Data Retrieval Committee statistics of Embryo Transfer- Year 2008. The worldwide statistics of embryo transfers in farm animals.

By Professor Michel Thibier – Chairperson

Summary

Again this year, the committee has managed to get some global statistics on the farm animals Embryo Transfer industry for the 18th year in a row. However, this year, it has been quite a challenge and more so than in previous years, to get the needed information. Unfortunately there are gaps and lack of reports from some countries from various regions in the world, which results in some underestimation of the true numbers. Nevertheless, **540,000 bovine *in vivo*-derived embryos** have been reported to have been collected and transferred this year around the world and on all continents. This reduction of about 6% compared to last year data cannot be directly related to any decrease of the activity of the industry. It is mainly due to the absence of reporting from major countries such as P R China, India, Taiwan in Asia and only partial data from some areas in South America and Oceania. From countries where the collection of data is satisfactory on the long term, one can see some slight variations this year, such as a small reduction in North America and Europe but an increase in South America and Japan. In terms of regional distribution, North America takes into account this year more than 52% of the total number of bovine *in vivo*-derived embryos with Europe comprising 17%.

The total number of **bovine *in vitro*-produced embryos amounts to 254,714 this year** which, is slightly more than the previous year (+ 4%) essentially due again to the significant increase in the *in vitro*-production of bovine embryos in Brazil.

According to the reports received this year and on **the whole for the bovine species, 794,400 embryos** have been transferred in 2008 (versus 823,160 in 2007). The partial data collected in small ruminants show that embryos in these species are being transferred and moreover subject to some international movements, sometimes in significant numbers (close to 5,000 sheep embryos were exported). Equine embryos are also collected and transferred particularly in Argentina, Brazil and the USA, including some frozen embryos. It is also difficult to retrieve data in swine, however more than 3,000 swine embryo transfers have been here reported.

Introduction

This annual report of the IETS Data Retrieval Committee is the 18th in a row. The committee met at the IETS Conference venue in San Diego earlier this year, with attendees from almost all regions in the world. There was a common view on the need to improve our network, which had showed some weaknesses this past year, for example when relying on one single person who might change his position and hence stop collecting data. From a tour de table of the committee members at this meeting, it was clear that a consensus emerged in order to improve the system and make every effort to stop the decline in getting data from the whole world. The members were also informed that the current Chairperson will stop chairing this committee after the 2010 annual meeting and hence 2009 will be his last year as the global data collector. This means that IETS will have to find someone willing to take over and chair this important structure of the Society. The current chair did emphasize the fact that these global statistics are very well received and in fact very useful to many institutions around the world in addition to highlighting and communicating on the dynamics of the Embryo Transfer industry worldwide.

Again from surveying the committee members attending that San Diego meeting, it was recommended to the Board of Governors to make every effort and take prompt action to continue the high standard work done by this data retrieval committee for almost 20 years. Reuben Mapletoft, on behalf of the Committee, very deeply thanked the current chairman for his fantastic dedication to the committee and the great success this endeavor has received for two decades all around the world.

However, by contrast to this friendly and somewhat enthusiastic meeting, the data retrieval this year for the 2008 data has been again disappointing and somewhat even more problematic than that of the previous year. For two years in a row, the number of data lacking either totally or partially has increased. There is a need here for the committee and the Board of Governors for a thorough brainstorming: including whether the BoG wishes to continue this data retrieval effort, should another methodology be used? These are some of the many questions that should be debated regarding this issue at the next IETS Conference.

Nevertheless, many national or regional collectors have responded and have put together their numbers and figures, which will allow this report to present data to the world even if it is quite underestimated in many cases as commented on below.

1. The overall activity of Bovine In Vivo derived embryos in 2008.

The total numbers of flushes and *in vivo*-derived embryo transfers in cattle have for the second year in a row decreased. Close to 112,000 flushes were performed around the world in 2008 and about 540,000 embryos were transferred (Table 1). Compared to the numbers collected last year, this represents a reduction of about 6%. However, it should be noted that this year again, there were major countries that did not report at all, notably the P R of China, India, Korea, Thailand and also some countries in South America. In addition, in some other areas of the world only partial data were received, notably from Oceania even though there was a significant progress this year and improvements noted after the chairperson had visited some colleagues in their region.

