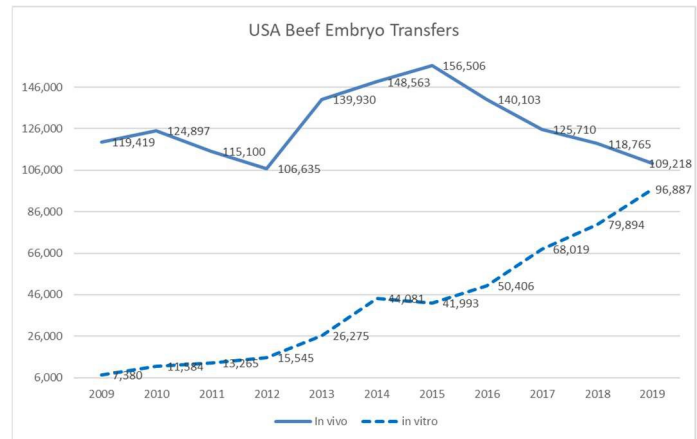
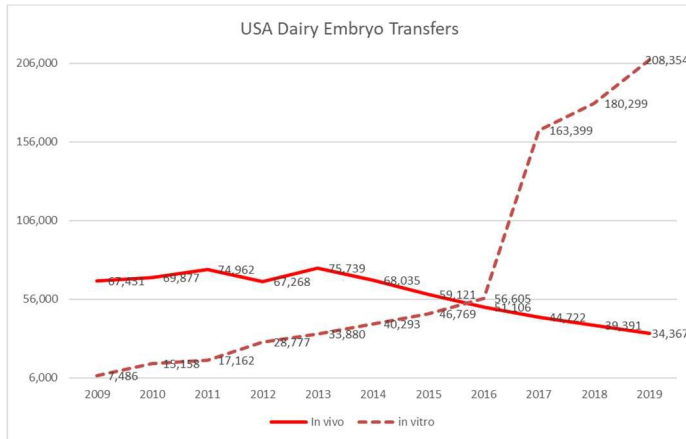


2020 STATISTICAL INFORMATION COMMITTEE REPORT (2019 DATA)

By Daniela Demetrio (chair), Charles Looney, Hoyt Rees and Michael Werhman

In 2018 the International Embryo Technology Society (IETS) recorded over one million *in vitro* produced (IVP) bovine embryos, accounting for 68.7% of the world total.

In 2019 the USA had a 7% increase in the number of bovine embryos transferred (+30,477), with a 10% decrease for *in vivo* produced embryos and a 15% increase in IVP embryos. The graphs below illustrate the number of Dairy and Beef *in vivo* and *in vitro* embryo transfers in the USA in the last 11 years.



Survey data is only as good as the quality and integrity of the data submitted by people. Before submitting your survey, please take a second look and make sure everything is correct. There are a lot of minor errors that can probably be fixed without us having to contact you for clarification. Thank you for taking the time to submit your data, it benefits the whole embryo industry. A special thanks to non-certified members and non-AETA members that voluntarily submitted data.

The data from 150 surveys including 266 embryo practitioners (61 non-members), 118 AETA certified Embryo Transfer Businesses (ETBs) are summarized below.

- 135 ETBs transferred embryos;
- 119 ETBs flushed cows;
- 52 ETBs performed OPU's;
- 16 IVP labs (fertilized oocytes and cultured embryos *in vitro*) reported data (some companies have several labs in different States but were reported as one).

