four technicians right there at that machine most of the time while it is running. I do almost as much blood typing with two technicians and no machine. I thought maybe we would be interested in the machine if we ever got our volume of cattle blood typing up to 10,000 or 15,000 a year, but as long as it stays 5,000 or less, I can do more with two girls in mini skirts!

Dr. Farrell: I'll bet you can!

Dr. Baldwin: How are you going to automate starch gel electrophoresis.

Dr. Stormont: This has been thought about. The United States Atomic Energy Commission, Oak Ridge, Tennessee has a man thinking about it now, but I haven't heard anything of it yet, on automating starch gel.

Mr. Hayes: What is the time element from the time you receive the blood until you can get an answer back and what is the cost involved?

Dr. Stormont: We are really slow. In about three weeks after the time you submitted the blood samples, we should have a reply in the mail to you. With cattle blood typing tests, we run 40 blood samples per day in the routine and hemotytic typing tests, but we can only run tests three days per week, say Monday, Wednesday, and Friday. Tuesday and Thursday are priming up to get ready for the next set of tests and cleaning up the mess we have left before. So it is a rather slow program. Once in awhile we get overwhelmed with blood samples and then we have our slow periods, where not too many are coming in, but we average about three weeks. With horses it is even longer than that. There are eight electrophoretic systems alone, and each one requires a slightly different technique so we have to pour eight different starch gels for each of those systems to get all the red cell antigens we test for. My technician will try to run through ten horses in a group in one week. If she can do ten in one week and get them pretty well covered, that's pretty good. It takes a lot of work. Most cattle blood typing is done under contract with the purebred dairy cattle associations, which in turn subcontracts a lot of the beef organizations. They are getting their blood typing, presently, for around $18.50 for the first 2,700 blood samples, and if they go over that quota, its $16.00 a sample. For the horse blood typing, most is now being done for four registry organizations, the Arabian Horse Club, the Quarter Horse Association, the Jockey Club and the United States Trotting Association, and each one of those organizations gives us what amounts to a grant-in-aid of $2,000 a year which allows them to process up to 20 parentage cases. A case is defined as one foal and usually its known mother plus as many stallions as might be involved in the case, usually two. So that is the definition of the case and that works out at $100 a case. So, that's the cost.

Mr. Drayton: How much sample do you need to do this test and does it have to be frozen in transit, assuming you are talking about horses?

Dr. Stormont: We usually send out the tubes for this. We send the vacutainer tubes which draw about ten milliliters per tube. We send one dry tube, the red-stoppered one, that will be used for the serum sample. The blood will clot in that tube and we collect the serum and do the electrophoretic test on the serum, and there are lots of those tests. Then the other ten milliliter tube, a purple-stoppered one, contains E.D.T.A. as the anticoagulent. The red cells from the purple-stoppered tube are used in the ordinary blood typing test, and as a source of carbonic anhydrase and catalase for the electrophoretic, etc. They must not be frozen in transit or at any time. If they are frozen this is going to lyse the red cells and hemoglobin discolors everything and we cannot use it.

Dr. Vail: When you return the vacuum tube, do you prefer that the serum sample were spun down to the serum only?

Dr. Stormont: No, its just as easy for you to collect that in the vacutainer vial and send it through like that. Usually by the time it reaches the lab the clot is well contracted and we merely centrifuge it down and take the serum off. Incidently, another reason we want you to do that, is sometimes something has happened to the blood that comes in the purple-stoppered tube with the anticoagulant, so we can still have resort to the red cells off the clot. We do get a few that way.

Mr. Drayton: I presume that with all this gear involved in testing, there is no way that this stuff is going to be portable at any time.

Dr. Stormont: One could design a portable lab and take it to the field. I've thought of this in connection with going over to Africa and getting antelope blood, etc., on safari. You would need some source of power for refrigeration, but this could be done. But, the most important thing is refrigeration and a little bench space. Also, you need direct current for your electrophoresis. You would need some kind of AD-DC converter.

FREEZE BRANDING OF STANDARD BRED HORSES

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In October of 1970 the New Zealand Trotting Conference commenced freeze branding standard bred mares and foals to establish a National identification register. By mid-November some problems in the application of the technique became apparent and trial work was undertaken to identify causes and provide guide lines for an improved rate of success.

This work studied length of application time, length of hair on the brand site, two alcohol swabbing materials, variation in freeze and thaw techniques[1] and the effect of continuous application of the branding equipment.

A brown standard bred gelding was provided by the N.Z. Trotting Conference. Studies I, II and III were instated on 3rd December and Study IV on 8th December, 1970. All studies were evaluated at seven weeks and six weeks.

Materials and Method

The brander used was the insulated container type model, developed in New Zealand and made exclusively for the New Zealand Trotting Conference. The brander which is charged with crushed CO_2 and alcohol, is normally fitted with six interchangeable branding heads 3/4" square with a 1/4" curved branding face. Height of each brand is 3/4". The branding heads were constructed of gun metal.

Temperature tests were conducted on this equipment prior to the studies to establish temperature retention during a two hour period.

Thermocouples were slotted into the face of two symbols and the temperature charted using a potentiometer with an ice reference during a test brand on two cattle. It was found that the equipment attained a temperature of -62°C on the face of the branding head prior to use. On application a 20°C rise was registered (to -42°C) with some temperature recovery during the 30 second application. On removal from the animal the equipment recovered to -60°C in 60 seconds.

[1] R. K. Farrell Personal Communication

To test temperature retention over a period of 2 hours the equipment was loaded with crushed CO_2 and sufficient methylated spirits to provide a slurry. Six branding heads were attached and temperatures recorded at intervals. Copper, brass, phosphor bronze and gun metal branding heads were also tested. The equipment attained -60°C after a ten minute cooling period and gradually cooled further to -66°C during the two hour period. Branding heads were changed at intervals and cooling times noted. Marginal differences were noted between the branding heads of different metals with slightly cooler temperatures in the order of 1°C being attained by the copper and phosphor bronze heads. Speed of cooling following changing of heads showed that all metals attained -60°C within two minutes from +20°C with copper and phosphor bronze attaining -60°C a little sooner (5 secs.). The brander was not re-charged during test period and still retained some CO_2 at the termination of the trial. However it should be noted that this time trial was conducted in-doors and was free of wind effect as would be experienced in the field.

Study I

To examine the effect of freeze branding over a range of application times and length of clipping.

Two branders loaded with two branding heads, figures Z, V arranged in a vertical pair, were charged with crushed CO_2 and sufficient methylated spirits to create a slurry. The branders were used alternatively with application times ranging from 5 to 35 seconds.

Clipping Method

To compare the effect of different hair lengths on brand success rate, a site was shaved, close clipped and long clipped as follows:

a) The shaved site was liberally lathered and the hair removed by scraping with a bare new safety razor blade.

b) The short clip was obtained from a hand set of barber's hair clippers. There appeared to be little difference in length of hair cover between this clip and shaving.

c) The long clip was attained from a Sunbeam horse clipper which was representative of the conventional clippers being used by operators. Approximately 3/16" of hair was left after clipping and this presented a dense layer lying close to the skin, which required ample swabbing to attain saturation.

Each clipped area was swabbed with methylated spirits and branded simultaneously with the two symbols.

Good frozen impressions were achieved at 10 seconds on the shaved and short clip treatments, with freezing extending to adjacent skin as application time was extended beyond 25 seconds.

Figure I

Type of Clip	Time of Application in seconds						
	5	10	15	20	25	30	35
Shaved	Z	>	Z	>	Z	>	Z
	>	Z	>	Z	>	Z	>
Close Clip	Z	>	Z	>*	Z	>	Z
	>	Z	>	Z	>	Z	>
Long Clip	>	Z	>	Z	>	*Z	>
	Z	>	Z	>	Z	>	Z

* Denotes movement

On the long clip little impression resulted until application time reached 15 - 20 seconds and there was no freezing of surrounding skin areas at the 30 or 35 application.

Results

Legible and satisfactory brands were obtained within the application range of 10 to 35 seconds where shaving or close clipping had been used. The brand of greatest clarity appeared to be where application times of 20 - 25 seconds had been used. Some scab formation and loss of hair follicles was apparent on the shaved site at 25 seconds with increased but mild damage at 35 seconds on both short clip and shaved.

On the long clip the hair length appeared to buffer freezing and no satisfactory mark was achieved under 20 seconds application, and there appeared to be a limited response to increased application time.

Plate I

The response to the treatment outlined in Fig. I is shown in this photograph taken at eight weeks from treatment. The two top lines running parallel with the mane show response to shaving. Some white hair formation is visible in the five second application brand site on the extreme top left.

The middle two lines show response to close clipping with the first positive brand at 10 second application. Some hair discolouration occurred on the 5 second brand site, but no white growth developed. Brand time of best definition is the 25 second application.

The lower two lines on the long clip show no white hair development until the 20 second application. The 30 second brand site is blurred due to movement during application and has smudged the lower brand on the 35 second application. This treatment illustrates the importance of clipping on brand success.

Study II

Comparing methylated spirits 90% alcohol and ethanol 95% alcohol as a swabbing liquid.

Figure II

Swabbing Liquid	Time of Application in seconds		
	15	20	25
Methylated Spirits	>	Z	>
	Z	>	Z
Ethanol	Z	>	Z
	>	Z	>

A neck site was close clipped and liberally swabbed with the respective alcohol prior branding. It was found most convenient to squirt the alcohol from a soft plastic bottle onto the site. A range of application times of 15 to 25 seconds was used.

Results

Satisfactory brands were achieved with both swabs at all three applications. Greater definition was achieved on the area where ethanol was used but this is not due to the swabbing material. It is noted in Plate II that the second line of brands (methylated spirits 15 - 25 secs.) has given a poorer definition than either lines 1, 3 or 4 and follows the soft neck line between two neck muscles. This feature is also noted in Study III and I am of the opinion that the variation observed in Study II is due to variation of pressure and lack of firm muscle backing, and is not related to different swab liquids.

Study III

To examine the effect of repeated use of the brander with and without a temperature recovery period. Site - Upper neck.

Figure III

Recovery Period between Brands	Time of Application in seconds		
	30	30	*30
Nil	>	>	>
	Z	Z	Z
60 seconds	Z	Z	Z
	>	>	>

Close clip, ethanol swab
* Denotes movement

The area was close clipped and swabbed with ethanol. (95%). There appeared to be a temperature loss particularly on the third application where no recovery period was permitted. A frozen impression was achieved but was less extensive than the first and second applications. There appeared to be no fall off in freezing action when the 60 second recovery period was permitted. The branders were loaded as for the previous studies and had been operating for approximately one hour.