Table1. Overall Activity of *In Vivo*-Derived Bovine Embryos in 2008

CONTINENTS	FLUSHES	TRANSFERRABLE EMBRYOS	NUMBER OF TRANSFERRED EMBRYOS			
			FRESH	FROZEN	TOTAL & PERCENTAGE	
AFRICA	2,389	13,537	5,749	3,298	9,047	1.7%
N.AMERICA	67,681	419,846	131,934	152,009	283,943	52.6%
S.AMERICA	15,313	92,246	41,506	39,628	81,134	15.0%
ASIA	9,205	92,343	18,057	44,814	62,871	11.6%
EUROPE(*)	14,894	115,344	39,102	50,798	89,900	16.7%
OCEANIA	2,324	12,934	5,658	7,130	12,788	2.4%
TOTAL	111,806	746,250	242,006	297,677	539,683	-

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

The trend from 2007 to 2008 hence, varies according to regions and according to the efficiency of collecting data. For North America and Europe in which some consistency in the data retrieval network was observed, one can note a slight reduction in the numbers of embryos transferred (around – 5%) and the same holds true for Europe (- 8%), which could be related to the economic crisis occurrence in the second half of the year 2008. By contrast one notes that there is some increase in the activity in Africa (mainly the Republic of South Africa), and South America (mainly Brazil). In terms of respective distribution, North America takes into account almost 53% of the total number of embryos transferred, Europe close to 17% and South America 15%. The Asian percentage of activity has significantly declined this year (11.6%) due to the no collection of data from quite a few. From the tables and comments sent by the regional collectors, a certain number of points may be shared.

In Africa, the Republic of South Africa has seen its numbers increased during the course of 2008 with a 25% increase for example in the number of collections performed during this year as compared to the previous one. A quarter of those flushes were from dairy donors and the balance either from beef breeds or from local animals (6%). Domestically, 70% of the transferred embryos are fresh in both dairy and beef females. Close to 800 embryos have been imported, mostly from beef breeds and almost 1,000 (990 exactly) have been exported, again most being from beef breeds. RSA reports having more than 6,000 embryos stored in its tank from

various breeds including 11% of local animals.

From North America, the USA reports a slightly diminishing number of collections and embryos transferred (-6%) with the predominance from the beef breeds, which represent grossly the two-thirds of the activity. The fresh and frozen embryos are almost equally transferred with those frozen in their large majority being done so by Direct Transfer. More than 15,000 embryos have been exported (two-thirds from dairy breeds) and there are a considerable number of embryos in storage: 145-054 is the number resulting from all practitioners having given their figures. Canada has again released a comprehensive report on the ET industry in 2008. The dairy breeds take into account the vast majority of the industry with 80% of the flushes being performed on such dairy cows. From close to 90,000 transferable embryos collected, 63,000 of them were frozen. However, from the transfers reported, there is barely more embryos frozen transferred than fresh: 26,615 frozen embryos transferred vs. 23,247 fresh embryos transferred. The national collectors also report on some interesting features such as the following: fresh and frozen sexed semen embryos have been transferred in respectively 1,227 and 1,321 occasions. Close to 300 embryos have been split before transfer. Interestingly enough the mean pregnancy rates reported were 59.7% and 58.0%, respectively for fresh and frozen embryos – very similar obviously! Canada has close to 70,000 embryos stored, it has exported 14,112 embryos in 2008 and imported 324, mainly from beef breeds.

Europe also has seen its numbers slightly diminished (- 8%) in 2008 as compared to 2007. This is related to various trends between European countries. As seen in Table 2 for the top twelve European countries, France and the Czech Republic have seen their numbers drop although by contrast those in the Netherlands or in the United Kingdom have increased. The regional collector cannot give a true estimation of the percentages of embryos from dairy or beef cows because some countries do not report those to him. However, it is stated that there was on average 5.97 *in vivo* embryos collected per flushed donor and that the percentage of frozen embryos transferred was 56.3%

Table 2. The top Twelve European Countries Ranked according to numbers of In Vivo derived Embryos transferred in 2008 (AETE, 2009).