2019 USA BOVINE EMBRYO TRANSFERS

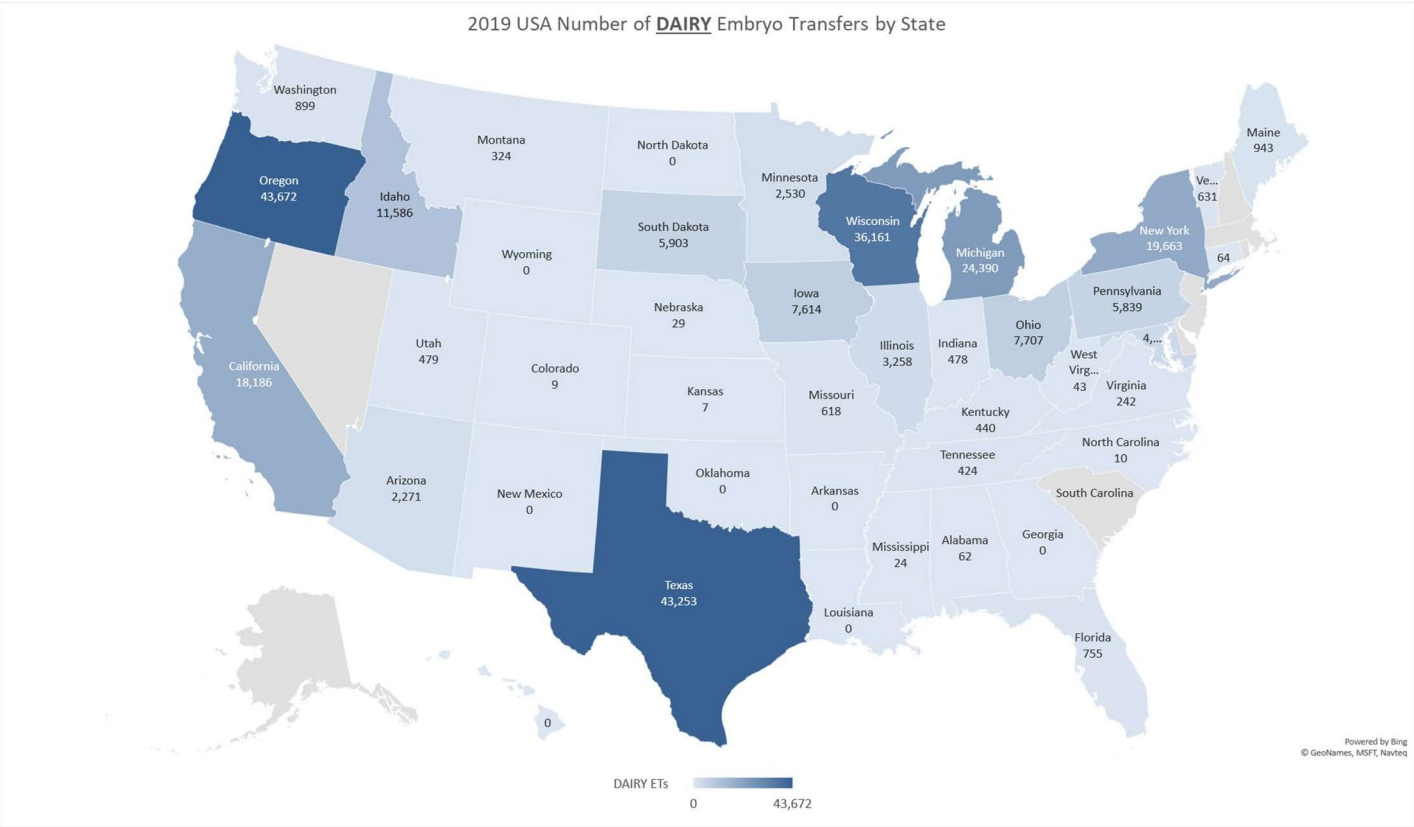
		IN VIVO			IN VITRO			TOTAL		
		FRESH	FROZEN	TOTAL	FRESH	FROZEN	TOTAL	FRESH	FROZEN	TOTAL
DAIRY	TOTAL	17,768	16,599	34,367	140,736	67,618	208,354	158,504	84,217	242,721
	%	52%	48%	14%	68%	32%	86%	65%	35%	54%
BEEF	TOTAL	32,820	76,398	109,218	31,975	64,912	96,887	64,795	141,310	206,105
	%	30%	70%	53%	33%	67%	47%	31%	69%	46%
TOTAL	TOTAL	50,588	92,997	143,585	172,711	132,530	305,241	223,299	225,527	448,826
	%	35%	65%	32%	57%	43%	68%	50%	50%	

