

# Assisted reproductive technology in Europe, 2006: results generated from European registers by ESHRE<sup>†</sup>

J. de Mouzon\*, V. Goossens, S. Bhattacharya, J.A. Castilla, A.P. Ferraretti, V. Korsak, M. Kupka, K.G. Nygren, A. Nyboe Andersen, and The European IVF-monitoring (EIM) Consortium, for the European Society of Human Reproduction and Embryology (ESHRE)<sup>‡</sup>

ESHRE Central Office, Meerstraat 60, B-1852 Grimbergen, Belgium

\*Correspondence address. Service de Gynécologie Obstétrique II et de Médecine de la reproduction, Groupe Hospitalier Cochin-Saint Vincent de Paul, 82 Avenue Denfert Rochereau, 75014 Paris, France. Tel: +33-6-62-06-22-74 or +33-1-58-41-22-68 or +33-1-58-41-15-29; Fax: +33-1-58-41-18-70; E-mail: jacques.demouzon@inserm.fr

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**BACKGROUND:** In this 10th European IVF-monitoring (EIM) report, the results of assisted reproductive techniques from treatments initiated in Europe during 2006 are presented. Data were mainly collected from existing national registers.

**METHODS:** From 32 countries, 998 clinics reported 458 759 treatment cycles including: IVF (117 318), ICSI (232 844), frozen embryo replacement (FER, 86 059), egg donation (ED, 12 685), preimplantation genetic diagnosis/screening (6561), *in vitro* maturation (247) and frozen oocytes replacements (3498). Overall this represents a 9.7% increase in activity since 2005, which is partly due to an increase in registers (seven more countries with complete coverage). European data on intrauterine insemination using husband/partner's (IUI-H) and donor (IUI-D) semen were reported from 22 countries. A total of 134 261 IUI-H and 24 339 IUI-D cycles were included.

**RESULTS:** In 20 countries, where all clinics reported to the IVF register, a total of 359 110 assisted reproductive technology (ART) cycles were performed in a population of 422.5 million, corresponding to 850 cycles per million inhabitants. For IVF, the clinical pregnancy rates per aspiration and per transfer were 29.0 and 32.4%, respectively. For ICSI, the corresponding rates were 29.9 and 33.0%. After IUI-H the delivery rate was 9.2% in women below 40. After IVF and ICSI the distribution of transfer of one, two, three and four or more embryos was 22.1, 57.3, 19.0 and 1.6%, respectively. Compared with 2005, fewer embryos were replaced per transfer, but significant national differences in practice were apparent. The proportion of singleton, twin and triplet deliveries after IVF and ICSI combined was 79.2, 19.9 and 0.9%, respectively. This gives a total multiple delivery rates of 20.8% compared with 21.8% in 2005 and 22.7% in 2004. IUI-H in women below 40 years of age resulted in 10.6% twin and 0.6% triplet pregnancies.

**CONCLUSIONS:** Compared with previous years, the reported number of ART cycles in Europe has increased, pregnancy rates have increased marginally, even though fewer embryos were transferred and the multiple delivery rates have declined.

**Key words:** European Society of Human Reproduction and Embryology / Europe / ART / intrauterine insemination / register data

## Introduction

This report is the 10th annual European Society of Human Reproduction and Embryology (ESHRE) publication on European data on assisted reproductive technology (ART). The nine previous reports,

also published in Human Reproduction (ESHRE, 2001a, b, 2002, 2004, 2005, 2006, 2007, 2008, 2009), covered treatment cycles from 1997 to 2005. This year, the printed version only contains the four most important tables; additional tables are available online, making the whole report consistent with those from previous years,

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<sup>‡</sup> EIM Committee members are listed in the Appendix.

whereas also including additional material. In the published report, these tables will be referred as 'Supplementary Data, Table SI–SXVIII'. The main results of this report were presented at the annual ESHRE congress in Amsterdam July 2009.

## Materials and Methods

### Data collection

Data on ART have been collected from 32 European countries, covering IVF, ICSI, frozen embryo replacement (FER), egg donation (ED), *in vitro* maturation (IVM), pooled data on preimplantation genetic diagnosis (PGD) and screening (PGS) and frozen oocyte replacements (FOR). In addition to ART, data on intrauterine inseminations using husband/partner's semen (IUI-H; 20 countries) and donor semen (IUI-D; 18 countries) were also included. The report includes treatments started between the 1st of January and the 31st of December 2006. Follow-up data on pregnancies and deliveries are cohort data, based on the reported cycles.

