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## **Prevalance of Hereditary Disorders in Imported Brown Swiss Bull Sperms throughout Ten-Year Period**

**Mustafa Cam**  
Selcuk University

**Seref Inal**  
Selcuk University

**Abstract:** The purpose of this study was to determine hereditary defects of frozen Brown Swiss bull sperms imported to Turkiye during the period between 2013 and 2022. The data were obtained from website of General Directorate of Livestock of Ministry of Agriculture and Forestry. The hereditary status of each imported bull was examined on various website producing bull sperms or including their databases. Totally, 37 of 375 bulls whose frozen sperms imported to Turkiye carry at least one genetic defect. A total of 30 bulls carried Braunvieh Haplotype 2 which was the most prevalent disorders among examined ones. The carried bulls were reported to be originated from USA, Germany and Italy respectively. The study was first to examine occurrence of hereditary disorders of imported Brown Swiss bull sperms in Turkiye. The result of this study would be a beneficial for authorities to make more precautions during importing frozen bull sperms against genetic pollution.

**Keywords:** Brown swiss, Frozen sperms, Hereditary disorders, Genetic defects, Genetic pollution,

### **Introduction**

The artificial insemination (AI) implementation has been popular for decades in Türkiye. Almost all heifers and cows are getting pregnant via AI implementation. For this purpose, a considerable amount of frozen sperm has been imported annually. The procedures and principles regarding the import of sperm, ovum and embryo were issued by General Directorate of Livestock of Ministry of Agriculture and Forestry.

Although considerable number of Brown Swiss Bulls bred for the purpose of producing frozen sperms carried some hereditary disorders, there is no regulation against importing frozen sperm straws of carriers. Hereditary disorders cause genetic pollution throughout worldwide. So, the frozen sperms should be tested for common hereditary disorders and the results should be specified in pedigrees. The aim of this study was to determine hereditary disorders of frozen Brown Swiss Bull sperms imported to Turkey between 2013 and 2022.

### **Method**

The excel worksheets including the name and ID of the bulls, the related companies and the number of straws were downloaded in the website of General Directorate of Livestock of Ministry of Agriculture and Forestry. In this study, hereditary status of imported Brown Swiss bulls throughout the last ten-year period were examined and separated into years and origins. Some of imported bulls were the same bulls which were imported in different years. So, they combined for general examination which reduced to 375 bulls (1777220 straws). Table 1 showed websites of various companies that produce sperms, bull catalogues and databases of Brown Swiss bulls. Effect of number of carriers on different year was analyzed using Chi-Square analysis in SPSS (ver. 25.0). %5 confidence interval was accepted for the significance level of the tests.

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- Selection and peer-review under responsibility of the Organizing Committee of the Conference

Table 1. Websites of various companies investigated in the research

Company	Websites
Braunviehzuchtverband	www.braunvieh.it
Zuchtwert Austria	www.zuchtwert.at
ST Genetics	www.stgen.com
Accelerated Genetics	www.accelgen.com
ABS Global	www.absbullsearch.absglobal.com
World Wide Sires	www.ct.wwsires.com
Genex	www.catalog.genex.coop
Aberekin	www.aberekin.com
New Generation Genetics	www.brownswiss.com
Superbrown	www.superbrown.it
Club Brown Swiss du Quebec	www.brownswissquebec.com
Synetics	www.evolution-xy.international.com
Swiss Genetics	www.swissgenetics.com
Brown Swiss Association	www.brownswissusa.com
Brune Genetique Services	www.brune-genetique.com
DataGene	www.datagene.com.au

## Results and Discussion

Brown Swiss cattle has been breeding in Turkey for years and well accepted by farmers in terms of its beef and adaptation capabilities. The study was the first to examine all Brown Swiss frozen sperms imported to Turkiye throughout ten-year period. Table 2 shows hereditary defects of Brown Swiss frozen sperms imported throughout the last ten-year period. The results showed that 37 of 375 imported bulls carried at least one genetic defect. BH2, characterized by high newborn mortality (Schwarzenbacher et al, 2016), was the most commonly seen hereditary disorder to compare with other defects.

Table 2. Hereditary defects of the Brown Swiss frozen sperms imported between 2013 and 2022.

Hereditary defects	Carriers (n)	Straw (n)
BH2	30	184388
SM	1	18605
W	2	11100
BHD	2	8775
A	1	1950
BH14	1	5000

Frequency of hereditary defects in different years was presented in Table 3. Significant differences were observed among carriers imported in different years. No carriers were determined in the bulls imported after 2018.

Table 3. Effect of year on frequency of hereditary disorders of the Brown Swiss frozen sperms

Year	n	Carriers rate	Straw Number of Carriers	Total Straw Number
2013	38	21,05 <sup>ab</sup>	23332	173677
2014	50	30,00 <sup>a</sup>	55797	214682
2015	64	14,06 <sup>b</sup>	55543	361153
2016	44	9,09 <sup>bc</sup>	14127	191161
2017	36	2,78 <sup>c</sup>	3010	178228
2018	26	30,77 <sup>a</sup>	66409	157762
2019	15	0	0	54365
2020	43	0	0	121982
2021	74	0	0	191553
2022	52	0	0	132657

<sup>a,b,c</sup>: Different superscripts in the same column show significant differences.

Frequency of carriers from different countries were shown in Table 4. The results showed that majority of Brown Swiss bull frozen sperms were imported from Italy, Germany, Switzerland and USA respectively. More than 10% of imported Brown Swiss bulls from USA, Germany and Italy carried at least one genetic defect.

Table 3. Frequency of carriers from different origins.

Year	n	Carriers rate (n)	Straw Number of Carriers	Total Straw Number
Austria	13	0	0	61425
Switzerland	54	3,70 (2)	14092	284011
Germany	77	11,69 (9)	33642	349117
Spain	4	0	0	41476
France	19	5,26 (1)	18605	76577
Italy	159	10,06 (16)	128801	817444
Netherlands	1	0	0	20192
USA	48	16,67 (8)	26078	126978

## Conclusion

The study showed that the highest frequency among investigated hereditary disorders was Braunvieh Haplotype 2. The highest frequency of carriers was originated from the bulls imported from USA, Germany and Italy respectively.

## Recommendations

The result of this study encourages authorities to make more precautions during importing frozen bull sperms against genetic pollution.

## Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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### Author Information

#### Mustafa Cam

Selcuk University Faculty of Veterinary Medicine,  
Department of Animal Science, 42003, Konya, Turkiye  
Contact e-mail: [mustafa.cam@selcuk.edu.tr](mailto:mustafa.cam@selcuk.edu.tr)

#### Seref Inal

Selcuk University Faculty of Veterinary Medicine,  
Department of Animal Science, 42003, Konya, Turkiye  
Contact e-mail: [sinal@selcuk.edu.tr](mailto:sinal@selcuk.edu.tr)

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