Results

Satisfactory brands were achieved in lines 1 and 2 where no recovery period was given, though some loss of definition is apparent on the third application. Line 2 of this study is poorer than either lines 1, 3 and 4 and follows a soft area between two neck muscles, similar to line 2 in Study II.

When recovery period of 60 seconds was permitted, all applications resulted in brands of good definition.

Plate II

Study II is shown on the left of this photograph, with Study III on the right. The site was close clipped, and adequate definition has been attained at 15 second application in Study II. Lack of muscle backing to provide adequate pressure is illustrated in line 2 of both studies.

Study IV

To examine the effect of slow and fast freezing and slow and fast thaw on white hair development and hair follicle loss. Site - Shoulder.

Figure IV

Clip	Freeze	Application	Control Thaw	Fast Thaw
Short	Fast	25	(V ((Z	Z Λ
Long	Slow	25	(V ((Z	Z Λ
Long	Slow	30	(V ((Z	Z Λ

To achieve fast and slow freezing, close and long clipping was used as for the previous studies. To induce a fast thaw, a towel soaked in warm water was placed on the brand site immediately after branding. Ethanol 99% was used for pre brand swabbing.

Results

An adequate but not good brand was achieved in the control thaw with close clipping and 25 second application. The fast thaw on close clipping showed little white hair and extensive hair loss. There appeared to be no skin damage.

The brands on the long clip were not of satisfactory definition on either control or fast thaw treatments. Some improvement could still be expected but at six weeks, there appeared to be no advantage from the slow freeze fast thaw technique.

This study confirms the findings of Study I by demonstrating unsatisfactory brands on a long clip. It does not demonstrate any advantage in a fast thaw. It is noted also that although the brand site is over a muscle area, the shoulder muscle is less firm than the neck muscle and there is a relationship of a lesser definition in the close clip area with the firmness of muscle backing.

Effect of Freeze Branding on Melanophores

At eight weeks a biopsy was made across a good mark resulting from a 25 second application. The skin section was then examined by the Department of Agriculture, Diagnostic Station, Lincoln, to determine the effect of freezing on the melanophores. It was found that the hair follicles in the frozen areas were devoid of pigmentary cells whilst those in the untreated area contained pigmented melanocytes. This is in line with previous work by A. C. Taylor (1949).

Plate III - A, B, C

Slide A shows a normal pigmented hair follicle. The melanocyte cells surrounding the hair bulb and papilla are apparent as a pattern of large dark cells.

Slides B and C show hair follicles taken from branded areas on which white hair development has taken place. Both slides show cross sections of the bulb and distal portion of a hair follicle. In slide B some pigmented melanophores remain both near the papilla and the base of the bulb. In slide C no pigmented melanophores remain, and it is evident that the freezing treatment has destroyed most of the pigment producing melanocyte cells in both slides.

A B C

NOTES ON THE PRACTICAL ASPECTS OF FREEZE BRANDING ON THE STANDARDBRED

These notes, based on the experience of the New Zealand Trotting Conference, are prepared to assist the deliberations of the conference on Equine Identification.

In 1969 a Committee set up by the New Zealand Trotting Conference decided to proceed with the system of freeze branding to positively identify all foals bred in the season 1970. At the same time all mares at the stud that year were to be similarly branded. The brander used was the insulated container type model, developed in New Zealand and made exclusively for the New Zealand Trotting Conference. The brander which is charged with crushed CO_2 and industrial grade methyl alcohol, is normally fitted with six interchangeable branding heads 3/4" square with a 1/4" curved branding face. Height of each brand is 3/4". The branding heads were constructed of gun metal.

The ITV system was used and this has proved satisfactory. The foals in 1970 are now racing as two-year-olds and it is fair to say that the results that were obtained are most satisfactory. With experience our techniques have improved and it is now possible to produce results which are uniformly effective and we believe superior to any method which we have studied.

Procedure

Because of the great convenience in handling, it is endeavoured to brand all foals on the farm where the mare is located for service. Unless a foal is exceptionally well grown, it is not branded before five weeks. By leading the mare into a race it is a simple matter for an assistant to capture the foal and adequately restrain it. This is done by the assistant positioning himself on the left side of the foal taking the butt of the tail over the foal's back with his right hand and then placing his left arm under the foal's neck and grasping its right ear. In this way the assistant's right arm keeps the head raised and he is able to tense the skin.

It has been our experience that in the overwhelming majority of horses the mane tends to fall to the right side. For this reason our brand is placed high up on the neck with the brand starting very close to the base of the mane. Great importance is attached to adequate site preparation. We have tried various clipping machines but for a number of reasons these have proved unsatisfactory. We now use a bare stainless steel safety razor blade. This is held between the thumb and the first three fingers with the back of the terminal phalanges acting as a guard. A swab of wet cotton dipped in hexachlorophine based surgical scrubbing preparation such as Phisohex or Steriskin is used to produce a thorough wetting and a good thick lather. The area to be branded is then carefully shaved. With practise it is possible to achieve a perfectly shaved area in a matter of seconds. The area so prepared is not only totally devoid of hair but completely clean and this is most necessary if a good brand is to be produced. The prepared site is flooded with industrial methyl alcohol. The operator takes hold of the mane with one hand and tenses the skin and with the other applies the brander with firm pressure taking care to see that the application is square to the skin over the face of all the symbols. It is advantageous to apply two or three slow rocking movements to ensure an even contact. Application time is not critical and we find that with a foal, 15 to 25 seconds produces an adequate result.

The procedure is exactly similar with an older horse except they require no restraint unless they are particularly sensitive. Where this is the case a simple nose twitch is adequate.

The important points to note are:

1. Thorough preparation to produce a clean and hairless site.
2. Flooding of the area with alcohol.
3. Firm even pressure for required time. Too long will produce a burn.
4. To allow adequate time for the symbols to chill if they have been changed - at least three minutes. It is necessary to have 60 seconds recovery time between each application.
5. It is particularly important that when the brander is not being used it be hung in a vertical position so that the partially filled container is in contact with the symbols. Obviously, if the brander is placed on its side some symbols will not be in contact with the slurry of CO_2, ice and alcohol and these symbols will not produce a brand.

Discussion:

Before the New Zealand Trotting Conference decided to use freeze branding they thoroughly investigated the alternatives which were available to them. These were:

1. Fire Branding

The rejection of this method was based on:

(a) Humane grounds. It was considered that the application of a red hot iron to produce a lasting scar was rather barbarous in this day.

(b) Because it would be impossible to control the use of branding irons, it was felt that a method involving fire branding would involve great difficulties in supervision.

(c) Unless a brand is used by thoroughly experienced personnel the result is usually illegible.

2. Lip Tattooing

Although the protagonists of lip tattooing seem to have no difficulty in reading the results of their own applications, we have been less successful and indeed have found it impossible on occasions to read lip tattoos on horses exported to New Zealand. This is particularly so if the tattoo is on a darkened surface. There seems no question that with time there is a definite migration of the carbon particles and although the tattoo is useful, we felt if possible we would like a better method. An obvious drawback and one which disqualified it absolutely was the fact that it had to be applied to mature animals.

3. Photographing of Chestnuts

Although this method would seem to have some application, we felt it was far too cumbersome to consider.

4. Freeze Branding

This method was chosen because:

(a) It is possible to brand the foal on the mare. This we consider to be of total importance and it is the only method we know of where a satisfactory result can be obtained while the foal still runs at the mare's side, and so can be definitely identified.

Any method that does not fulfill this criterion, we feel must be rejected in any identification system which seeks to be totally efficient.

It causes no pain and by limiting its use to a minimum number of operators, in our case five, we feel its application can be adequately policed. It has been suggested that a freeze brand can be easily changed. We have now had experience of branding about 15,000 horses and from this experience we would suggest that changing of brands would produce very considerable practical difficulties. Quite apart from these, one would wonder what the brands would be changed to as a very complete and meticulous description is taken of all horses at the time of branding.

Mr. Lilley: Dr. Farrell, do you think it would be appropriate if I gave a few words on the Australian system?

Dr. Farrell: I'd be delighted.

THE IDENTIFICATION OF RACE HORSES IN AUSTRALIA

by

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The first one that we have developed is the system of coding the natural markings and brands of horses so that we can identify any horse from its description. This is similar to the system used in New York with the chesnuts and all that sort of thing, but we do it manually.

First, I better mention the fact that the brands acts in Australia now permit freeze branding or firebranding and the rules of racing say that no horse can be registered for racing purposes unless it has been branded with a registered brand on the left shoulder and a number over the last figure of the year of foaling on the right shoulder. Say my mark brand was L, I'd put L on the left shoulder and if I had 3 foals bred in 1970, I'd have 1 over 0, 2 over 0, 3 over 0 on the right shoulder. So that there should be no 2 horses anywhere in Australia with the same combination of registered brands and numbers within the 10 year cycle. So the way I then proceed to code, I use a 9 figure code, the first 2 figures are the year of foaling, the next is the sex, 1 for a colt, 2 for a filly. In the filing cabinet drawers all the colts are on one side, all the fillys on the other. Then the color, 1 for chesnut, 2 for bay or brown, 3 for black, 4 for grey. I don't differentiate between bay and brown because I feel that the average layman cannot always tell the difference between bay and brown. (applause). The next one is the head markings, 0 for no white on the head, 1 for a few white hairs or a small star, 2 for an ordinary star, 3 for a large running star, 4 for a star and stripe and 5 for a blaze. Then go onto the legs, 0 for no white, 1 for coronet, 2 for pastern and fetlock and 3 if the white runs up the leg. Every horse that is registered, I put this stamp on their application and code it. It is then passed over to a girl who pulls out the card with that number on the top, and if there isn't one already, puts that number on the top of a card and then underneath lists the name of the horse and the brands. By that, we mean we can code the markings of any horse in Australia.

This has happened frequently. I have had stud masters telephone me from as far away as Townsville, Perth, all over Australia and say that overnight a float (a vehicle that carries animals) has left a mare in the yard; they've gone out in the morning and there is a strange mare in the yard.

The tape has come off her mane, they don't know the name of the mare, they don't know what stallion she's booked to, they don't know who owns the mare, and they will ring me and, providing they can give me an accurate description, I can pull the file and give them the name of the horse within 30 seconds, or so. In the case of a ringer, where they have altered the brands on the horse, it does take longer.

I had a case right up in Central Australia, at Alice Springs, where they had altered the brands. On the card there were 11 horses of that same basic description and by a process of elimination, I was able to find which of the 11 the ringer was actually. The system is quite simple, it takes me only a second or so to code each horse as I sign the certificate. It takes an 18-year-old girl a very short time, I suppose at the most 10 hours a week, to put results on the cards.