Following agreement of the consortium in Barcelona in 2008, the reporting forms used for 2006 data were expanded in comparison to those from previous years. A module describing the reporting methods has been added. The form on women's age now reports cycle outcome (pregnancies and deliveries) in relation to age. Multiple deliveries are reported according to the number of transferred embryos. The form on IUI now includes deliveries and multiple deliveries. Finally, an optional module was added to report the gestational age according to the number of infants per delivery.

As in previous years, data were directly entered in the ESHRE computer by each country coordinator, through software developed by ESHRE and modified according to the new forms. Data analyses were performed in ESHRE headquarters by V. Goossens.

## Results

### Participation

This report includes data from three more countries (Austria, Cyprus and Latvia) and one fewer (Croatia) than the 2005 report (Table I). The proportion of reporting clinics rose to 86.0% (998 out of 1160 clinics), in comparison to 81.4% in 2005 (923 out of 1134). In 20 countries, the coverage reached 100%, seven more than in 2005 (Austria, Cyprus, Czech Republic, Germany, Italy, Latvia and Turkey). In two other countries, the number of participating clinics also increased substantially (from 4 to 15 in Bulgaria, 1 to 4 in Serbia), but participation still remained very low in two countries (Greece and Serbia) and limited in four others (Bulgaria, Hungary, Poland and Spain).

### Number of treatment cycles

In total, 458 759 cycles were reported, 40 648 more than in 2005 (+9.7%). Among the 350 162 fresh cycles (+9.1%), there were 117 318 IVF (−0.1%) and 232 844 ICSI (+14.5%). The proportion of ICSI thus reached 66.5% of 'fresh' ART cycles (63.3% in 2005). The proportion of FER cycles compared with 'fresh' cycles was 24.6%. The number of ED increased in the same proportion, reaching 12 685 (+10.5%), reported by 22 countries, the main contributor being Spain (6547 cycles). PGD was recorded from 13 countries (6561 cycles, +12.2%). IVM was reported at the same low level (247 cases) as in 2005. Finally, 3498 FOR cycles were newly reported,

the majority from Italy (85.1% of cases). Table I also shows the number of cycles per million women of reproductive age (15–45 years) and per million inhabitants, in the 20 countries where 100% of clinics reported. The highest numbers of cycles were reported in Nordic countries, particularly in Denmark (10 132), followed by Belgium, Sweden, Finland, Iceland, Norway, all being over 6500 cycles. More details are reported in Supplementary Data, Table SI.

### Reporting methods and size of the clinics

Among the 20 countries with complete reporting (Supplementary Data, Table SII), the register was compulsory for 14 (11 held by a National Health Authority (NHA) and 3 by a medical organization (MO)] and voluntary for 6 (5 held by a MO and 1 by an health care insurance). Only six registers were based on individual forms. Among the 12 countries with partial coverage, only three were held by an NHA and only one was based on individual forms.

The distribution of clinics according to the number of cycles varied considerably among the countries (Supplementary Data, Table SIII). For example, it could be noted that in Italy 46% of the clinics provided fewer than 100 cycles annually, whereas in Belgium and Sweden 50% of the clinics performed more than 1000 cycles a year. In the Netherlands (where satellite stimulated cycles are frequent), 62% of the clinics handling gametes performed more than 1000 cycles annually.

### Pregnancies and deliveries after treatment

Table II shows pregnancy and delivery rates per aspiration for IVF, ICSI and FER. Only one country provided outcome per embryo transfer, whereas four others were unable to provide data on deliveries. Thus, the mean pregnancy rate and delivery rate were computed for countries providing the relevant information. There were huge variations across the countries. On average, the pregnancy rates were 29.0% (+2.0% compared with 2005) and 29.9% (+1.4%) per aspiration for IVF and ICSI, and 19.1% per thawing for FER (+0.1%). Mean delivery rates per aspiration/thawing were 21.5, 18.4 and 12.7%, respectively. The detailed numbers of cycles, aspirations, transfers, pregnancies, deliveries and the corresponding rates per technique are reported in Supplementary Data, Tables SIV for IVF, SV for ICSI and SVI for FER.

