Data Retrieval Committee Statistics of Embryo Transfer- Year 2007

The worldwide activity in farm animals embryo transfer.

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Summary

The numbers this year are highly underestimated due to difficulties in retrieving data from some countries. From the data available, **577,900 vivo-derived bovine embryos** were transferred, which represents a reduction of about 15% as compared with the previous year. However, from those regions where the data have been satisfactorily collected, it appears that there was a general trend of increased numbers of embryos transferred, particularly in North America and Europe in 2007. According to those somewhat partial data, North America is involved in more than 52% of the total ET activity and Europe represents about 17% of the ET activity. One striking feature is that in almost all regions reporting, the beef breeds account for the two-thirds or more of the embryos collected and transferred. The total number of **in vitro-produced bovine embryos amounts to 245,260 this year,** which is less than 2006 (-16%). Again, this is related to the fact that all data have not been collected. One special case is the fact that Canada has reported export of 194,125 in vitro-produced embryos but only 11,800 have been reported as transferred so that the exact destination of the other 180,000 or so is not known. Clearly three countries Brazil, China and Japan use this technology widely in contrast to other regions where the numbers of such embryos transferred only represent a small proportion of bovine transferred embryos. According to the reports received this year and on **the whole for cattle species, 823,160 embryos** have been transferred in 2007. The partial data collected in small ruminants prove that embryos in these species are being transferred and moreover subject to some international movements, sometimes in significant numbers (i.e. more than 3,000 sheep embryos were exported). Equine embryos are also collected and transferred in particular in Argentina, Brazil and the USA, including for some frozen-thawed embryos. It is also difficult to retrieve data in porcine, however more than 3,600 swine embryo transfers have been here reported.

Introduction

This annual report of the IETS Data Retrieval Committee is the 17th in a row. The committee met at the IETS Conference venue in Denver in January 2008 making comments on the statistics recorded the previous year and planning to continue to improve the system. The year started well, with an interesting IETS meeting at which there were attendees from most regions around the planet. However, it is fair to say that for some unknown reasons at this stage, the collection of data this year has not be as efficient as the previous years. There are major countries from where it was impossible to retrieve data or only very partial data. As a reminder, the basic policy of this committee is not to make samples and extrapolations but rely on accurate data collected first from the practitioners around the world, then anonymously compile data on a national or regional basis, which is then summarized by the chair of this committee. The later has sent so many letters or passed so many phone calls to try to have as an accurate picture as possible of what the ET industry is achieving in the livestock industry. It must be said, this year was a little disappointing in not getting some of the data that used to be retrieved previously. However, it was decided that it would be unfair to those who made the efforts to collect accurate numbers from various regions in the world not to report those data, so the present has been written for publication. It should be realized that many of the numbers are underestimated and therefore it will be difficult to draw any definite conclusions on the trends that could be observed from one year to the other. There is quite a contrast in some parts of the world between what had been collected the previous years and what is reported this year. The committee certainly hopes that decisions and commitments by IETS members will be taken at its next meeting so that the situation improves for the next report.

1. The overall activity of Bovine *In Vivo*-derived embryos in 2007.

From the data reported, the number of flushes was just over 122,000 in 2007 (Table 1), which is close to that of last year. This resulted in collection over 760,000 transferable embryos, which resulted in a little less than 580,000 being transferred. The ratio of fresh and frozen embryos is again close to 1/1 with some minor variations according to region. With the remarks made above, about the less successful retrieval than last year, this number of 580,000 is close to –15% as compared to the number of 2006. There is obviously a lot of underestimation. Due to this observation, it is not possible to draw any global conclusions on the real trend of the ET industry worldwide this year. There could be some reduction in specific countries but certainly in those regions where the data have been consistently retrieved from one year to another, a significant increase was observed. For example in Europe and in North America, there is an increase in numbers of transferred embryos of + 11% and + 3%, respectively. The same holds true for Africa where the vast majority of the embryos collected and transferred come from the Republic of South Africa. This region has also increased its numbers here by more than 30%.