2019 USA BOVINE EMBRYO TRANSFERS BY STATE AND NUMBER OF ETBS

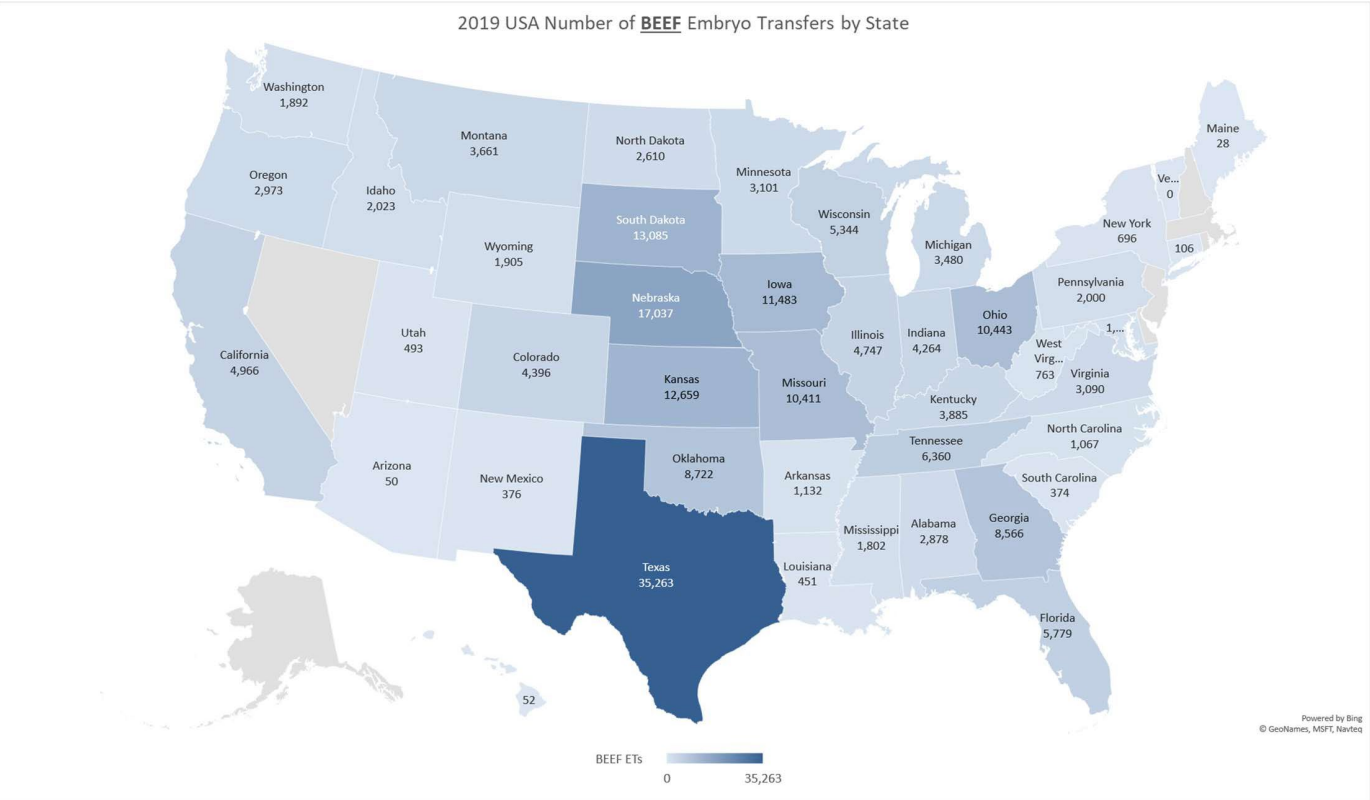
STATE	ETBs	DAIRY ETs		BEEF ETs		TOTAL ETs	
		TOTAL	%	TOTAL	%	TOTAL	%
Alabama	8	62	0.03%	2,878	1.40%	2,940	0.66%
Arizona	2	2,271	0.94%	50	0.02%	2,321	0.52%
Arkansas	7	0	0.00%	1,132	0.55%	1,132	0.25%
California	10	18,186	7.49%	4,966	2.41%	23,152	5.16%
Colorado	6	9	0.00%	4,396	2.13%	4,405	0.98%
Connecticut	1	64	0.03%	106	0.05%	170	0.04%
Florida	8	755	0.31%	5,779	2.80%	6,534	1.46%
Georgia	7	0	0.00%	8,566	4.16%	8,566	1.91%
Hawai	1	0	0.00%	52	0.03%	52	0.01%
Idaho	6	11,586	4.77%	2,023	0.98%	13,608	3.03%
Illinois	10	3,258	1.34%	4,747	2.30%	8,005	1.78%
Indiana	8	478	0.20%	4,264	2.07%	4,742	1.06%
Iowa	7	7,614	3.14%	11,483	5.57%	19,097	4.25%
Kansas	9	7	0.00%	12,659	6.14%	12,666	2.82%
Kentucky	9	440	0.18%	3,885	1.88%	4,325	0.96%
Louisiana	4	0	0.00%	451	0.22%	451	0.10%
Maine	2	943	0.39%	28	0.01%	971	0.22%
Maryland	5	4,208	1.73%	1,695	0.82%	5,902	1.32%
Michigan	5	24,390	10.05%	3,480	1.69%	27,870	6.21%
Minnesota	8	2,530	1.04%	3,101	1.50%	5,630	1.25%
Mississippi	4	24	0.01%	1,802	0.87%	1,826	0.41%
Missouri	7	618	0.25%	10,411	5.05%	11,028	2.46%
Montana	7	324	0.13%	3,661	1.78%	3,985	0.89%
Nebraska	14	29	0.01%	17,037	8.27%	17,066	3.80%
New Mexico	2	0	0.00%	376	0.18%	376	0.08%
New York	12	19,663	8.10%	696	0.34%	20,359	4.54%
North Carolina	5	10	0.00%	1,067	0.52%	1,077	0.24%
North Dakota	4	0	0.00%	2,610	1.27%	2,610	0.58%
Ohio	16	7,707	3.18%	10,443	5.07%	18,149	4.04%
Oklahoma	7	0	0.00%	8,722	4.23%	8,722	1.94%
Oregon	10	43,672	17.99%	2,973	1.44%	46,645	10.39%
Pennsylvania	16	5,839	2.41%	2,000	0.97%	7,839	1.75%
South Carolina	3		0.00%	374	0.18%	374	0.08%
South Dakota	8	5,903	2.43%	13,085	6.35%	18,988	4.23%
Tennessee	11	424	0.17%	6,360	3.09%	6,784	1.51%
Texas	16	43,253	17.82%	35,263	17.11%	78,516	17.49%
Utah	2	479	0.20%	493	0.24%	972	0.22%
Vermont	3	631	0.26%	0	0.00%	631	0.14%
Virginia	7	242	0.10%	3,090	1.50%	3,332	0.74%
Washington	5	899	0.37%	1,892	0.92%	2,790	0.62%
West Virginia	4	43	0.02%	763	0.37%	806	0.18%
Wisconsin	19	36,161	14.90%	5,344	2.59%	41,505	9.25%
Wyoming	4	0	0.00%	1,905	0.92%	1,905	0.42%
TOTAL		242,721		206,105		448,826	