In total, 87 705 babies were recorded to be born from in the 28 countries where the reporting from IVF, ICSI and FER included newborns. In countries with complete reporting, the percentage of babies conceived through ART varied from 1.0% of the national births in Italy to 4.1% in Denmark. More details are provided in Supplementary Data, Table SI, showing that the percentage of ART babies were above 3.0%, in most of Nordic countries, whereas this percentage was between 1.0 and 1.7% in the largest European countries (Germany, France, UK and Italy).

ED was reported by 22 countries (Supplementary Data, Table SVII). In total, 5516 clinical pregnancies resulted from 12 685 embryo transfers (PR = 43.5 versus 41.9% in 2005). The mean delivery rate was 28.6% in the 19 countries reporting deliveries ( $n = 3\ 448$ ).

### Age distribution

The age distribution of women treated with IVF varied across countries (Supplementary Data, Table SVIII). In several countries, more than 20% of women were aged 40 years or more (Greece,

**Table I ART in European countries in 2006.**

	IVF clinics in the country		Treatment cycles							Cycles/million		
	Total	Reporting	IVF	ICSI	FER	ED	IVM	PGD	FOR	All	Women 15–45	Population
Albania	2	1	0	120		21				141	NA	NA
Austria	25	25	1218	3733	226					5177	2582	624
Belgium	18	18	3619	11 928	6620	563				22 730	9383	2165
Bulgaria	15	8	642	634	93	18	0	0	0	1387	NA	NA
Cyprus	7	7	402	780	143	80		27		1432	5231	1432
Czech Republic	21	21	2331	6891	3560	511		414		13 707	5471	1331
Denmark	22	22	5500	4436	2515	31	52	84		12 618	10 132	2268
Finland	18	18	2849	1927	3561	385	22	27	345	9116	7827	1720
France	102	102	20 409	30 367	14 064	573	69	267		65 749	4436	1074
Germany	122	122	11 082	28 687	14 926					54 695	2843	664
Greece	50	9	1222	2287	310	152		0		3971	NA	NA
Hungary	10	5	522	2086	641	28	0	3	27	3307	NA	NA
Iceland	1	1	173	173	162	22	0	0	0	530	7088	1767
Ireland	7	6	1588	1004	636	4	0		0	3232	NA	NA
Italy	202	202	8680	28 186	905				2977	40 748	2993	691
Latvia	1	1	105	63	87	25	0	0	0	280	475	122
Lithuania	3	2	345		68					413	NA	NA
Macedonia	3	3	531	355	25					911	1726	456
Montenegro	2	2	40	202	3					245	1382	408
Norway	11	11	2749	2312	2054		19	0		7134	6645	1518
Poland	32	17	336	3790	1737	315	6	38	1	6223	NA	NA
Portugal	21	19	1161	2225	380	37	3	65		3871	NA	NA
Russia	55	50	10 785	6469	2910	1110	32	415	0	21 274	NA	NA
Serbia	11	4	124	378	15	9				526	NA	NA
Slovenia	3	3	687	1512	590	5	0	10	3	2807	5591	1404
Spain	182	107	4178	28 360	8203	6547	36	2478	141	49 943	NA	NA
Sweden	14	14	5304	4784	4695	148				14 931	7337	1631
Switzerland	24	24	821	3239	3049	0	0	0	0	7109	3851	948
The Netherlands	13	13	8365	6485	2920					17 770	4489	1084
Turkey	77	77	914	31 938	2308			2308		37 468	1878	508
Ukraine	16	14	3002	1309	710	338	2			5361	NA	NA
UK	70	70	17 634	16 184	7943	1763		425	4	43 953	3039	726
All	1160	998	117 318	232 844	86 059	12 685	241	6561	3498	458 759	NA	NA

For Belgium, France and Iceland 'treatment cycles' for IVF and ICSI refer to aspirations. FER refers to thawings, but for Austria, France, Iceland, Lithuania, Macedonia, the Netherlands and Turkey it refers to transfers. ED refers to transfers. FOR refers to thawings, except for Finland where it refers to transfers. For Russia IVM and PGD cycles were also counted in the number of IVF and ICSI cycles.

