A global survey of semen straw bar-coding practices and capabilities at bovine semen collection centers

J. M. DeJarnette[1], O. Gérard2[2], F. Schmitz-Hsu[3], J. Baltissen[4], J. Hooijer[5], L. Morelli[6], R. Spelman[7], L. Journaux[8] and B. Wickham[9]

[1]Select Sires, USA
Corresponding Author: jmdejarnette@selectsires.com
[2]Allice, France
[3]Swissgenetics, Switzerland
[4]Bundesverband Rind und Schwein, Germany
[5]CRV BV, The Netherlands
[6]INSEME spa, Italy
[7]LIC, New Zealand
[8]France Genétique Elevage, France
[9]ICAR, Italy

Abstract

A global survey was conducted to assess straw bar-coding practices, capabilities, and potential hurdles to implementation at bovine semen collection centers (SCC). The survey was distributed to recognized members of ICAR and NAAB. Responses were received from 31 SCC representing 14 countries and ~162 million straws of annual production. Only 8 of the 31 SCC (26%) indicated bar-codes are presently in use representing Europe (5), China (2), and North America (1). The 128 bar-code format was consistent across SCC. Information contained in the bar code varied slightly by SCC. Most SCC included sire identity and collection date (n=7). ICAR code identifying physical/geographic location of semen collection was included by 4 SCC. One organization included a batch number in the barcode which requires connection to central database for interpretation. More than half of SCC (20/31) indicted their present straw printing equipment has the capacity to print bar codes. The perceived lack of demand or need in the industry was viewed as the primary hurdle to implementation by 51% (16/31) of SCC. To a lesser extent, equipment expense (n = 11) and computer programming (n = 10) were also viewed as hurdles to implementation. Sixty-eight percent of SCC (21/31) offer sex-sorted semen but varied in how conventional and sex-sorted were distinguished within sire: 10 SCC used an alpha numeric field, 8 use a separate NAAB marketing code, and 3 reported other methods. In summary, the present capacity for straw bar-coding exceeds the application and the primary obstacle to implementation appears to be the perceived lack of need, utility, and (or) user-friendly application at the farm level. Enhanced efforts at the farm level to facilitate cow-side data capture, transfer, and storage in on-farm record keeping systems are likely necessary to generate producer demand which will in-turn drive global bar-code application by SCC.

Introduction

Accuracy of data recording is an essential component of the integrity and utility of any data management system. In the absence of mandatory requirements or incentive-based programs, easy of data reporting is critical to voluntary user adoption.

The global bovine artificial insemination industry is approaching 80 years of age and annual production is estimated in excess of 250 million straws. In most developed countries, extensive systems are implored for data recording and ultimately reporting to a centralized database for the purpose of comparative herds management analysis, genetic evaluations, and sire fertility evaluation to mention but a few purposes. Computerized on-farm herd management software has greatly enhanced the efficiency of these efforts. More recently, RFID provides a mechanism to enhance both accuracy and efficiency of data reporting for the female being milked, inseminated, evaluated, or treated.

Unfortunately, data recording of service sire information in most countries has progressed very little over time. Though now recorded in computers rather than barn chart, the process remains largely a manual process subject to clerical errors. In addition, tracing sire fertility potential to the freeze batch level has great potential to enhance our understanding of the relationship of semen quality to fertility and thereby enhance the efficiency of the semen quality control program. However, recording of freeze batch is rarely practiced in most countries.

Straw printer with the capacity to include a bar codes on straws have been available since the 1990's. Though several European AI organizations have successful implemented barcoding semen straws, most AI organizations globally have not. The objective of this survey was to assess current bar-coding practices and capabilities at global AI centers regarding straw and identify some of the major hurdles to greater implementation.

Materials and methods

The list of questions for this survey were composed by the 2018 ICAR artificial insemination and related technologies working group. The questions were assembled in an on-line answer format and distributed by the National Association of Animal Breeders to all bovine AI organizations with registered NAAB-ICAR recognized stud code and marketing codes. The survey was conducted during Nov. and Dec. of 2018. Due to the nature of surveys, it was anticipated responses would yield a small sample size of likely biased results and no statistical analysis was intended. Data are simply presented as numeric tallies.

Results and discussion

The global distribution of participants by continent and sum of total annual straw production is presented in Table 1. A total of 31 organizations participated in the survey representing 4 continents and 162,378,000 straws annually. Although South America was not listed as a contributor, at least 4 organizations acknowledged they have production centers in Latin America even though their primary production center was in Europe or North America.

Table 1. Survey participants by continent and total annual straw production.

Continent	No. organizations	Total annual straw production
Europe	10	37,350,000
North America	15	111,178,000
Asia	3	5,000,000
Australia/New Zealand	3	8,850,000
Total	31	162,378,000

Participant responses regarding the capability of existing equipment to print bar-codes and current implementation rates are presented in Table 2. More than half of participant possess equipment capable of printing bar codes but only a fourth actually implement bar-coding at present, with the majority of those residing in Europe.

The information and format of information included in bar codes are presented in Table 3 and clearly illustrate a lack of uniformity that could be problematic to global efforts to standardize data bases and recording.

The perceived primary obstacles to greater implementation are presented in Table 4. Lack of need or demand at the farm level was the predominantly mentioned obstacle though equipment expense and programming requirements were acknowledged as hurdles. Among open form write in comments, space on the straw was noted as an obstacle.

Table 2. Current bar-coding practices and capabilities

Continent	Number of organizations with equipment capable of printing bar-codes	Number of organizations currently implementing bar-codes
Europe (n = 10)	7	5
North America (n = 15)	9	1
Asia (n = 3)	2	2
Australia/New Zealand (n = 3)	2	0
Total (n = 31)	20	8

Table 3. Information included in bar-codes among organizations that presently use of bar-codes.

Organization	Semen collection center	Sire by registration number	Sire by ICAR-NAAB code	Freeze batch format	Batch number
China - A	Yes	Yes	Yes	DDMMYY	
China - B			Yes		
France		Yes		DDMMYY	
Germany (n = 2)	Yes	Yes		YYMMDD	
Netherlands	Yes		Yes	MMDDYY	
Switzerland	Yes				Yes
United States			Yes	MMDDYY	

Table 4. Primary obstacle to greater implementation of bar-coding.

Continent	Lack of need, demand at the farm level	Equipment expense	Programming needs
Europe (n = 10)	4	1	1
North America (n = 15)	10	7	8
Asia (n = 3)	1	2	1
Australia/NZ (n = 3)	1	1	0
Total (n = 31)	16	11	10

Table 5. Is sex-sorted semen offered and how is sex-sorted semen distinguished from conventional semen?

Continent	Offer sex sorted semen	ID by Marketing code	Alpha-numeric field	Other
Europe (n = 10)	8	0	5	3
North America (n = 15)	7	5	2	
Asia (n = 3)	3	1	2	
Australia/NZ (n = 3)	3	2	1	
Total (n = 31)	21	8	10	3

The number of organizations offering sex-sorted semen and the way sex-sorted semen is distinguished from conventional is presented in Table 5. Most organizations offer sex-sorted semen but considerable variation exists in how it is distinguished, with slightly more organization using an alpha-numeric field as opposed to separate NAAB_ICAR marketing codes. Interesting was the tendency for most organizations in North America to use marketing codes while European organizations used alpha-numeric fields.

Summary and conclusion

The capacity to implement bar-coding at global AI organizations presently exceed the implementation rates. Perceived lack of demand at the farm level was the most cited obstacle to implement. Considerable variation presently exists globally in straw identification procedures both within text within bar-codes themselves, which may present considerable challenges to global data assimilation efforts.