COUNTRIES	NUMBER OF FLUSHES	NUMBER OF EMBRYOS TRANSFERRED	
FRANCE	5,856	27,304	↘
NETHERLANDS	3,498	16,914	↗
GERMANY (*)	ND	14,077	≅
ITALY	2,089	12,353	↗
UNITED KINGDOM (*)	ND	6,110	↗
SPAIN	633	2,511	↗
DENMARK	489	2,757	↘
SWITZERLAND	485	2,700	↗
CZECH Republic	469	2,194	↘
IRELAND	410	2,219	↗
FINLAND	336	3,205	↗
BELGIUM	142	1,280	↘

(*)This is the only data available for this country this year.
↗↘≅ evolution as compared to the previous year

The top five countries outside North America and Europe have also some contrasted trends as compared to the previous year. The figures are reported in Table 3. Japan has again increased this year its numbers and from the 9,205 embryo collections performed this year, 7,433 (80%) are from the beef breeds. Most of the embryos transferred are frozen (only 30% as fresh) including of course the 1,400 embryos imported. This country did not publish the number of embryos that were exported this year. The Japanese collector indicates that there are about 32,000 *in vivo*-derived embryos in storage.

Table 3. The Top Five Countries Outside Europe and North America in 2008.

COUNTRIES	NO. FLUSHES	NUMBER OF EMBRYOS TRANSFERRED FRESH	FROZEN	TOTAL
JAPAN	9,205	18,057	44,814	62,871 ↗
BRAZIL	11,012	35,922	32,032	67,954 ↗
P R CHINA	ND	ND	ND	ND
ARGENTINA	4,301	5,584	7,142	12,726 ↘
SOUTH AFRICA	2,374	5,706	3,289	8,995 ↗

In South America, Brazil has continued to increase its activity not only for *in vitro*-produced embryos (see below) but also regarding *in vivo*-derived embryos in cattle, despite of the crisis, as stated by the national collector. The majority of the activity is in Zebu and beef cows as the dairy takes less than 20% into account of the total. However, the percentage of fresh and frozen embryos transferred differs by breed. For dairy donors, most (two-thirds) are transferred as fresh, in the beef breeds, almost as many fresh as frozen embryos are transferred. Import of embryos has not been reported this year in Brazil.

By contrast to the previous country, Argentina has reported a decline in the numbers of flushes and transfers by more than 30%. Even if one or two practitioners may not have delivered their numbers this year, it is reasonable to relate this reduction of transfers to the crisis that has severely impaired the Argentinean economy by the second half of 2008. Here like in Brazil the vast majority of embryos are from beef breeds (close to 90%) and if not taking into account the imported frozen embryos, domestically, the numbers of fresh and frozen embryos are almost identical (around 5,000 for each type). More than 1,000 embryos have been imported with half from dairy breeds and 6,379 embryos have been have been exported. The Argentinean practitioners estimate close to 15,000 frozen embryos are in their storage tanks.

2. The overall activity of Bovine In Vitro produced embryos in 2008.

As reported in Table 4, the total number of *in vitro*-produced embryos in cattle that were transferred is **254,714** and has increased by +4% compared to that of the previous year. However, they did not reach the record broken in 2006 with close to 300,000 IVF-produced embryos. This overall increase of this year compared to last year results from different trends in the various regions involved. Brazil in South America is obviously the major player in this field with on its own, 86% of the total IVP activity in the world. This is a 10%; increase approximately, as compared to the previous year. All of these embryos are derived from OPU and none from abattoir collection. It should be noted that at this stage, three quarters of the embryos transferred in cattle in this country, do come from IVP and only one quarter from *in vivo*-collected embryos. Again most of those IVF embryos are derived from beef breeds and mainly from Zebu females.

Table 4. The Number of Bovine *In Vitro*-Produced Embryos Transferred in 2008.