**Table II Results after ART in 2006.**

Country	Cycles IVF + ICSI	IVF			ICSI			FER			ART infants <sup>†</sup>	ART infants per national births (%)
		Aspirations	Pregnancies per aspiration (%)	Deliveries per aspiration (%)	Aspirations	Pregnancies per aspiration (%)	Deliveries per aspiration (%)	Thawings FER	Pregnancies per thawing (%)	Deliveries per thawing (%)		
Albania	120	0	—	—	119	40.3	36.1				78	
Austria	4951	1207	32.9		3 571	32.8					1041	1.3
Belgium		3619	28.3	21.0	11 928	27.2	18.4	6 620	13.6	8.7	4019	3.3
Bulgaria	1276	601	29.0	21.3	601	30.9	25.3	93	22.6	7.5	374	
Cyprus	1 182	377	30.0		745	37.9		143	21.7			
Czech Republic	9222	2208	31.4		6631	37.6		3560	23.3			
Denmark	9936	5290	27.8	21.1	4351	25.9	20.1	2515	15.5	10.2	2674	4.1
Finland	4776	2770	27.0	21.0	1885	26.8	21.6	3561	19.9	15.2	1908	3.3
France		20 409	24.2	18.7	30 367	25.8	20.3				13 480	1.6
Germany	39 769	10 276	29.9	18.8	27 789	28.0	18.4	14 926	18.1	10.8	10 427	1.5
Greece	3509	1146	26.5	19.0	1984	26.5	22.0	310	13.0	9.1	932	
Hungary	2608	471	21.7	17.6	2028	32.0	26.8	641	17.8	9.5	869	
Iceland		173	32.4	25.4	173	28.3	24.9				149	3.4
Ireland	2592	1299	30.9	26.3	880	29.1	24.3	636	17.6	12.7	787	
Italy	36 866	7429	21.4	13.4	25 392	21.1	12.3	905	16.0	9.3	5322	1.0
Latvia	168	105	68.6		63	41.3		87	10.3			
Lithuania	345	165	32.1		168	34.5		68	11.8		32	
Macedonia	886	491	25.3	21.4	335	20.9	16.4				227	
Montenegro	242	37	18.9	16.2	190	23.2	22.1	3	33.3	33.3	57	0.8
Norway	5061	2607	30.6	25.7	2240	28.4	24.1	2 054	15.8	11.5	1660	2.8
Poland	4126	314	34.1	29.9	3711	35.2	28.7	1737	16.8	13.6	1686	
Portugal	3386	1056	34.8	26.3	2034	28.5	22.8	380	19.2	14.2	964	
Russia	17 254	10 365	34.8	22.2	6 312	33.7	20.2	2 910	21.6	13.3	5424	
Serbia	502	117	47.9	38.5	361	26.9	22.2	15	20.0	13.3	200	
Slovenia	2199	646	31.1	26.0	1418	27.8	22.9	590	18.8	12.7	672	3.6
Spain	32 538	3479	34.9	30.6	25 972	34.0	17.6	8203	21.7	12.1	11 302	
Sweden	10 088	4917	32.5	25.4	4579	30.2	23.9	4695	23.8	17.0	3417	3.3
Switzerland	4060	749	24.2	16.6	3002	26.3	19.1	3049	17.7	12.2	1241	1.7
The Netherlands	14 850	7727	29.9	22.2	6076	32.9	25.8			19.2	4448	2.4
Turkey	32 852	867	47.9	14.5	31 212	37.3	11.5			8.3		
Ukraine	4311	2927	34.1	24.1	1286	35.1	26.7	710	21.8	14.8	1617	
UK	33 818	15 530	28.9	25.7	16 138	30.1	26.5	7943	20.1	17.5	12 698	1.7
All*	283 493	109 374	29.0	21.5	223 541	29.9	18.4	66 354	19.1	12.7	87 705	

\*Totals refer only to these countries where data were reported; <sup>†</sup>ART infants also includes ED.

The recording of deliveries is incomplete. Data on initiated cycles for IVF and ICSI not available for Belgium, France and Iceland. Data on deliveries for IVF and ICSI not available for Austria, Cyprus, Czech Republic and Latvia. For FER, no data available for Albania, Austria, France, Iceland, Lithuania, Macedonia, The Netherlands and Turkey. Data on deliveries for FER not available for Cyprus, Czech Republic and Latvia. For Lithuania: aspirations refer to transfers.