As an extension to this, we are not, I think, the only country in the world that identifies every brood mare every year. When the mare is served, the owner of the stallion is required to put in a stallion service certificate which not only names the mare served, and the nae of the stallion serving her, but also supplies a diagram with a full description of the color, white markings and brands of the mare actually served. This comes into my office and is compared with my records and we then say whether the mare served is actually the mare she is claimed to be. If it is proved that it is not the correct mare, we then go to this coding system and check to find out what mare the stallion actually served. We've found that there have been quite a number of cases where a float has taken perhaps half a dozen mares, there has been 1 dropped off at this stud, 2 or 3 more somewhere up the road. Somewhere along the line the wrong mare has been left at the wrong stud farm and we have been able to pick this up and correct it, as far as we know, on every occasion. We have actually only found 1 case that was proved to be deliberate substitution of 1 mare for another. The other cases appeared to have been accidental confusion, mainly as a result of float drivers unloading the wrong horse at the right place. It is a tremendous amount of work to do all of this, but we feel it is well worthwhile to insure that we do know for certain that the mare served by the particular stallion is actually the mare she is claimed to be. I think those two things are the only important aspects of identification that we have in Australia that have not been touched on here today.

(Space prohibits publishing the forms of registration and branding instructions used in Australia. They can be obtained by writing to Dr. Farrell requesting xerox copies).

Number of Breeders in Australia	5,632
" " Stallions eligible for the A.S.B. (Approx.)	900
" " Eligible Brood Mares	15,124
" " Non-Stud Book mares served by eligible stallions	3,674
" " Mares served by eligible stallions	18,798
Foals in 1971 season	6,867

72% of mares conceived of which 9% lost their foals through slipping.

1,694 mares (11%) of the mares served in the 1971 season were maiden mares.

Number of horses registered per year has increased from 5,491 in 1964/65 to 8,550 in 1971/72.

Number of horses racing has increased from 15,000 to 19,580.

There are 519 race clubs in Australia.

In 1971/72 the number of race meetings held was 1,761, an average of 34 per week.

Mr. Drayton: Tell me this (I've really enjoyed this), the alphabetical letters on your code system, what do they correspond to, like the "L" or the "ABC"?

Mr. Lilley: They are the registered firebrands listed with the Department of Agriculture. They are firebrands.

Mr. Price: What is your Thoroughbred population in Australia?

Mr. Lilley: We have about 15,000 stud book mares and we probably have about another 4,000 non-stud book mares which are used for breeding purposes.

Mr. Hayes: Are your firebrands registered on an Australian basis, rather than say our state basis?

Mr. Lilley: Unfortunately, on the state basis.

Mr. Hayes: Is there any duplication then?

Mr. Lilley: This means there could be duplication, yes. But, as far as possible, the Blood Horse Breeders' Association has some influence on their members' decision that these brands are not duplicated among professional horse breeding establishments.

Dr. Farrell: When I was in Australia a few years ago they were doing a study at the slaughter house to determine how good a job was being done on branding cattle and at that time they made the statement that only 38% of their firebrands could be read at the abattoir. These brands (on horses) are put on by experts, are they not? By your organization?

Mr. Lilley: No. The branding is done by each individual horse owner around the country. There are some experts, working as stud grooms on the big profession studs, who do an excellent job. I've walked through a paddock and seen a 23-year-old mare that I could read the firebrands on from one end of this room to the other, on a 23-year-old mare with a winter coat. Other cases, where what we call some "caw cocky", who has one mare in his back yard and he brands it, and some of the yearlings, I inspect before the sale are not as good. Every year I have to order some of the yearlings be re-branded because even at 18 months old, the firebrands are not legible.

Mr. Urgel Bell: Your demonstration there brought up some intriguing possibilities to me that could be used for coding the blood tests of stallions, mares and foals. A stallion serves many mares, and you could have the blood type already coded for that stallion, at a fairly reasonable price, I believe, according to the testimony that we have heard. Why not have the brood mares also previously coded as to blood type. Then you only have the foal remaining to be coded as to blood type on the foaling papers. That wouldn't be too expensive, I don't believe. I think maybe some work could be done on this and see what the possibilities are.

Mr. Lilley: It certainly is a fascinating prospect. I hadn't realized that they had gone nearly so far with the blood typing, as I have learned

this morning. And, I think it really opens up all sorts of fascinating possibilities which I most certainly intend to go into a lot further when I get home. I think definitely that the stallions would not by any means be an impossible job. We've only got about 1,000 stallions regularly serving mares, so that should not be any tremendous problem. The only trouble is that Australia is a country about the same size of mainland as the States and there is not the concentration of breeding in one area that you get possibly in Kentucky or some part of the United States. We have stallions standing at properties way out in the Northern Territory and in central Australia, all sorts of places, some of them practically unfenced, and they are breeding more or less wild horses for station purposes. Every now and then, they will find one of these stock horses that looks as though he can gallop a bit, and they bring it in and register it and run it in their little local picnic meetings. Maybe half a dozen property owners get together somewhere out in the bushes and get a few kegs of beer and each picks their fastest stock horse (they have to register them), and then, owners up, they race against each other. There might not be a town within 500 miles. Everybody flies up in their own aircraft, takes part in the meeting, has a great old party, and flies home again. To blood type horses under those circumstances, would be extremely difficult and the trouble is that once a horse is registered for racing, even in one of those remote areas, that registration carries through in racing in Sydney or Melbourne or anywhere. These are just problems that I can think of, but I agree that the prospect is so exciting that we must get onto doing something about it, no question of that.

Dr. Stormont: You might contact Dr. Kevin Bell at Brisbane. He's working on cattle blood typing, but with a little encouragement on your part----

Mr. Lilley: Yes, I'll make a note of that. This is a pity, because I'd rather hoped that this might be an excuse to make another trip to the United States. (laughter).

DETECTION OF CRYOGENIC FRAUD IN THE HORSE

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Thomas G. Bell: Polarization Stress Analysis and Histopathologic Detection of Cryogenic Fraud in the Horse.

It is my pleasure to tell you about the experimentation that we conducted into the nature of methods that might be used to permanently alter the color of the coat of horses in such a way that they might be represented as a different animal, either in the genetic sense or on an individual basis.

I will comment on a method which I have developed for field use,[2,3] one that enables a technician to come to an accurate, rapid conclusion with regard to the cause for lack of pigment in the hair. That is, he can answer the question: Is it a natural white hair growth or is it a result of freezing or other alterative processes? My comments will be followed by those of Dr. George Padgett, a veterinary pathologist. He will discuss another method of assessment of alteration; the cellular changes on a microscopic level, more properly termed the histopathology of the freezing process.

First, let me express a way of thinking about marking, or identification procedures, in horses. This method has been very helpful in my being able to deal with the subject in general.[12] We only know one certain fact and that is: No matter how great the contribution of any of you may be, there will always be other, better methods developed in the future; methods that probably haven't even been touched on here. With that in mind, I want to ask you to try to very generally group the methods discussed here for the last day and a half.

When I was six or seven years of age I was allowed by the foreman on the ranch to be the official "sex identifier" of the spring calf crop. With a dirty, but sharp knife I would cut the tip of the left ear of all the heifer calves. I must admit, when it comes to surgery, my techniques haven't improved a devil of a lot. Anyhow, removing a piece of the animal, I term a subtractive method of identification. Into this class fall methods such as dew-lapping, tail-bobbing, etcetera. You logically have other methods which are additive. Additive methods would include ear-tagging, subcutaneous capsules, dying of hair, latex injection, and tattooing. We need one other group besides the subtractive and additive ones. That group I term the alterative method. By alterative methods we simply mean that some tissue in the animal is recognizably changed to aid us in identification. Hot branding, freeze-marking, and some other methods fall under this category. We can't forget, however, in thinking about additive and subtractive and alterative methods, that a systemic method of characterization of the animal, that is, characterizing the animals attributes, is helpful, no, I think I'd better say, is absolutely necessary, in conjunction with any marking process that we might use. Methods such as chestnut photographs (the "night eye" method) and blood typing will certainly remain as a foundation for animal identification procedures.

Think then, about the additive, subtractive, and alterative methods in terms of the ease of which fraudulent alteration might be accomplished. In subtractive methods, you need only increase the amount of tissue removed or you might go to the other side of the head and hack off another ear. In additive methods you can always remove the substance added and/or replace it with another substance suitable to your purpose. For an example, Dr. Litman and others have shown that it is easily possible to remove the dragon from the dragon-lady, that is, they can remove a tattoo from the skin of a human who no longer has the desire to be wearing that tattoo. They can do this process without altering the appearance and texture of the skin. When we consider the alterative methods, such as freeze-marking, with respect to the ease of fraudulent alteration, the question becomes a little bit more exciting, and it is this question which I will discuss this morning.

We already know that markings of an animal's coat can easily be changed by freeze-marking. The method has been used to give animals the characteristic markings required for registration by specific breed associations, and to produce forgeries of the markings of other animals. Although we have encountered only a few cases of cryogenic fraud, the wide geographic distribution of these cases in Washington, California, New Mexico, and Texas indicates to us that the procedure of freeze-marking is well-known and that, therefore, additional cases might be expected. Suspecting that the technique was being used to produce ringers and artificial Appaloosas, the Appaloosa Horse Club, Inc. requested that we search for a method of differentiating normal white hair from cryogenically-altered white hair. In our initial efforts towards this end, we investigated the following methods: nuetron activation analysis (also known as atomic fingerprinting), assays of biochemical activity such as tyrosine and glutathione reductase, X-ray diffraction of hair, morphologic characterization of hair by using homogeneous refractive index media, gross observation of skin and hair over a period of time, biopsy of the skin for microscopic and histopathologic examination, and, finally, the method I'll spend my time on, polarization stress analysis or PSA.

Let's discuss some of the tools that might be used by the fraudulent alterator. We have already seen numerous examples of freezing methods utilizing dry ice and alcohol and nitrogen. There are two types of freon. One freon will develop, because of its boiling point, a temperature of -26°C, the other, a temperature of -40°C. These cans of freon might be transported easily by anyone. The liquid is simply poured out into a vial and can then be poured directly on to the skin to freeze the tissue or can be used to chill a marking instrument. With these warmer temperatures we find that, although the time required for producing the mark is increased, the end points are very broad and an amount of hair loss which would allow us to be able to identify a freezing process does not occur.

In general, we have found that the freezing process is the most damaging if a fast freeze, slow thaw cycle is adhered to.[10] This is the freeze-thaw cycle we get when we simply apply a chilled marking instrument to the skin. Initial freezing is extremely fast and the thawing curve reflects the redistribution of blood to the area which was contacted by the iron. There is a hesitation in the thawing temperature because of the energy required to go from ice phase to liquid phase of saline or tissue fluid. On the other hand, if you control the freezing process so that you have a very slow freezing curve and a rapid thawing curve, you will find that the amount of damage done is much less in terms of abnormalities in the skin surface, loss of hair, and loss of glandular function.