CONTINENTS	TRANSFERABLE EMBRYOS	TRANSFERRED EMBRYOS		
		FRESH	FROZEN	TOTAL
ASIA	80,817	6,666	5,989	12,655 ↘
N.AMERICA	17,747	13,142	0	13,142 ↗
S.AMERICA	220,465	204,029	16,412	220,441 ↗
EUROPE	7,832	2,314	3,287	5,601 ↘
OCEANIA	4,092	1,649	1,226	2,875 ↗
TOTAL	330,953	227,800	26,914	254,714 ↗

Asia and Japan mostly have still some very active units of IVF production of cattle embryos but the number has on the whole slightly diminished this year regarding the number of transfers. As far as the collection is concerned the numbers are still high with ~80,000 transferable embryos produced, out of which 78,000 were derived from abattoir collection, conversely to what occurs in Brazil. Here only 3% of the embryos so produced have been collected through Ovum Pick Up. Only a minor fraction of those produced embryos have been transferred (12,655). It should be noted that close to 50% of these embryos were transferred as frozen-thawed embryos (47% exactly). In addition the Japanese collector reports that 16,22 IVP embryos are in storage of which 95% come from abattoir collections. The US had produced 13,987 IVF embryos in 2008 according to their report, of which 12,843 embryos have been transferred fresh. The breed of origin of those embryos was not been reported. Canada reports having produced 3,850 IVP embryos in 2008 of which 650 (17%) were derived from OPU sessions. However, only a small number of them have been transferred domestically ~299. In total the number for North America of IVP transferred embryos has slightly increased as compared to the previous year. Europe reports having had 3,753 OPU sessions during this year with a number of 6,751 transferable embryos from those sessions with therefore a mean number of such transferable embryos of 1.8 per OPU session. In addition 1,081 embryos have been collected fro ovaries in abattoirs. This production figure is slightly higher than that of last year. However in terms of transfers, the total number has somewhat decreased (-7%). The 5,601 of such embryos transferred were for 59% of them frozen-thawed.

Finally in Oceania, the numbers of this year are quite higher than those of last year with more than 4,000 embryos produced and close to 3,000 transferred. All embryos come from OPU sessions with more than 2,000 of those reported with more than 18,400 oocytes collected out of which a little more than 4,000 transferable embryos were produced. As can be seen on Table 4, the number of frozen embryos so produced and transferred accounts for almost 43% of the total, showing obviously that there are definitely two options in transferring those IVP embryos either as fresh or as frozen. The pregnancy rates have not been reported in either circumstance.

According to the reports received this year and on **the whole for the bovine species, 794,400 embryos** have been transferred in 2008 (vs. 823,160 in 2007 and the record of almost 1 million in 2006).

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 just above 5,000 of which less than 10% were frozen as compare to the 43% rate of frozen embryos reported for the year 2006. The RSA reports having exported more than 2,600 sheep embryos and has 2,782 embryos in storage. Oceania along with RSA is the major providers of sheep embryos around the world have only transferred fresh embryos (2,200 approximately). Both Australia and New Zealand have reported exporting embryos in the magnitude of 1,200. Canada is another country having reported exporting sheep embryos (close to 1,000) and having performed the transfers in various regions such as South America, Central America and in the Caribbean. The remaining countries having reported to have some embryo transfer in this species are Argentina and in Europe, Romania and Turkey. Close to 400 embryo transfers have been performed in Europe in total.

Table 5. Small Ruminants ET Activity in 2008.

SPECIES	TRANSFERABLE EMBRYOS	TRANSFERRED EMBRYOS		
		FRESH	FROZEN	TOTAL
SHEEP TOTAL	18,828	4,793	433	5,226 ↘
GOAT (*) TOTAL	3,141	824	278	1,102 ≅
CERVIDS TOTAL	980	840	0	840 ≅

In goats, the figures reported this year are dramatically low with just more than 1,000 embryos being transferred, far from the ~ 20,000 reported two years ago. It is impossible to distinguish here what is due to the lack of reporting by the data retrieval collectors and what is due to the economics. New Zealand and the RSA seem to be the major contributors to this industry, each of those two countries being involved in some exports of Caprine embryos, the number recorded being in total just over 300. Romania in Europe has also reported some 75 transfers in goats and Canada has transferred some goat embryos domestically and in the Caribbean as well. As can be seen from Table 4, there are approximately a quarter of such embryos that were frozen thawed before transfer.