Ireland, Italy, Macedonia, Montenegro, Serbia and Switzerland), whereas it was <10% in Bulgaria, Czech Republic, Lithuania, Norway, Poland, Portugal, and Ukraine. As expected, pregnancy rates decreased with age, from 28.2% through 22.2% to 9.6% for women aged ≤34, 35–39 and ≥40 years, respectively. The same trend was seen for delivery rates (26.6, 20.5 and 8.6%). Similar findings were found for ICSI (Supplementary Data, Table SIX). For FER (Supplementary Data, Table SX), only 11% of women were aged 40 years or more. In ED (Supplementary Data, Table SXI), the recipient was aged 40 years or more in 50.0% of cases, in almost all countries except Denmark (57.1% < 35), Latvia (92% < 35), Slovenia (60% < 35) and Sweden (52% aged 35–39). Pregnancy and delivery rates in oocyte recipients were comparable across different age groups.

### Number of embryos transferred and multiple deliveries

Table III shows the number of embryos transferred after IVF and ICSI combined. The total percentage of single embryo transfers (SET) was 22.1% (20.0% in 2005), dual embryo transfers (DET) was 57.3% (56.1% in 2005), triple embryo transfers was 19.0% (21.5% in 2005) and four or more embryo transfers was 1.6% (2.3% in 2005). As indicated in this table, major differences were seen between countries. In 2006 several countries reported a high number of SETs. The highest levels were found in Sweden (69.9%), Finland (54.7%), Belgium (49.2%) and Norway (48.0%). The proportion of triple embryo transfers ranged from zero in Sweden to 50.9% in Italy. Transfer of four or more embryos ranged from zero in 12 countries and <1% in 5 to 60.9% in Albania.

In fresh cycles, the percentages of multiple deliveries were 19.9% for twins (21.0% in 2005) and 0.9% for triplets (0.8% in 2005). After FER, the percentages were 13.4% for twin deliveries (13.9% in 2005) and 0.4% for triplets (0.4% in 2005). Additional data on pregnancy outcome, singleton and multiple deliveries are provided in Supplementary Data, Table SXII (for fresh cycles) and Supplementary Data, Table SXIII for FER.

### Risks and fetal reductions

Supplementary Data, Table SXIV shows the risk of preterm deliveries according to the number of newborn. Data were available from 17 countries. It clearly shows that the risk of extremely preterm birth rate (gestational week 20–27) increases from 0.8% for a singleton delivery, to 2.6% for twins and 7.4% for triplets. The same trend was noted for very preterm (28–32 weeks), from 2.5 to 11.0% and 37.4%, respectively, and for preterm (33–36 weeks), from 8.7 to 39.3 and 43.9%, respectively.

Ovarian hyperstimulation syndrome (OHSS) was reported in 27 of the 32 countries (Supplementary Data, Table SXV). In total, 2753 cases of OHSS were recorded, corresponding to a risk of OHSS of 0.8% (1.2% in 2005) of all stimulated cycles. The table also includes other complications, such as fetal reductions (*n* = 466).

### Preimplantation genetic diagnosis and screening

PGD/PGS activity was recorded from 13 countries (Table I) and involved 6561 cycles, 5718 aspirations, 3545 embryo transfers and

**Table III** Number of embryos transferred and deliveries after ART in 2006.

Country	IVF + ICSI				FER						
	Transfers	1 embryo (%)	2 embryos (%)	3 embryos (%)	4 + embryos (%)	Deliveries	Twin (%)	Triplet (%)	Deliveries	Twin (%)	Triplet (%)
Albania	110	4.5	10.0	24.5	60.9	43	30.2	14.0			
Austria	4884	16.6	71.5	10.9	1.0	814	22.0	2.9			
Belgium	14 226	49.2	41.9	8.0	0.8	2876	13.2	0.2	565	12.4	0.0
Bulgaria	1089	9.0	30.2	43.7	17.1	280	22.5	3.2	7	0.0	0.0
Cyprus											
Czech Republic	8009										
Denmark	8253	36.4	59.3	4.2	0.0	1993	19.3	0.1	257	12.1	0.0
Finland	4281	54.7	45.0	0.3	0.0	988	12.0	0.0	543	9.2	0.0
France	41 395	20.0	63.3	15.2	1.5	9982	20.1	0.5	1827	11.2	0.2
Germany	36 875	12.4	65.8	21.8	0.0	7040	19.8	0.9	1616	14.4	0.7
Greece	2753	13.7	26.4	46.3	13.5	508	22.8	1.6	47	10.6	0.0
Hungary	2322	11.2	45.7	37.3	5.9	629	19.9	2.4	59	16.9	5.1
Iceland	288	35.1	56.6	8.3	0.0	87	11.5	1.1	35	17.1	0.0