We can point out that the object of the freeze-marker, and I might add the fraudulent alterator, is to simply destroy the pigment cells at the base of the hair follicles. It has been found that once the pigment cell is destroyed at the base of the hair follicle it will not be replaced. The pigment cell is easily demonstrable by photomicrography. Let's run over some of the gross observations that might be made after freeze marking has been done to point out what you might be looking for if you suspect that an animal has been altered by the freezing process.

A biopsy of skin and deep dermis of normal and of freeze marked tissue will show us several things. There is a decrease in the amount of pigment in the hair and the skin, there is some loss in the number of hair follicles that remain viable, and there is a smoothing out of the dermal-epidermal junction so that we have a loss of the rete peges in the skin. This is further exaggerated in the severely frozen skin. In this case, there is an actual replacement of tissue by a fibrous meshwork of cells that come in when the scarring process takes place. Such skin will be bald and not hard to detect.

As for the immediate effects of the freezing process, once the marking instrument is pulled off the skin, we see an indentation. This characteristic change is followed within five to ten minutes by a redness and swelling which lasts two to three days on horses. As this reddening and edema recedes from the site, a scaly, exudative surface appears and remains visable until the hair and superficial epidermis have been shed. Within twenty to sixty days a bald mark results and is then gradually replenished with white hair. Pigment gradually remigrates into the white skin, particularly if it is exposed to sunlight after sloughing of the epidermis. This migration always occurs from the margins of the mark towards the center and appears to be stimulated by sunlight. Thus, the season of the year may affect the migration rate. Pigment doesn't migrate into hair follicles, however, as we've already mentioned.

If the freezing process is less severe, we find that hair coming out of the marking site may be hyper-pigmented. This might be used advantageously, or, for illegal purposes by the fraudulent alterator. However, the change is not permanent and within two hair growth cycles there is no apparent difference in pigmentation. We noticed, as you probably already have, that the freezing process causes a stimulation of hair. Hair grows out faster from the frozen area than it does from normal areas. Also, the texture of the hair involved is not quite normal. It seems to stand up as a cowlick would and the appearance of the hair is abnormal enough that, as you will see later, we felt that there must be some way to characterize it.

The normal hair and skin color of an animal has various characteristics which are important to those wishing to demonstrate a fraudulent alteration. On an Appaloosa skin, the dark hair originates from dark skin. The white hair may originate from either dark skin or white skin. In the case of a freeze mark, however, usually we will see white hair originating only from dark skin after the process of pigment remigration within the superficial layers of the skin has occurred. In order to assess the methods of the person using the freezing process for fraudulent means, we felt it necessary to run a group of horses through procedures which one might guess the alterator would use.

We anesthetized the animals and, after careful evaluation of the skin thicknesses, we began to try various freezing processes. By using a gentle drip-on liquid

we were able to depigment the hair very successfully, and in some cases, the skin.

After finding out the cost of various successful detection methods such as nuetron activation analysis (as I remember those samples were running a couple thousand dollars for twenty-five samples or so), I felt a substantial amount of pressure to develop a very simple field technique which was cheap and easy to apply. Going back to the phenomena that we noticed, the excess hair growth, we clipped the brand site after white hair had already appeared, and allowed it to regrow. White hair from the freeze marked area grew out much faster. This led me to speculate that if there was an abnormal hair follicle producing these fast growing hairs, we might be able to see it with a microscopic technique that we use to detect foreign bodies in a tissue and also to detect the presence of some structures which have a laminar pattern which will cause the rotation of plane polarized light.[8,12]

Let me briefly explain the nature of the so-called "polarization stress analysis" technique which we have utilized for analyzing these tissues. One simply uses plane polarized light. This is done by placing a polarizing filter over a light source. Then one places the sample to be analyzed above this polarizing filter. Finally, we put in a third component, the analyzer, which is a second polarizing filter at a ninety degree angle to the first filter. We know that hair and other biologic tissues rotate plane polarized light forty-five degrees. Since the crossed filters block light from crossing through our analyzer, the hair appears illuminated against a dark field when we look into the other end of our analyzer. Under these conditions normal white hair becomes yellow or a whitish color, but white hair from cryogenically-altered areas emits light of various wave lengths, usually red, orange, blue and green. This means that we have a very simple field technique which would allow us to simply take an ordinary microscope, look at a hair sample plucked from a suspect white area and, if available, hair from a normal white area on that same horse, and analyze it very quickly right in the field.

Double Blind test results of polarization stress analysis on ninety-five paired samples, that is, a sample of normal white hair and a freeze marked sample from the same horse, were about ninety-six percent accurate. We did not read any samples of normal hair as being freeze-altered. However, four percent of the freeze-altered samples were recorded as normal hair. The inaccuracy relates to the fact that some samples from freeze-altered sites contain hair that has been aged to the extent that the protein content is no longer of a type that allows us to characterize the hair follicle damage. By sampling only actively growing hair this inaccuracy can be easily avoided. What we do then, if we suspect an area has been freeze-altered, is take our initial sample, and, if our suspicions are aroused, we simply clip the hair, wait two or three weeks and go back and sample the new growth, and test that for polarization stress analysis.

In the hair is a tough cuticle surrounding cortical material which is composed of lamellar proteins arranged in longitudinally directed fibers. Each of the cortical cells contains many macrofibrils and these macrofibrils are, in turn, composed of nine protofibrils. Each of the protofibrils is formed of an alpha helix of amino acids. In other words, what we've got is a very long strand of amino acids, incidentally, containing quite a bit of cystine and proline, that forms the alpha helix.

So, within the hair we have small subunits which are arranged in a parallel manner. The distance between these small subunits is such that light passing between them is affected because the distance we're talking about is nearly the same as the wave length of visible light. One effect we see, of course, is the rotation of plane polarized light. The other effect that we see in these freeze marked hairs, where stress has been produced within the cortex of the hair, is a retardation of certain wave lengths and an enhancement of others. I think we can understand this by simply proposing a model that involves a rearrangement of protein fibrils within the cuticle so the linear arrangement of the protein fibrils is not uniform throughout the cortex of the hair. This causes the chromatic aberration and gives the positive test.

I conclude with the observation that PSA is presently the most practical method for initial field determination of fraudulent alteration of coat color in horses. It can be rapidly accomplished with inexpensive equipment; it requires little experience for interpretation and, judging on the basis of a limited number of trials, results are extremely accurate. To define the method's specificity for cryogenic alteration, further studies are required.

*Bibliography for Björck, Farrell, Hooven, Bell and Padgett are combined at the end.

Letters to the Editor
by
Shirley D. Johnston
presented by
Dr. Thomas G. Bell

While I have the floor, I would like to read into the proceedings a letter from Mrs. Shirley Johnston which appeared in "Hoof Beats" August, 1971, concerning the alterable symbol system used by the New Zealand Trotting Conference.

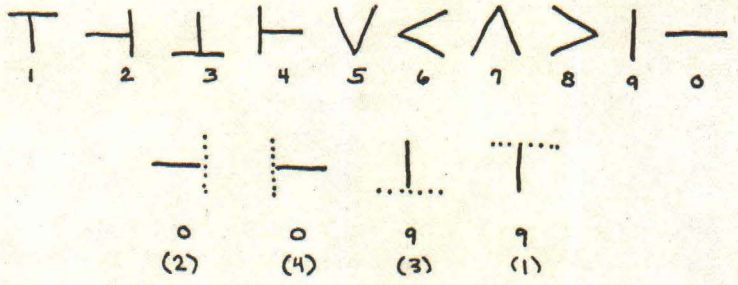
"Dear Sir:

I read with interest the article entitled "Freeze Branding in New Zealand" on pages 28-31 of your June 1971 issue of "Hoofbeats." Both the branding box and identification symbols appear to have some serious drawbacks not discussed in the article.

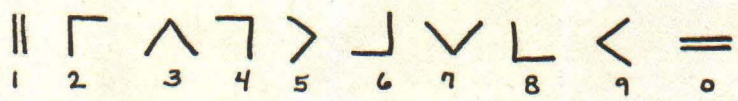
Dr. Keith Farrell of Pullman, Washington, who both invented and holds patent rights on the process of freeze branding animals, has devised an angle system of identification to which I would like to call your attention. (I'll enclose an article published in Washington State University's "Animal Health Notes" that discusses the angle system; the system itself is diagrammed on page 6 of that article.) Dr. Farrell's angle system, used with irons similar to firebranding irons, appears to be far superior to the method described in "Hoofbeats." Some main points are discussed below.

IDENTIFICATION SYMBOLS

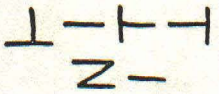
a. Alterability. The first paragraph states that the symbols are non-alterable. This is clearly not the case. Symbols for 0 and 9 can easily be altered into any of the first four digits as shown below.



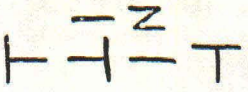
From pictures included in the article it appears that the size of the symbols, the slant of the horse's neck and stretching of skin during growth might even allow alteration of the V's to T's by the addition of half a crossbar. Dr. Farrell's system (shown below) is clearly non-alterable. A line added to any of the angle symbols (2-9) produces a non-intelligible symbol and the double line for 1 and 0 precludes conversion of these symbols to angles.



b. Numeration of Animals. I find the method of turning the brand box upside down to number foals extremely confusing. In paragraph four the article states that a mare branded with the number 3042-Z would have a foal numbered Z-1042. This can't be right. When 3042-Z is turned upside down it yields the number Z-4201.



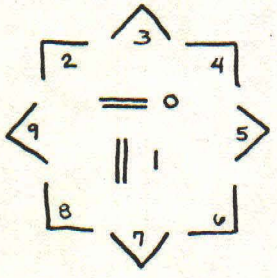
3042-Z
Turn box
upside down
to get
Z-4201

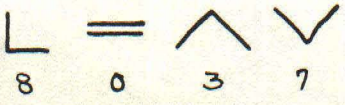


The whole approach of branding foals in this manner is rather irresponsible. Three generations of animals will bring you to a point of numbering a new foal with the same number as its mother's dam. There is also a problem with brood mares producing more than one foal during their lifetime. If this upside-down box business is merely a random numbering to save time without the necessity of using it for every mare/foal relationship, then I fear the users of this system are asking too little of their number code. Parentage is important to all horsemen, and a more well-thought-out approach to numbering of foals is in order. Now that detailed data about our animals can be computerized, stored and rapidly retrieved, it is foolish to number animals randomly.

c. International Marks. In paragraph six the article states that the letter Z stands for New Zealand, evidently implying that users of the system expect other countries with other prefixes to adopt the system. Still they make no provision for uniform numbering so that horse identification numbers may be standardized internationally. This smacks of the mess U.S. cattlemen are in with state brand registries duplicating cattle marks to the extent that only some 20% of market cattle moved in the U.S. can be traced back to their state of origin.

d. Miscellaneous. No mention is made of the age of foals when they are first marked. Dr. Farrell's angle system needs only 2 characters instead of 3 in the T-V-I system, and it is readily learned after only one exposure to the characters. One need only remember that 2 lies in the upper left hand corner and that angles proceed numerically around a basic square. The T-V-I system requires blanket memorization of all the digits.