Table1. Overall Activity of In Vivo-Derived Bovine Embryos in 2007

CONTINENTS	FLUSHES	TRANSFERRABLE EMBRYOS	NUMBER OF TRANSFERRED EMBRYOS			
			FRESH	FROZEN	TOTAL	PERCENTAGE
AFRICA	1,916	13,459	3,235	4,181	7,416	1.3%
N.AMERICA	68,633	424,053	136,481	165,501	301,982	52.2%
S.AMERICA	14,505	73,891	49,273	17,635	66,908	11.6%
ASIA	17,563	135,016	38,601	57,132	97,733	16.6%
EUROPE(*)	18,332	106,284	49,973	47,994	97,967	16.9%
OCEANIA(**)	1,689	10,764	4,177	3,694	7,871	1.4%
TOTAL	122,638	763,467	281,740	296,137	577,877	-

(*) Those European data are derived from the statistics of AETE 2008 and a few recorded later

(**)Due to lack of responses from many ET teams from this continent, this line is highly underestimated.

For the same reasons, the distribution of the numbers of embryos collected and transferred according to regions is biased. From the figures shown in Table 1, one sees more than 50% of *in vivo*-derived embryos originate from North America, close to 17% both from Europe and Asia (with only partial data from this region) and around 12% from South America (also not complete). From the tables and comments sent by the regional collectors, a certain number of points may be shared. From Africa, more than 90% of the embryos collected and transferred come from the Republic of South Africa. It is of note that the majority (78%) comes from beef breeds, the compliment from other native breeds and little from dairy. Several hundred frozen embryos were imported, 2,800 exported and more than 9,000 embryos are in storage. In North America, a very well documented report has been put together once more in Canada, including the transfers made by Canadian practitioners overseas. Domestically, 54,000 embryos were transferred, close to 2,000 embryos were sexed and transferred as fresh embryos with 800 sexed embryos frozen and then transferred. Splitting embryos is still quite a popular procedure and 1,049 of such embryos were transferred. More than 500 embryos were imported and close to 20,000 were exported. Finally, 76,000 embryos are in storage in Canada.

In total, the US has transferred 247,736 bovine embryos, which ranks them first for a single country worldwide. The practitioners report the breeds of origin of the embryos and it is of note that this year, two thirds of the embryos transferred were from beef cattle. Just slightly more than 50% of embryos transferred were frozen-thawed. Almost 48,000 embryos have been exported during the Fiscal Year 2007 and 1,800 imported. From the 134 teams that sent their data, it is reported that more than 120,000 are in storage. In South America, Brazil has transferred 41,402 *in vivo*-derived embryos (vs. close to 200,000 *in vitro*-produced embryos) and a little more than 90% are

from beef breeds. The same percentage holds true for Argentina although the absolute numbers are much less (see Table 3). The Argentinean collector reports that 3,616 embryos have been exported from the teams who responded and 12,401 embryos are in storage. Data from Asia are only partial this year. From the Japanese report, it is shown that 90% of the embryos transferred are from beef breeds. The total number of *in vivo*-derived embryos stored is 29,000. Korea also is much more active in the *in vitro* production than in the *in vivo* -derived collection. From the 2,000 embryos transferred, 80% are from beef breeds. The partial report from the People Republic of China gives a total number of embryos of close to 34,000 embryos of which 54% were transferred as fresh and almost 20,000 are currently in storage. From Oceania and from the partial data collected, it appears that most of the cows flushed were from beef breeds in Australia and dairy in New Zealand. Several thousands of embryos were exported from Australia (around 3,000) and several hundred from New Zealand. Similarly more than 6,000 embryos are in storage in Australia and about 300 reported in New Zealand. In Europe, more than 18,000 flushes were performed this year with close to 100,000 embryos transferred. The breeds of origin were not reported and it is of notice that there was a slight majority of such embryos being transferred as fresh (51%).

Table 2. The Top Twelve European Countries Ranked According to Numbers of In Vivo-Derived Embryos Transferred in 2007 (AETE, 2008).

COUNTRIES	NUMBER OF FLUSHES	NUMBER OF EMBRYOS TRANSFERRED
FRANCE	5,753	33,687 ↗
NETHERLANDS	3,470	15,350 ↘
GERMANY	2,430	13,929 ↗
ITALY	2,350	12,153 ↗
CZECH Republic	1,002	5,828 ↘
UNITED KINGDOM (*)	N D	5,717 ↗
DENMARK	548	3,447 ≅
FINLAND	430	2,850 ↗
SWITZERLAND	413	2,552 ↗
SPAIN	467	1,893 ↗
IRELAND	391	1,972 ↗
BELGIUM	232	1,359 ↘

(*)This is the only data available for this country this year.