Embryo transfer numbers per State were calculated based on the % of work provided by members on the survey. The 3 highest numbers per State in each category are highlighted.

2019 USA Number of **DAIRY** Embryo Transfers by State



2019 USA Number of **BEEF** Embryo Transfers by State



2019 USA BOVINE IN VIVO EMBRYO PRODUCTION (SUPERVOVULATION/FLUSH)

	ETBs	COLLECTIONS		TOTAL OVA		VIABLE EMBRYOS			FRESH ETs		FROZEN	
		#	% using Sexed Semen	#	Average	#	Average	%	#	%	#	%
DAIRY	73	8,012	53%	70,624	8.8	40,837	5.1	58%	15,685	38%	25,152	62%
BEEF	110	17,780	7%	220,770	12.4	126,868	7.1	57%	32,330	25%	94,540	75%
TOTAL	183	25,782	24%	291,394	11.3	167,705	6.5	57%	48,015	29%	119,692	71%

2019 USA BOVINE IN VITRO EMBRYO PRODUCTION (IVP)

<i>All ETBs that performed OPU</i>	DAIRY			BEEF			TOTAL		
	WITHOUT FSH	WITH FSH	TOTAL	WITHOUT FSH	WITH FSH	TOTAL	WITHOUT FSH	WITH FSH	TOTAL
Total OPUs	57,318	38,130	95,448	4,800	22,183	26,983	62,118	60,313	122,431
Total Oocytes Recovered	850,792	627,164	1,477,956	103,575	533,491	637,066	954,367	1,160,655	2,115,022
Recovered Oocytes per OPU	14.8	16.4	15.5	21.6	24.0	23.6	15.4	19.2	17.3
% of OPUs fertilized with Sexed Semen	68%			41%			62%		
<i>ETBs with IVF labs only</i>	DAIRY			BEEF			TOTAL		
	WITHOUT FSH	WITH FSH	TOTAL	WITHOUT FSH	WITH FSH	TOTAL	WITHOUT FSH	WITH FSH	TOTAL
Total OPUs	57,302	30,412	87,714	4,667	20,298	24,965	61,969	50,710	112,679
Total Oocytes Recovered	850,575	511,151	1,361,726	101,358	496,391	597,749	951,933	1,007,542	1,959,475
Oocytes per OPU	14.8	16.8	15.5	21.7	24.5	23.9	15.4	19.9	17.4
Fertilized Oocytes	553,967	465,558	1,019,525	87,742	451,035	538,777	641,709	916,593	1,558,302
Fertilized Oocytes per OPU	9.7	15.3	11.6	18.8	22.2	21.6	10.4	18.1	13.8
Total Viable Embryos	134,127	143,259	277,386	23,146	170,924	194,070	157,273	314,183	471,456
Viable Embryos per OPU	2.3	4.7	3.2	5.0	8.4	7.8	2.5	6.2	4.2
% Viable Embryos (Viable/Recovered)	16%	28%	20%	23%	34%	32%	17%	31%	24%
% Viable Embryos (Viable/Fertilized)	24%	31%	27%	26%	38%	36%	25%	34%	30%
Total Frozen (in the production lab)	42,482	52,490	94,972	18,437	117,841	136,278	60,919	170,331	231,250
% Frozen	32%	37%	34%	80%	69%	70%	39%	54%	49%
Total Transferred Fresh or Discarded	91,645	90,769	182,414	4,709	53,083	57,792	96,354	143,852	240,206
% Transferred Fresh or Discarded	68%	63%	66%	20%	31%	30%	61%	46%	51%
<i>Commercial Abattoir Embryo Production</i>	DAIRY			BEEF			TOTAL		
Total Oocytes Recovered	5,196			5,230			10,426		
Total Viable Embryos	1,980			1,001			2,981		
% Viable Embryos	38%			19%			29%		