BRANDING BOX

a. Frost. The box frosts up because the cold symbols are in contact with air. Dr. Farrell advocates use of a brass iron cooled in a dry ice/alcohol solution. This is kept submerged until branding occurs so that no frost buildup is allowed to blur the characters.

b. Ice Melts. This results in loss of coldness so that if you are branding several animals with one box you get varied intensities of marks. Uniform marks require uniform coldness. With an iron and a dry ice/alcohol bucket solution levels are observed constantly, and the bucket can be refilled when necessary.

c. Weight. When the box is filled with dry ice and alcohol it is much heavier than a brand iron. I imagine it is therefore less maneuverable and probably more tiring to use if the iron must be held on the horse for any period of time.

The last sentence of the article states that "USTA Executive Vice President Edward F. Hackett and former Registrar Ken McCarr" . . . "are studying the program and equipment." I sincerely hope that USTA will investigate methods of freeze marking and animal identification symbols more thoroughly than the New Zealand Trotting Conference has evidently done before advocating and using a system that affects large numbers of horses and horsemen.

Sincerely,

(Mrs.) Shirley D. Johnston
Moscow, Idaho"

I might add to Mrs. Johnston's clear statement on alterability, that W. H. Bishop, Ruakura Agricultural Research Centre, himself confirmed Dr. Farrell's discovery in an article written in the New Zealand Farmer, July 24, 1969, entitled "Freeze Branding." In this article he states "such a code as this (TVI) should be of particular interest to users of the freeze branding technique because the fewer branding irons needed the better." Mr. Bishop must surely concur that the angle numbering system is better than the TVI by 33-1/3%, since it has one less symbol.

Question: The branding device used to make the symbols discussed, was this the deal made by McIvor?

Dr. Tom Bell: Yes, this is what they call the McIvor iron (A. R. McIvor, Lincoln College, Christchurch, New Zealand). As far as the structural changes on the molecular basis, we have no idea, really, what is going on.

Dr. Bergevin: You were showing us these changes which---

Dr. Tom Bell: We weren't showing you any changes there at all, since those were diagrams of normal hair. If you take a series of protein fibrils, supposedly representing the alpha heli, you've got a distance between these fibers which is not too different from the wave length of light. Now, the wave length of light ranges from short, in the blue range, to long in the red range. If we have a constant parallelism, in other words, a constant spacing of these protein fibrils in the hair, we would expect that the effects on light would be the same throughout. So, we do get a polarizing effect, but we don't get an alteration of wave length in normal hair. Now, if we take a hair and alter it by a freezing process, we ruin our perfect spacing between these fibers. We would then expect that in some areas, where fibrils are closer, to retard the shorter wave lengths and just get out red, and in some of the other areas where the stress is not so great, we would have a wider spacing and advance the longer wave lengths and not retard the short wave lengths. Thus, we get a so-called chromatic aberration of whole white light. But, it is like I said, we have not begun to prove this, and I don't imagine we will have the chance.

Mr. Drayton: This is great, but its supposing that you have a reason for testing to begin with.

Dr. Tom Bell: Yes.

Mr. Drayton: Some of the alterations you've got on those horses look like a pretty darn good job to me. Let's suppose one of these horses showed up at a track. I don't think even an identifier would be able to tell what was an altered mark on a horse. In other words, he would have no reason to ask you to test that horse, which is what worries me.

Dr. Tom Bell: I think maybe Dr. Padgett will cover some of this. If you had any reason at all to suspect that something was going on, if you'd let me go out there, I could tell. You are going to have to suspect him somehow, there is no doubt about that. Something has to tip you off. There is a sparsity of hair usually with the unskilled freeze marking process that tips you off. There is also this babyish skin feeling to the previously frozen skin that will also tip you off, so if you run your hand over an area that has been frozen, you'd say that it feels different. So, if a person were familiar with what the freezing process does to the skin, I think that you might be very suspicious, even though at a casual look there is a perfectly normal horse with a white stocking, or maybe a blaze that is different, or something like this.

Mr. Blair: The reason that the Appaloosa Horse Club got into this to this degree is that we did suspect a horse at the track. We did run into these

horses at the track. Now, how do we prove it to go through a court of law? One of our first detections was made when we photographed a winner's circle picture of a horse. The white looked a little opaque, and it looked more opaque on a photograph. Like Dr. Bell says, after you have seen some of these, it jumps out and hits you. It just showed up in a photograph a little more opaque than would be expected, and as I looked at it I thought that the horse was not right, it doesn't look just natural. So, this is when we then went into this deal, we were sure, now let's prove it.

Dr. Tom Bell: Mr. Drayton has a good point though. I think that if I were to take a fellow who wanted to fraudulently alter a horse down to the laboratory and show him how to do it with the least damage, I could produce a pretty nearly normal area of white hair. Understand, that it would be positive to the PSA test and, of course, Dr. Padgett would also be able to pick it up, but, depending upon the degree of skill of the person making the alteration, you have a darn good point.

Mr. Lilley: I had an experiment at home of altering the markings on a horse. I had a horse that had a star and a stripe with about a two-inch gap between the two, and I used the freeze branding technique to join the two white markings. I did the best job I could, but there was a definite difference in the hair growth, the hair texture and the general appearance of the connecting white line that I had added to the horse, compared with the white hair above and below. Probably, if the horse had walked past 20 or 30 feet away, I wouldn't have noticed, but as soon as you got close and felt the horse or looked at it closely, there was a definite difference in the texture, and the lay, and everything else of the freeze branded hairs to the normal hair above and below it.

Dr. Tom Bell: If anybody is interested in the PSA method, we've got free papers up here for you.

Dr. Stormont: I would like to make one brief comment with respect to the suspicion in these cases and how you might go about to verify your doubts. I think quite a few of you have heard about the famous steer, Mr. Mac, who won the Grand Championship prize at the Denver Livestock Show last year. Somebody got suspicious, they went up and looked at this animal. He was entered as a purebred Angus, by the way. And, there were two things wrong, his coat color didn't look right on close inspection and he had horn spurs that would suggest that he had been dehorned. So there were two counts. The next step was blood typing; did his blood type fit that of his parents. No. We did the blood typing in my lab and the Ohio State Laboratory showed that he could not be from the stated parents. He could have been from the dam, she was okay, but the sire claimed was definitely excluded. This was actually a Charolais-Angus crossbred. You could tell that by blood typing. There is one important system that will enable us to always say, without a doubt, what breed is involved. We saw this particular group in the B system which suggested Charolais crossbred, and they came up with a Charolais bull that fit perfectly. So you can tie it all together and sustain your doubts.

Mr. Urgel Bell: Dr. Bell, one more thing, I think the best reason we pick up fraudulent cases at race tracks is the fact that we have tip-offs. You can't fool other horse trainers, I mean they know more about horse racing than all the people in this room probably put together. They know the gait

of the horse and they can tell the horse from away back when and where they saw him last. This is the reason we pick up ringers at race tracks, generally. Now, they might get by with discolorations, etc., but they are not going to get by with it very long, this is our experience in racing.

DETECTION OF FREEZE MARKING BY HISTOPATHOLOGIC TECHNIQUES

Drs. George A. Padgett, Thomas G. Bell, R. Keith Farrell
Department of Veterinary Pathology
College of Veterinary Medicine
Washington State University
Pullman, WA 99163

Presented by Dr. George A. Padgett:

Artificially altering the color of a horse by freeze marking has been shown by various individuals to be a practical procedure. Therefore, it is also possible to alter the markings on an animal for illegal purposes in the same manner.

It is essential, therefore, that adequate methods of detection of freeze marked animals be developed for the purpose of protecting the legitimate interests of the horse industry. The Appaloosa Horse Club, Incorporated financed a study to determine whether histopathologic techniques would be useful in the detection of freeze altered skin.

METHODS

One hundred and eighty-eight biopsies were taken from Appaloosa horses from various areas of the body. Sites selected were freeze marks varying in age from 6 months to 5 years. Perfect marks by gross observation as well as bald marks with variations in-between were examined. Normal white areas as well as normal pigmented areas were studied to see if they would confuse the study.

All biopsies and tissue sections were prepared and numbered by one individual. The tissues were read as a blind study by the pathologist.

RESULTS

One hundred and sixty-one or 86% of the biopsies were correctly diagnosed in this blind study. In no case was normal skin called freeze marked. Fourteen percent of the samples which were perfectly freeze marked escaped detection by this method. However, when histopathology and polarization stress analysis were combined, every freeze mark was detected.

The lesions induced by freeze marking which were detectable on a regular basis included alterations in the pigmentation of the hair and epithelium. This is detectable mainly as an unevenness of pigmentation rather than a complete loss. The unevenness is probably due to variations in the temperature of the surface of the iron when the animal is freeze marked. The second consistent feature is the loss of, or alteration in the structure of the sweat glands which are a consistent part of the histology of horse skin.

DISCUSSION

It is clearly possible to detect freeze marks in the horse by histopathologic techniques. Using a combination of methods, 100% of freeze altered animals can be detected.

Mr. Graves: Have you ever run any tests on Paint horses?

Dr. Padgett: No, we have though for the Spotted Pony Club of America.

Mr. Graves: This is the same party, but I don't know if you would experience the same type of results in that as you would Appaloosas.

Dr. Padgett: We experimented with horses that were not Appaloosas, but the reason we were most interested in Appaloosas is because it is obvious that it would be easier to put small spots scattered on a horse.

Dr. Farrell: I'd correct Dr. Padgett, the reason we were most interested in Appaloosa horses is because they were the ones that were giving us some money. (laughter).

Mr. Graves: Well, maybe we can correct that.

Mr. Drayton: Let's suppose that you had a freeze brand that was applied in January of 73, subsequently, you added to it in March of 73, can you detect the original from the subsequent brand?

Dr. Tom Bell: Assuming you are speaking of observations some months after both marks are applied, I can answer mine very easily. No. If there is white hair there then I would get the same answer from both, and if there is not white hair in one area, I can't use my method.