↗↘≅ evolution as compared to the previous year

From the remarkable report collected by the AETE, it is interesting to see the trends observed in various countries of this continent. As shown on Table 2, France ranks first with a further increase in the numbers of flushes and embryos transferred. The Netherlands and Germany, like last year rank 2nd and 3rd, respectively, with numbers around 15,000. The former have reduced their activity a little whereas the German practitioners have slightly increased theirs. Among those countries, Italy has seen its activity significantly increased, and so have performed U K, Finland, Switzerland, Spain and Ireland. The top five countries outside Europe and North America are listed in Table 3. Unfortunately, data from the People Republic of China collected this year are very partial, which most likely explains why the numbers are about 4-fold less than those recorded in 2006. Japan ranks first with close to 60,000 embryos transferred, most of them frozen. Brazil with about 47,000 embryos transferred ranks second. Argentina with more than 20,000 and the Republic of South Africa are the other two countries of this group with respectively more than 20,000 and 7,350 embryos transferred.

Table 3. The Top Five Countries Outside Europe and North America in 2007.

COUNTRIES	NO. FLUSHES	NUMBER OF EMBRYOS TRANSFERRED		
		FRESH	FROZEN	TOTAL
JAPAN	9,459	18,278	41,414	59,692 ↗
BRAZIL	9,405	41,402	5,292	46,694 ↘
P. R. CHINA(*)	7,338	18,310,	15,511	33,821 ↘
ARGENTINA	5,063	7,838	12,306	20,144 ↗
SOUTH AFRICA	1,873	3,188	4,162	7,350 ↗

(*) partial data

2. The overall activity of Bovine *In Vitro*-produced embryos in 2007.

The total number of bovine *in vitro*-produced embryos amounts to 245,257 this year (Table 4), which is less than that of 2006 (-16%). This is again related to the fact that all data have not been collected. One special case is Canada, which has reported to have exported 194,125 bovine *in vitro*-produced embryos but only 11,786 have been reported as transferred in the People Republic of China. As the exact destination of those 180,000 IVP embryos is not known with certainty, it was therefore impossible to take this enormous number in the total calculation. In speculating that half of those embryos have been transferred, it would result then a total number of about 330,000 which would be in fact a high increase compared to last year (290,000).

Examining the national reports in detail, one sees first from Japan, that there was a considerable number of transferrable embryos collected (around 138,000) but only a small proportion –less than 10% - were reported to have been transferred domestically (11,355). The destination of the other embryos is not known. The same holds true for Korea who recorded 31,967 transferable embryos but only 9,321 were transferred. In those two countries a significant proportion of such embryos were transferred as frozen (about half in Japan and 15% in Korea). On the whole, this results in a marked reduction of embryos transferred in that region although the number of embryos produced and transferable did not decrease.

Table 4. The Number of Bovine In Vitro-Produced Embryos Transferred in 2007.

CONTINENTS	TRANSFERABLE EMBRYOS	TRANSFERRED EMBRYOS		
		FRESH	FROZEN	TOTAL
ASIA	77,020	13,767	18,695	32,462
N.AMERICA	137,958	9,223	29	9,252
S.AMERICA	211,496	188,726	7,194	195,920
EUROPE	5,832	2,404	3,428	5,832
OCEANIA	2,275	1,392	399	1,791
TOTAL	434,581	215,512	29,745	245,257

In Brazil, 211,443 transferable embryos were collected and 195,811 were transferred with only 4% as frozen which is strikingly different from what is observed in Japan, these two nations together with the People Republic of China being the leaders in terms of *in vitro* -produced embryos transferred. In the other regions, transfer of IV embryos is not so widely used. Again, Canada produces a lot (close to 300,000 in total) but their final destination, place and numbers are not known for most of them. Only a small percentage derives from OPU (0.5%). North America has slightly increased its numbers both in Canada and in the US. Europe has slightly decreased but Italy has transferred the most with close to 10,000 as fresh and 2,300 as frozen. Europe records IVP embryos according to the collection procedure and the AETE reports that 70% of such embryos derive from OPU. Finally, in Oceania, only New Zealand has reported producing and transferring IVP embryos, 22% as frozen. Clearly three countries, Brazil, China and Japan use widely this technology in contrast to other regions where the

numbers of such embryos transferred only represent a small proportion of bovine transferred embryos. In total, for the bovine species, 823,160 embryos (*in vivo*-derived + *in vitro*-produced) have been transferred, as partially reported this year.