The data for this table were divided in 2 categories: companies that predominantly use FSH for OPU cows (WITH FSH) or don't (WITHOUT FSH).

Fertilized oocytes – oocytes that went to fertilization or cleaved.

Viable embryos – Day 6 embryos sent from the lab to a practitioner (not necessarily will be transferred or frozen on day 7) and/or Day 7 embryos transferred fresh, frozen or discarded.

2019 USA EMBRYOS EXPORTED BY BREED

BREED	IN VIVO	IN VITRO	TOTAL
Ayrshire	11	9	20
Brown Swiss	511	33	544
Guernsey	32		32
Holstein	13,158	3,403	16,561
Jersey	316	107	423
Montebeliard	5		5
TOTAL DAIRY	14,033	3,552	17,585

BREED	IN VIVO	IN VITRO	TOTAL
Akushi	46		46
American Bucking	20	85	105
Angus	763	994	1,757
Brangus	30	1,179	1,209
Charolais	82		82
Charolias	7		7
Crossbred	183	148	331
Hereford	121	11	132
Hereford - polled	25	93	118
Limousin	18		18
Longhorn	13		13
Red Angus	43	128	171
Red Bhraman		232	232
Santa Gertrudis	14	49	63
Scottish Highland	18		18
Simmental	930		930
Speckled Park	6		6
Wagyu	893		893
White Park		3	3
TOTAL BEEF	3,212	2,922	6,134

The highest numbers in each category are highlighted.

2019 USA EMBRYOS EXPORTED BY COUNTRY

COUNTRY	IN VIVO		IN VITRO		TOTAL
	DAIRY	BEEF	DAIRY	BEEF	
Australia	902	575	120	687	2,284
Belize			25		25
Brazil	686	200			886
Canada	218	229	146	990	1,583
Chile		159			159
China	3,151	907			4,058
Colombia	65		25		90
Costa Rica		34		49	83
Czech Republic	4		1		5
Denmark	111	16		22	149
France	265		48	36	349
Germany	1,218	260	584		2,062
Great Britain		15			15
Guatemala	34		35	524	593
Indonesia			500		500
Ireland	139		72		211
Italy	142		70		212
Japan	2,314	9			2,323
Korea	473				473
Mexico				50	50
Nepal	100				100
Netherlands	1,510		626	10	2,146
New Zealand	23	73			96
Pakistan	100				100
Panama		21			21
Poland	44	18	1,025		1,087
Portugal	71	12			83
Romania		3			3
Russia	78				78
Slovakia	8				8
South Africa		342			342
South Korea	82				82
Sweden	38	12			50
Switzerland	266		85		351
Thailand				401	401
Turkey	85				85
United Kingdom	470	314	190	153	1,127
Uruguay	6	13			19
Vietnam	1,430				1,430
TOTAL	14,033	3,212	3,552	2,922	23,719