Dr. Padgett: I would make the same observation from my technique, I would say the same thing. If I'd studied that piece of tissue in March I could show a difference, but if I got at that piece of tissue two years later, no, I couldn't.

Dr. Farrell: There is one point, you should bring out; there is a change in the mark associated with time, in that the skin turns to a very much darker appearance grossly after a few months and the more recent mark may not look exactly like the original mark, if it is a bald centered mark.

Dr. Padgett: I would like to respond to a question you asked Tom Bell previously. How you pick up ringers is based on an index of suspicion and that is suspicion when you pick them up right now, even if it doesn't involve freeze marking. Something has to tip you, as Mr. Bell said, that something is wrong. Then you start checking, because there are all sorts of ways to alter a lot of things on horses. Something has got to suggest that something is wrong. If there is nothing suggested wrong, then that horse will be an effective ringer and it doesn't matter what system you use. So you have to develop an index of suspicion and setup a system that is difficult to alter technically. If you can do those two things, you can solve much of the problem of ringers.

FREEZE MARK IDENTIFICATION FOR PUREBRED ARABIANS

Ward B. Howland, Executive Secretary
Arabian Horse Registry
One Executive Park
7801 East Belleview Avenue
Englewood, Colo. 80110

Permanent identification of the Arabian horse has always been desired, yet has posed a problem to Arabian owners throughout history. In an effort to find the most suitable identification method, the Arabian Horse Registry has investigated every system available including hot iron branding, lip tattoo, ear clipping, and others. None of these systems have been adequate. Five years of intense study, investigation and research enables the Arabian Horse Registry to present a new method of identification - Freeze Marking.

Numerous experiments were conducted using freeze marking and the right angle symbols developed by Dr. R. Keith Farrell. As a result of comprehensive testing on over two hundred Arabian horses at Al Marah Arabians, we are convinced that this new process is a solution for permanent identification. As a result, the Arabian Horse Registry is making this new technique available, on a voluntary basis, to all those Arabian owners who desire to participate.

Freeze Marking is a permanent, painless unalterable means of identification which destroys the pigment producing cell that gives the hair its color so as to leave a mark of white hair. On the grey horse, a depilated, hairless mark is left.

The Registry designated the right side of the neck under the mane as the official site of application. For those owners who desire, the mark will be applied to the neck on the left side under the mane. The mark will be applied approximately two inches below the eruption of the mane and about midway between the poll and withers.

An area approximately two inches by seven inches is clipped close to the skin. Afterwards, this area is washed with alcohol. Meantime, the marking iron is submerged in the bath of dry ice and alcohol until it reaches about -109°F. The iron is removed from the bath, dried and applied to the clipped area of the neck. The exposure time is dependent on the color, age and thickness of skin.

As far as we can determine the horse experiences no pain during, or after, the application of the marking iron. When the marking iron is removed from the neck, the alpha symbol and angles will be visible for approximately two to four minutes, or until the mark thaws. Some slight swelling will occur for 12 to 18 hours after application. After a few days, sloughing of the outer layer of the skin can be seen where the mark was applied; (this may continue for 3 or 4 weeks).

After one hair growth, the hair on the dark hair horses will grow back white, leaving an easily-read, permanent mark. On grey horses, no hair growth will take place in the marked area, again this is easily read. Hair growth on many horses will be excessive during this time. Clipping will recover the readability of the mark.

A recorded owner may request an application for identification from the Registry. The form must be completed by the recorded owner and returned to the Registry. The Registry will schedule a trip into your area when a sufficient number of applications have been received from your locality. The Registry will not mark an Arabian under 12 months of actual age until further research of the horses growth rate can be completed. Otherwise, all Arabians may be marked.

The Freeze Marking program is being administered by the Arabian Horse Registry of America, Inc. The Registry has specially trained and licensed identification technicians who are the only persons authorized to freeze mark purebred Arabian horses in Canada, United States and Mexico.

With the growing number of purebred Arabians and the inherant aesthetic and monetary value, it is of prime importance to accurately identify horses. The Registry issues approximately 10,000 new certificates of registration each year and hundreds of these foals are indistiguishable on markings alone. The problems encountered in the past from an inadequate identification system are numerous but most could be resolved if the horses had a permanent mark of identification.

The identification technician will not mark an Arabian if:

A. If the original certificate of registration is not presented for identification prior to marking.

B. If the recorded owner or authorized agent is not present.

C. If the markings or sex or color or age or any combination do not match the horse to be identified.

D. If the actual age of an Arabian is less than 12 months.

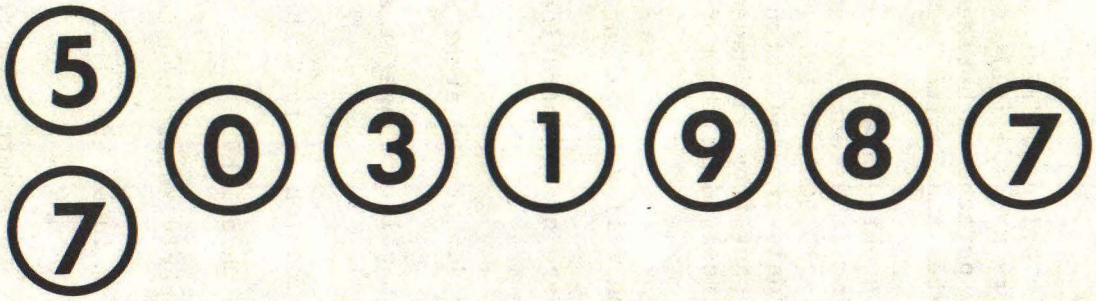
E. If a horse appears to be unhealthy.

F. If a horse cannot be properly restrained to apply a good mark.

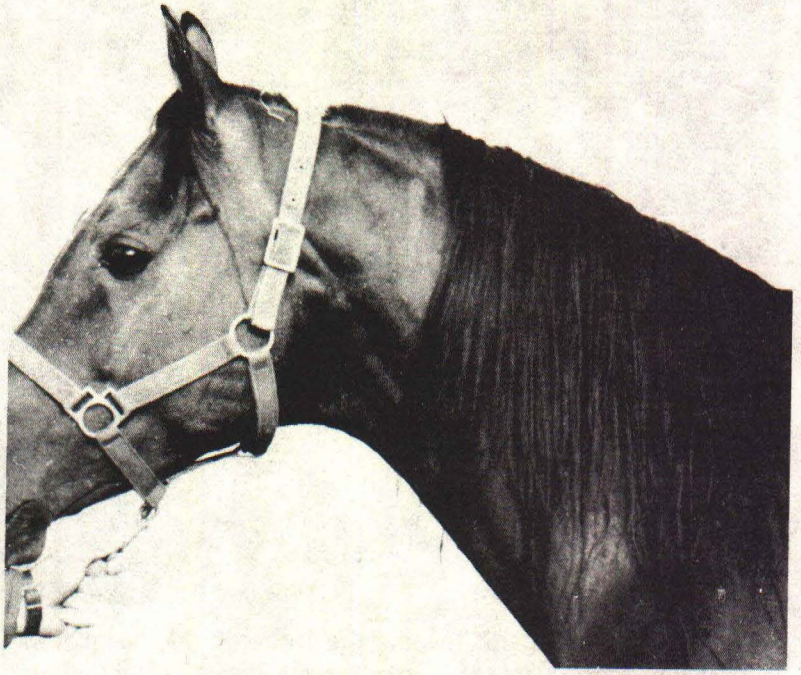
G. If the horse is restrained in an area that could prove dangerous to the horse or technician.

The angle system is adaptable to modern data retrieval methods and it is the intention of the Arabian Horse Registry to develop a computerized program, based on signalment and freeze mark, to record registered Arabians.

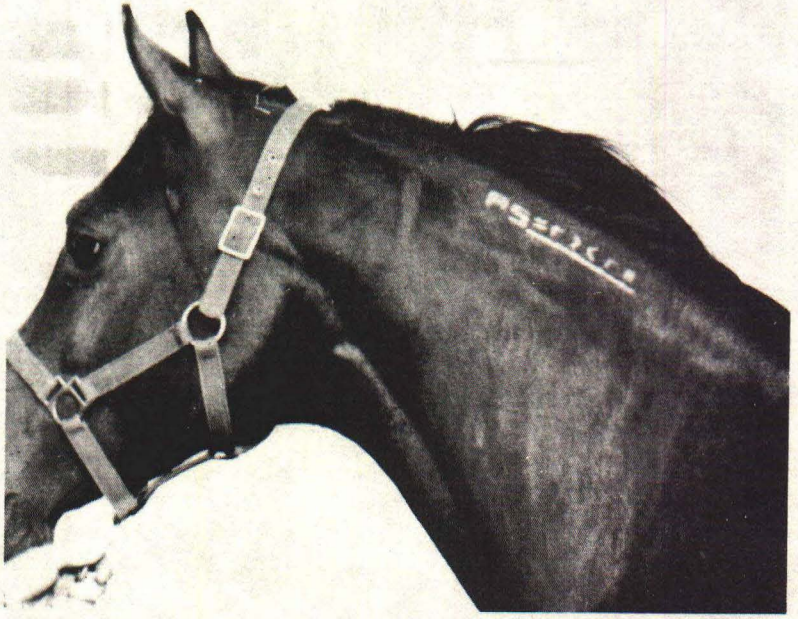
Actual Size



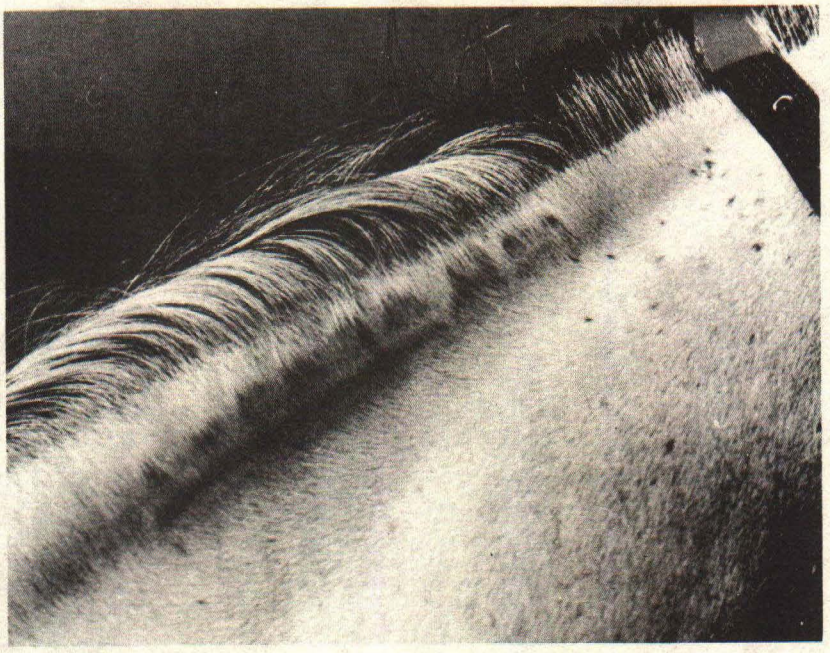
The alphabetical symbol represents the designation for purebred Arabians. The stacked symbols in the second position designate the year of birth (69, 70, 71, etc.) The remaining symbols represent the registration number (as illustrated (031987). Thus, by reading the freeze mark on a horse's neck, as in the example above, it will tell you the horse is a purebred Arabian, born in 1957 and it's registration number. Please note, the stacked symbols shown above have replaced the alpha symbol for the year of birth as shown in the following photographs.