3. The results in the other species.

Data for the three species of ruminants investigated: sheep, goats and cervids are reported in Table 5. Again this year, only partial data have been collected which explains the much lower figures than last year and hence probably does not describe well the magnitude of the activity of the ET industry in such species. In sheep, the total number of embryos transferred is about half of that of last year and the proportion of frozen embryos here reported (23%) is also less that that of last year (45%). Some international movements have been reported (3,566 embryos exported), notably from Canada, the Republic of South Africa, Australia and New Zealand.

Table 5. Small Ruminants ET Activity in 2007.

SPECIES	TRANSFERABLE EMBRYOS	TRANSFERRED EMBRYOS		
		FRESH	FROZEN	TOTAL
SHEEP TOTAL	25,421	9,769	2,365	10,483
GOAT (*)TOTAL	2,434	1,110	113	1,223
CERVIDS TOTAL	566	601	89	690

The number of Caprine embryos recorded this year is also much smaller than last year with only 1,223 transfers most of which were done with fresh embryos. The majority of those originate from the Republic of South Africa, New Zealand, USA and also from Europe. More than 200 embryos have been exported from the Republic of South Africa and this country reports having close to 200 embryos in storage. Cervid embryos continue to be collected and transferred in numbers close to those of last year. Around 700 were so reported with 89 of them being transferred as frozen. The two countries involved in this species are Canada and New Zealand.

The Equine activity is reported in Table 6. Thanks to the efforts of some collectors, it has been possible this year to get rather more data than in the past. To the extent that for the first time, as high a number as close to 42,000 flushes has been recorded. Most of these collections come about equally from the three major countries involved in this industry: Argentina, Brazil and USA. In total, around 25,000 embryos have been transferred as fresh and more than 300 have been reported as frozen in the US. It could be noticed that in its European report, the AETE mentions that among the transferable embryos collected, there were in fact 32 that were *in vitro*-produced and that have been transferred.

Table 6 Equine ET Activities in 2007.

COUNTRIES	FLUSHES	TRANSFERABLE EMBRYOS	EMBRYOS TRANFERRED	
			FRESH	FROZEN
ARGENTINA	15,360	9,600	9,600	
BRAZIL	12,800	8,100	8,100	
CANADA	47	32	26	
EUROPE		764(*)	622	
SOUTH AFRICA	33	19	19	
AUSTRALIA	10	8	8	
USA	13,500	6,840	6,500	340
TOTAL	41,750	25,363	24,875	340

(*) including 32 In Vitro produced embryos

Finally, the Committee is trying to get some figures in porcine but with obvious difficulties because only a fewteams unfortunately forward their numbers. It can be seen from Table 7 that a significant number of porcine embryos have been collected and in particular in Korea where more than 64,000 of such embryos were assessed as transferable. However, only a smaller number is being transferred, 606 in Korea and more than 3,000 in Canada.

Table 7 Swine ET Activity in 2007.

COUNTRIES	FLUSHES	TRANSFERABLE EMBRYOS	TRANSFERRED EMBRYOS FRESH	TRANSFERRED EMBRYOS FROZEN	RECIPIENT FEMALES
CANADA	156	3,037	3,037		
KOREA	17	351			
(*)		64,147	606		
EUROPE (**)		621	32		
TOTAL	173	68,156	3,675		

(*) In vitro produced and clones

(**) From AETE statistics

In conclusion, the total output of this year data retrieval has been contrasted. A certain number of countries, notably from North America and Europe as well as some in South America, South Africa and Asia have been able once more to report accurate data, but in total, the lack of some teams or collectors to forward their data has prevented this report to be as close to the reality as it has been previously. It is the intention of the Committee to review and discuss the reasons why this has been this way this year and hopefully try to make it better next year because the Board of IETS as well as this Committee are well aware, by an experience of over 17 years, that those data are an excellent tool for communicating the benefits that this ET industry can provide to all farmers around the world.

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