2019 USA EMBRYOS EXPORTED BY CONTINENT

CONTINENT	IN VIVO		IN VITRO		TOTAL	
	DAIRY	BEEF	DAIRY	BEEF	TOTAL	%
Africa	82	342			424	1.8%
Asia	7,739	916	500	401	9,556	40.3%
Australia	925	648	120	687	2,380	10.0%
Europe	4,278	650	2,701	221	7,850	33.1%
North America	252	284	206	1,613	2,355	9.9%
South America	757	372	25		1,154	4.9%
TOTAL	14,033	3,212	3,552	2,922	23,719	

2019 EMBRYOS IMPORTED INTO THE USA

COUNTRY	BOVINE Dairy	BOVINE Beef	OVINE
Australia		12	212
Canada	93		
Italy		21	
TOTAL	93	33	212

2019 Equine Embryo Transfer / In-Vitro Embryo Production

USA - Number of submissions: 12 (3 AETA members)

Embryo recovery from mares via uterine flush	
A. Number of recovery procedures performed	2597
B. Number of recovered embryos	1603
C. Average	0.6
Transfer of IN-VIVO RECOVERED embryos to recipient mares	
A. Number of FRESH embryos (recovered at your facility or shipped to you by others) transferred to recipient mares at your facility	2863
B. Number of CRYOPRESERVED / warmed embryos (recovered at your facility or shipped to you by others) transferred to recipient mares at your facility	181
c. Total Transfers	3044
Oocyte recovery procedures (TVA, OPU, flank) for in vitro embryo production	
A. Number of oocyte recovery procedures performed	1794
B. Number of immature oocytes recovered (oocytes recovered from diestrus/subordinate follicles)	11256
C. Number of in vivo-matured oocytes recovered (recovered from the stimulated dominant follicle)	641
D. (if separation by oocyte type is not possible) Number of mixed oocytes	3200
Embryo production via ICSI at your facility	
A. Number of oocytes on which ICSI was performed	5460
B. Number of transferrable IVP blastocysts produced via ICSI	1015
C. Number of IVP embryos produced at the cleavage stage, for transfer to the oviduct, via ICSI	0
Embryo production via other assisted reproductive techniques at your facility	
A. Number of oocytes used for embryo production via intra-oviductal oocyte transfer or similar techniques	0
B. Number of embryos recovered / pregnancies at 14 days established by intra-oviductal oocyte transfer or similar techniques	0
C. Number of oocytes used for in vitro embryo production by standard IVF	0
D. Number of transferrable embryos (blastocysts) produced by standard IVF	0
Transfer of IVP embryos at your facility	
A. Number of FRESH IVP blastocysts transferred to the uteri of recipient mares at your facility (including fresh shipped IVP blastocysts)	1139
B. Number of CRYOPRESERVED /warmed IVP blastocysts transferred to the uteri of recipient mares at your facility (including shipped cryopreserved IVP blastocysts)	419
C. Number of CLEAVAGE STAGE IVP embryos transferred to the oviducts of recipient mares at your facility	0
D. Number of embryos produced by standard IVF transferred at your facility	546

A separate survey is conducted for Equine. Thanks to Dr Katrin Hinrichs (University of Pennsylvania) and Dr Robert Foss (Equine Medical Services, Colombia, MO), we were able to collect detailed equine embryo transfer data from practitioners that are not associated to the AETA. They created the questionnaire above and distributed to equine practitioners around the country.

2019 USA SMALL RUMINANT EMBRYO PRODUCTION

Species	ETBs	Collection data							Transfer Data		
		Collections	Total Ova	Viable	Average Ova	Average Viable	% Viable	Frozen	Fresh	Frozen	Total
Ovine	11	1,275	11,226	7,893	8.8	6.2	70.3%	695	7,213	181	7394
Caprine	12	1,005	15,550	7,714	15.5	7.7	49.6%	1,104	6,263	821	7084

We have been working hard to gather more information on other species embryos from practitioners that do not belong to AETA. This year we were able to collect data from a large commercial ovine embryo company and that affected our numbers significantly (we only had 193 collections reported in 2018).

One ETB reported the production of 914 IVP caprine embryos. One ETB reported the transfer of 30 cervine embryos (18 fresh and 12 frozen). There was no data reported for any other species other than equine, ovine, caprine and cervine.

Six ETBs reported to have manipulated 1039 embryos (589 biopsied for sexing, 283 biopsied for genomic testing and 167 bisected).

There is a large amount of IVF abattoir embryos being commercialized and transferred by AI technicians but we were not able to collect the data from the main companies.

For any questions or suggestions for next year's survey, please contact:

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For questions or comments about this committee report, please contact Daniela Demetrio, at 559-960-7200 or ddembryos@gmail.com