No obvious form of identification.



Freeze mark revealed by moving mane on bays, chestnuts and blacks.



Moving the mane reveals the freeze mark on greys.
(Photo shows freeze mark 3 months after application.)

Freeze mark completely revealed by clipping.

Mr. Franks: You don't require photographs on the front of the application for registration?

Mr. Howland: No sir, we do not require photographs to accompany the application, because we don't have many good photographers either. I think if we asked for photographs, we'd have to ask for both sides, front and back, and I'm sure that many people wouldn't get all we wanted, because the place they were taking the picture in could be high grass or weeds and we still wouldn't get what we wanted.

Dr. Campbell: What is the youngest age at which you would recommend freeze marking?

Mr. Howland: Right now, Dr. Campbell, we are not doing anything under a year unless we are requested to, we have three things that we are concerned about on our under-yearlings. One, we don't have a real specific answer yet on the growth of the mark using this size iron. I was interested in Dr. Björck's comment that he found 25% growth, but once we get some real solid figures on growth, then we can probably ask Y-Tex to design an iron that will fit a foal so when the growth is finished it will be the same size as the iron we use on mature animals. Again, one thing I mentioned, we have a problem in Arabs that they sometimes don't know what color they are going to be until they are four or five years old. If it is going to be a grey horse, we want to stay on the horse longer than we do on a dark horse, because we want this bald-centered mark. Another thing, on a foal it is sometimes difficult to determine to which side of the neck the mane will fall.

Mr. Magnuson: Is the size of brand you are using there what you consider the minimum practical size; I know Dr. Farrell has done some things on that.

Mr. Howland: I don't know if we consider it the minimum practical size, Keith, it is probably the most readable size that we have come up with today, and I think we can probably come up with a smaller iron, but maybe Keith can comment on that.

Dr. Farrell: We do make small irons for wild mice studies on tularemia, etc., 1/8 inch high. This is much too small to be practical on a horse. (For official registry symbols I favor one size for both adults and foals, because this will eventually give us a check, by measurement as to the age when the animal was marked which will assist us greatly in weeding out possible fraud).

Mr. Howland: I have some booklets here, Identifying the Arabian, if you would like. I have some freeze marking booklets too, but they have disappeared, so if you would like any of those booklets, just drop me a line in Colorado and I'll be gald to send you some.

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I have been asked by Dr. Farrell to give an impromptu report on the use of mild detonating fuze (MDF) for the marking of animals. The idea was first conceived by Dr. Thomas C. Poulter, Director of the Biological Sonar Laboratory, Marine Mammal Study Center, 2100 Patterson Ranch Road, Fremont, Calif. Dr. Poulter is also a Senior Scientific Advisor to the Stanford Research Institute (SRI), and formerly was in charge of scientific experimentation for Admiral Byrd's second expedition to the Antarctic.

The original purpose of the method was for the instantaneous marking of sea lions, elephant seals, and other pinnipeds in the wild. After numerous attempts of marking by this method an electrical detonating system was designed utilizing a short length of MDF mounted, in a particular configuration, on the end of a small offset template. The animal to be marked would be struck with the template, and the MDF detonated manually on impact leaving a uniformly abraded epidermis in the form of the predetermined design.

Since then a safer designed branding device was fabricated, modified, and field tested. A chronological report on these activities was presented at the Eighth Annual Conference on Biological Sonar and Diving Mammals by R. Homestead, Palo Alto, Calif., and B. Beck and D. E. Sergeant, Fisheries Research Board of Canada, Arctic Biological Station, Ste. Anne de Bellevue, Quebec, Canada.

I will now read some excerpts from the proceedings of that conference and, by means of the opaque projector, show the investigator's illustrations of the device and how it works.

"In March 1971 the Fisheries Research Board of Canada, Arctic Biological Station, carried out field trials in the Gulf of St. Lawrence of an improved lightweight explosive branding device"....for branding Harp seals and Hooded seals.

"The improved device included the substitution of a stab initiator for the electrical detonator thus eliminating the radio or radar transmitter hazard and the need of the battery and capacitor circuit. This lightweight device combined a simple pivotal branding block frontally attached to a modified spear-fishing gun..."

"The applicator (spear-fishing gun and branding block) weighted 3 pounds, and the 200 MDF brands weighed only five pounds. Loading and reloading was done easily and rapidly. The MDF brand charge (Pentaerythritol tetranitrate, PETN, 2 grains/ft.) delivered approximately 2 feet pounds of explosive energy on impact, and was so fast in application that"....no restraint was needed.

"No animal marked showed signs of distress, even the newly born pups of the hood seal. After the initial marking the animals quickly became quiet and resumed their normal behavior pattern. Suckling was observed 2 minutes after marking both a female hood seal and her pup."

"This device can be varied in many ways. The applicator can be lengthened or shortened. The size of the mark can be physically regulated. The width of the mark can be controlled by varying both the amount of charge (MDF in grains/ft.) and the stand-off (depth of recess in the rubber template which confines the detonating gases). The depth of the wound can be varied by either increasing or decreasing the amount of charge or the width of the template recess."

Last March I was on the ice in the Gulf of St. Lawrence during the Harp seal harvest, and I saw the branding device used, and I took several feet of moving pictures which I will now show. The method seemed very fast and easily performed, and the report of the explosion sounded no louder than that made by a boy's cap pistol.* It would seem that the resulting brand is uniform and adjustable so as to obviate overbranding or underbranding. The method, insofar as domestic animals are concerned, would appear to be particularly well suited to the marking of TB and Bangs reactors (cattle), swamp fever suspects (horses), and hog cholera suspects (swine) to mention a few.

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* Due to atmospheric conditions this is so, but in a confined area, a barn, this is invalid. A device modification recently done reduces the noise level to a clap of the hands. [R. E. Homestead]

** Photographs of the MDF device may be obtained from Dr. R. Keith Farrell. Compliments of Mr. Ronald E. Homestead, 1770 Guinda St., Palo Alto, Calif. 94303.

DR. R. KEITH FARRELL'S COMMENTS ON FEDERAL REGULATIONS CONCERNING EQUINE INFECTIOUS ANEMIA:

Farrell: I have been asked to comment on the reason why I voiced opposition to the Notice of Proposed Rule Making published in the Federal Register on November 7, 1972, relative to Part 75, Title 9, Code of Federal Regulations concerning Equine Infectious Anemia. Let the record show that I am in complete agreement with designating the recently developed immunodiffusion ("Coggins") test as the official test in the United States. I am, however, opposed to the addition of a primary mark of stigma without a requirement for mandatory individual identification of the horse. Indeed, I feel that the addition of a three inch high "A" plus a "national uniform tag" code number, also three inches high, to designate a state, without a mandatory individual horse identification system would be ridiculous. It should be born in mind that the precedent for marking diseased animals with a fire brand was only on cattle, using a T (tuberculosis) or B (brucellosis) on the jaw of diseased cattle. Such cattle were ear tagged at the time or prior to the time that a blood sample was drawn.

Further, I am even more concerned with the use of freeze marking, a technique of my invention, to make such a primary mark of stigma. Experience has shown that when freeze marking is first introduced there is usually a period of opposition, because the mark is too obvious. This occurred in England and in New Zealand and is now occurring in the U.S. The strong opposition eventually disappeared in England and within the Trotting industry in New Zealand. I am assured by the state veterinarian of Connecticut that the use of the freeze mark as a mark of stigma for EIA works in that it results in owners destroying such animals.

I, therefore, feel that introducing freeze marking as three inch high marks of stigma to embarrass the owner into destroying his animal could only raise strong opposition to the freeze mark in general. This would be most unfortunate at a time when freeze marking is being accepted in other countries as an acceptable mark for official individual identification and is being considered and tried for the first time in the U.S.

Freeze marking is much too valuable a tool to be used to kill 2-4% of the horse population, if it also kills freeze marking programs just now being born. Let's identify the animals as individuals, and then control of all diseases, certification of vaccination, genetic improvement, husbandry practices, insurance programs, etc., will all have a solid foundation on which to grow and improve.

PASSPORTS FOR THE IDENTIFICATION OF RACEHORSES

Unfortunately France was not able to send a representative, but the following is a description of the material included in their passport, which was sent to us by: Mr. Henry Blanc, Ministère de L'Agriculture, et du Développement Rural, Service des Haras, 26, quai de la Râpée, Paris 12ème, France. A xerox of the passport may be obtained from Dr. R. Keith Farrell.

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de CHEVAUX en FRANCE
11, rue du Cirque - PARIS (8e)

SOCIÉTÉ des STEEPLE-CHASES de FRANCE
137, faubourg Saint-Honoré, PARIS (8e)

The passport was created by the Société d'Encouragement in 1964 with the approval of the French Ministry of Agriculture (National Studs and Racing Department). The Steeple-Chases Society in France also adopted it in 1968.

Instituted by the Rules 23 to 25 of the French "Code desCourses" and by similar rules of the Steeple-Chases, the passport makes possible an easy and severe control of racehorses' identity.

The systematical checking of the descriptions comes within the general framework of a group of measures adopted spontaneously by the Société d'Encouragement to strengthen the control of the regularity of racing which principally consist in the film patrol, the Study of irregular performances, the Starting stalls, the checking of training declarations and stable movements, etc.

Since 1965 the efficiency of the passport was verified by the discovery of 18 cases of substitutions detected before the race.

The passport (appendix 1) is produced with a plastic cover different in colour according to the year of birth (appendix 2).

The name of the produce appears in the right upper corner printed on an adhesive band of the "Dymo" type.