Finally, it is nice to see that the Cervine are still subject to embryo collection and transfer. This activity is performed essentially in New Zealand and in Canada. The Canadian teams have practiced some transfers in these species in the US, Mexico and in New Zealand. All those were fresh although some export has been reported and a few are stored in New Zealand.

The equine activity is reported in Table 6. Again it has been hard in this species to get some accurate data on time. We were confirmed that the numbers given last year were still valid in Argentina and in the US, only a few practitioners in these countries sent their data and that was obviously insufficient to reflect the reality. So with this exception here for this species, numbers given do not all derive from work sheets and do not result from exact

Table 6 Equine ET Activities in 2008.

COUNTRIES	FLUSHES	TRANSFERABLE EMBRYOS	EMBRYOS TRANFERRED	
			FRESH	FROZEN
ARGENTINA (*)	15,000	9,000	9,000	
	185	122	122	
BRAZIL	14,200	9,900	9,800	35
CANADA	42	36	36	
EUROPE (**)	1,216	1,043 (**)	1,014	
SOUTH AFRICA	56	48	48	
AUSTRALIA	24	15	15	
USA (*)	13,500	6,840	6,500	340
	115	78	71	4
TOTAL	44,338	27,082	26,606	379

(*) Estimation considered being similar to that of 2007 according to the national data collector.
(**) Including 48 *In Vitro*-produced embryos

counting of the embryos collected or transferred. One of the striking features of this table is that ET in equine is now performed almost all around the world and transfers have been reported in al regions including Africa, Oceania and the other continents except Asia.

Taking for granted that the large numbers in those two countries have not changed over the year, it is not surprising that the total number this year of 44,338 flushes and around 27,000 embryos transferred has increased compared to those of last year. Brazil for example has reported an increase in the number of embryos collected and transferred of more than 10%. There is some indication particularly in the southern hemisphere that the polo horses get more and more involved in the embryo collection and transfer procedures. Europe also sees its involvement increased and it is of notice that like last year there has been some IVF embryos produced and transferred from several countries including Austria, The Czech Republic, Finland, France, Hungary, Italy and the Netherlands.

Finally, the committee tried to get reports on ET in swine. This is not an easy job and I suggest that the Committee discusses the matter again to see whether it is worth the effort as very little feed back comes from the swine industry. However, we still got some data and think it would be unfair not to publish those that were sent to us for sharing, those numbers have been here reported on Table 7.

Table 7. Swine ET Activity in 2008.

COUNTRIES	FLUSHES	TRANSFERABLE	TRANSFERRED EMBRYOS		RECIPIENT FEMALES
		EMBRYOS	FRESH	FROZEN	
CANADA	15	341	341		21
KOREA	ND	ND			
EUROPE (*)		736	28		
USA	134	2,723	2723		
TOTAL	149	3,800	3,092		21

(*) From AETE 2009 statistics

It basically shows the world that some transfers being performed in this species. From a few teams having agreed to forward their data to the committee, we have been able to demonstrate that at least more than 3,000 embryos have been transferred in this species. It is of notice that some countries in Asia who used to be the most active investigators and accurately reporting to IETS usually did not send their data this year. This explains the much lower numbers here reported as compared to those of last year.

In conclusion, this year has been a hard year to retrieve data and something must be done inside the committee to try to make a better job and hopefully as good as it was in the 2005- 2006 years for instance. Beside this, those figures, nevertheless accurately and correctly collected, show that ET despite of the economic crisis has continued to be popular and efficient. There are all reasons to think that if this is so, it is most likely because of the tremendous help it gives to the farmers for managing their herds or flocks with economic comparative advantages and also with full health safety as shown every day when no diseases are reported to have been associated with such germplasm.

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