It contains the following indications:

- Name, date and place of birth
- Name of breeder
- Indications of breed (Thoroughbred, French Saddle horse, French Trotter, etc.) with reference to the Stud Book
- Sex and colour of coat
- Pedigree limited to grandparents
- Particulars of identification; distinctive marks both written and drawn including the transcription of the description such as it appears on the certificate of origin together with the observations made by the controlling veterinary on the change which may occur after the first description of the foal coat
- Successive owners of the horse

- Inspections by Racing Authorities, controls before the race, exportations
- Pages reserved for customs
- Pages reserved for health visas
- Pages reserved for mentioning vaccinations.

The passport cannot be considered as a deed of Ownership, it must accompany the horse concerned in all his career.

The passport of a gelded horse must be sent to the Société d'Encouragement to have the castration mentioned in it.

The passport of a dead horse must be returned to the Société d'Encouragement.

Since 1964, the use of the passport has largely gone beyond its initial purpose of identity checking.

Its use has extended to international exchanges, it has been adopted by thirteen countries: France, Great-Britain, Ireland, Belgium, Netherlands, West Germany, Italy, Spain, Austria, Algeria, Tunisia, Morocco, Czechoslovakia and fourteen other countries plan to use it which are Sweden, Norway, Denmark, U.S.A., U.S.S.R., Switzerland, Hungary, Poland, Jugoslavia, Kenya, U.A.R., Turkey, South Africa and Mexico.

The passport is printed in the language of each user country with both a French and an English translation.

It has improved health and customs controls. Its use has extended to Breeding and to Saddle horses.

A. The Issue of the Passport

For each thoroughbred born in France, the description of which has been settled under the dam by an Officer of the National Stud Administration, the Ministry of Agriculture issues a certificate of origin on which the description of the foal is written.

This certificate of origin is then sent to the Société d'Encouragement by the Ministry. The description is immediately typed upon the central page of the passport; then this page is signed by a veterinary who certifies it true to the certificate of origin.

The central page is then filed in the documents of the horse.

As soon as he needs it (export, sale, training, show-jumping, breeding), the owner of the horse receives, when requested, the central page. He has to ask a veterinary (approved by the Société d'Encouragement), to verify the description of this horse. Then this veterinary draws the outline diagram of the horse and writes either the modifications (body colour, sex) or the corrections he has to do on the original description. He certifies true or not the description of the animal, dates, signs and sets his seals.

The central page is then sent back to the Société d'Encouragement where the concordance between the original description, the outline diagram and eventual remarks, is verified by a veterinary. If he agrees with this central page, he signs in the left lower part, after he has verified that the veterinary is approved by the Société d'Encouragement and that his signing is true to the one registered; in case of disagreement, the central page is sent back to the approved veterinary for more informations.

When an important correction is made by the approved veterinary, the central page with the certificate of origin is sent to the Ministry in order to ask them to rectify the description.

The signed central page is then dated and provided with an administrative seal, and enclosed in the passport which is sent to the holder of the horse. If the passport is lost, investigations are made in order to find the last holder. If the holder is not found, a new central page is issued and the identity of the horse is verified again as described above.

It has been decided that no more duplicate will be issued, because it is impossible to be sure of the identity of the animal for which the duplicate has been called for.

When a second passport is issued for a given horse, a comparison is drawn with the photostat-copy of the first central page of the first passport.

It is to be desired that this system of passport would be used for all light bred horses in France.

As a matter of fact, this is the essential basis for both prophylaxis and fair races, and truth of genealogy.

At least, in case of horses with no marks, in the near future; one will indicate on the central page the outer morphology of night-eyes scheduled under a code-number, as well as the reference number of blood-group (hemotype).

B. Use of the Passport for Racing Purposes

1) In France

Any horse declared in training is provided with a passport by the care of the Société d'Encouragement.

This passport should be produced to the Racing Authorities
- before the running of the first public race
- before each exportation or after reimportation
- before each race in which the horse has been entered to be claimed.

The Société d'Encouragement acting in its quality of "Leading Society" in charge of the French "Code des Courses" and representing the French Steeple-Chases Society prepares for each flat and jumping race disputed in France the elements of compulsory checkings of horses identity to be made on racecourses.

The results of these checkings and the eventual enquiries on substitutions are centralized in the office of the Société d'Encouragement which created a specialized service and keeps a central file composed of the photostat copies of all the passports in circulation.

Unexpected checking ups of horses identity at certain races all over the country are also operated by the Veterinary Surgeons of the French National Federation of the Racing Societies.

2) Use of Passports when Horses go Abroad

The passport endorsed with a visa dating from less than three months delivered by the Racing Authority of the country from which the horse comes from, is the only document required for racing in Great-Britain, Ireland, Belgium, Netherlands, West Germany, Italy, Spain, Austria, Algeria, Tunisia, Morocco and Czechoslovakia.

If the horse remains more than three months abroad a certificate of exportation is forwarded to the foreign Racing Authority which then uses the passport in the same manner as those delivered by its own offices.

Before the exportation of a horse, the passport must be endorsed, by the Racing Authority of the country of origin which states that the said horse is not in the forfeit list.

The Health authority visa put down by a veterinary surgeon certifies that the horse is sound and has not been on any premises on which existed any contagious notifiable disease of equines.

When a passport is stamped for exportation the Racing Authority of the country of destination is advised by the Société d'Encouragement which accompanies this information with a racing performance record.

The "Union Nationale Interprofessionnelle du Cheval" is also kept informed of all exportation.

C. Use for Breeding Purposes

1) In France

The French Ministry of Agriculture has given all necessary instructions to the "National Studs" to use the passport for checking the description of English thoroughbred breeding animals specially of the mares when the description of the produce under the mother is taken down.

In order to be valid the passport should bear the stamp of the Stud Book department which authenticates the mention of the registration in the French Stud Book.

The Société d'Encouragement achieves the necessary procedure at the mere request of the concerned breeders.

Moreover the French Breeders Syndicate requested the Société d'Encouragement to provide with a passport all the yearlings put up for public auctions.

2) Use Abroad

Any mare going abroad for a covering season (stay not exceeding one year) needs only be accompanied by her passport endorsed by the Société d'Encouragement before exportation and stamped by the Stud Book Department.

The Société d'Encouragement has to inform the Racing Authority of the country of destination about the date of the départure of the mare, her stationing place abroad and the name of the stallion to which she is to be presented.

It is also precised whether the mare is in foal, barren or accompanied by foal.

Reciprocally the mares coming from the countries which have adopted the passport are admitted in France, with their passport stamped by the Racing Authority of their country of origin.

The Société d'Encouragement achieves the procedure of registration in the French Stud Book and controls the stay of the mare in France by means of an appropriate form (appendix 3).

D. Use For Saddle Horses

In order to promote the sale of thoroughbred horses taken out of training, the Société d'Encouragement with the approval of the French Ministry of Agriculture puts at the sellers' disposal a form of sale agreement with limitation of use (appendix 4).

This form signed by both the vendor and buyer is filed with the Société d'Encouragement which publishes the sale agreement with limitation of use in the "Bulletin Officiel des Courses".

A special mention to this effect is put down in the passport and on the safe custody receipt of the certificate of origin.

To conclude, the use of the passport since its introduction in 1964, has proved the efficiency of this document:

1) Suppression of substitutions of horses by systematic control
2) Suppression of frauds, the passport being for the English thoroughbred racehorses the only identity document in circulation
3) Simplification of the procedures for exportation
4) Simplification of customs controls and suppression of delays at frontiers customs houses
5) Severe health control
6) Vaccinations control
7) Checking ups of breeding animals' identity
8) Guarantee for sellers of thoroughbreds destined to "saddle use"
9) Guarantee for buyers of yearlings.

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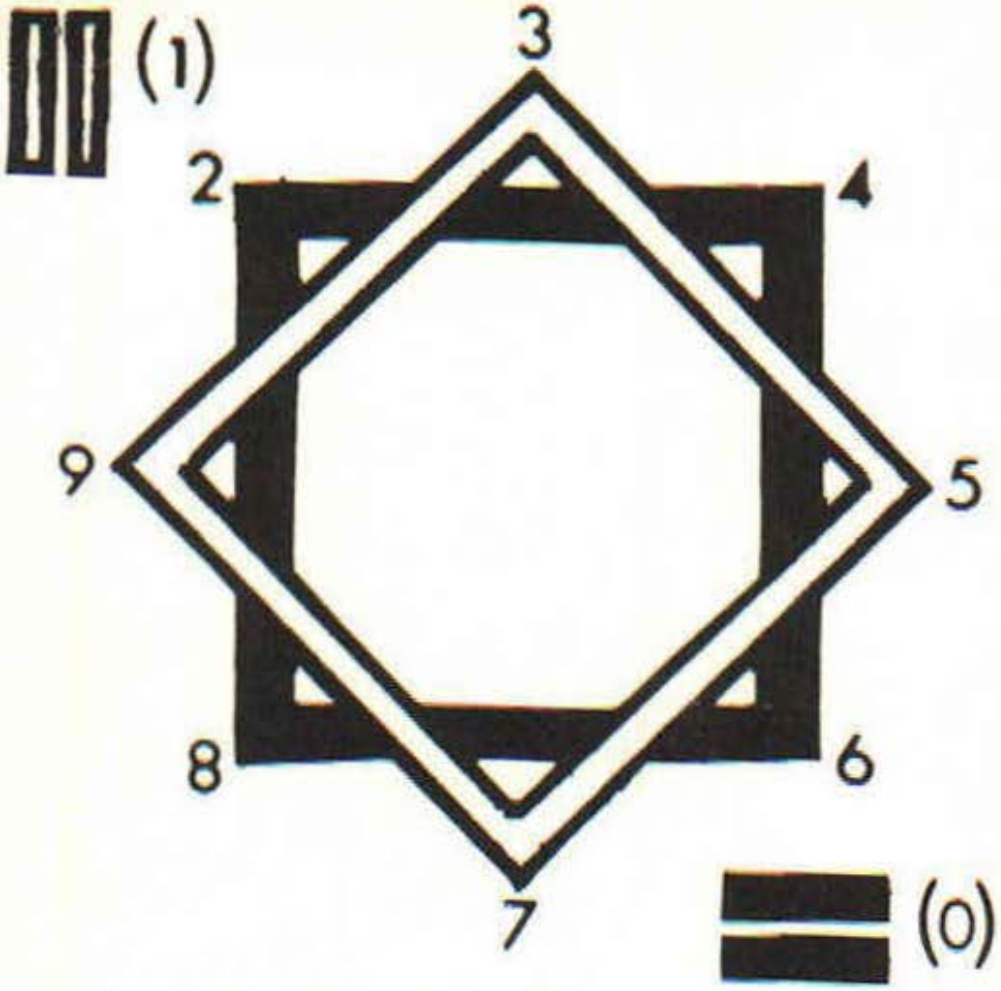

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