Continued

Table III Continued

Country	IVF + ICSI					FER					
	Transfers	1 embryo (%)	2 embryos (%)	3 embryos (%)	4+ embryos (%)	Deliveries	Twin (%)	Triplet (%)	Deliveries	Twin (%)	Triplet (%)
Ireland	2018	9.5	80.7	9.7	0.1	555	22.7	0.5	81	18.5	0.0
Italy	28 315	18.7	30.4	50.9	0.0	4129	21.0	2.8	84	15.5	0.0
Latvia	164	15.2	52.4	32.3	0.0						
Lithuania	333	8.1	12.0	79.9	0.0	24	16.7	4.2	2	0.0	0.0
Macedonia	665	26.5	23.5	29.9	20.2	167	29.9	1.8	3	33.3	0.0
Montenegro	219	12.8	24.7	34.7	27.9	48	16.7	0.0	1	0.0	0.0
Norway	4404	48.0	51.8	0.2	0.0	1208	14.9	0.2	236	11.9	0.4
Poland	3684	14.0	66.0	19.4	0.5	1159	19.2	1.0	236	18.2	0.4
Portugal	2817	17.0	67.8	14.4	0.7	721	22.2	0.3	54	13.0	0.0
Russia	15 609	16.6	59.4	18.6	5.4	3571	24.5	1.5	388	16.0	0.8
Serbia	424	16.5	35.8	23.6	24.1	133	38.3	3.0	2	0.0	0.0
Slovenia	1886	23.6	70.4	5.9	0.0	493	18.5	0.2	75	12.0	0.0
Spain	25 975					5637	22.1	1.6	991	18.9	0.3
Sweden	8604	69.9	30.1	0.0	0.0	2336	5.7	0.1	856	5.6	0.2
Switzerland	3372	13.1	64.4	22.5	0.0	692	18.8	1.0	363	11.0	0.3
The Netherlands	12 169					3288	15.5	0.3	561	11.6	0.4
Turkey											
Ukraine	3948	9.9	29.8	38.1	22.2	1048	26.0	1.4	105	9.5	2.9
UK	29 416	11.6	83.6	4.8	0.0	8276	23.5	0.3	1388	18.5	0.3
All*	222 354	22.1	57.3	19.0	1.6	58 725	19.9	0.9	10 382	13.4	0.4

\*Totals refer only to these countries where data were reported.

Transfers: data on transfers not available for Cyprus, Czech Republic, Spain, The Netherlands and Turkey. Finland: three more transfer cycles without data (not included), Switzerland: nine more transfer cycles without data (not included), Belgium: 78 transfer cycles without data (not included).

Deliveries IVF + ICSI: Lithuania: all details on deliveries are from only one centre. The other centre did not send in data. Deliveries refer to those deliveries with documented number of infants. For Cyprus, Czech Republic, Latvia and Turkey, no data were available.

Deliveries FER: France: in 138 deliveries, multiplicity is not known. Lithuania: all details on deliveries are from only one centre. The other centre did not send in data.

Deliveries refer to those deliveries with documented number of infants. For Albania, Austria, Cyprus, Czech Republic, Latvia and Turkey, no data were available.

802 deliveries (14.0% per aspiration), the main contributors being Spain (2478 cycles) and Turkey (2308 cycles).

### **In vitro maturation**

IVM was recorded in eight countries (Table I). A total of 241 aspirations were recorded, resulting in 32 pregnancies and 20 deliveries (8.3% per aspiration).

### **Intrauterine inseminations**

Table IV provides data on IUI-H and IUI-D, reported by 22 countries, with two countries reporting only donor insemination (Sweden and UK), whereas five countries did not report/practice IUI-D (Albania, Italy, Lithuania, Serbia and Slovenia).

For spouse's insemination (IUI-H), 134 261 cycles were reported, main contributors being France, Italy and Spain. Among the countries reporting deliveries, the mean delivery rate was 8.5% per cycle, 10.6% of deliveries being twin and 0.8% triplet deliveries.

For donor insemination (IUI-D), 24 339 cycles were reported, main contributors being Spain, France and Denmark. The delivery rate was 12.4% per cycle, with multiple delivery rates similar to IUI-H.

Data were also divided in two female age groups, below 40 years (upper panel) and 40 years or more (lower panel), both for IUI-H (Supplementary Data, Table SXVI) and IUI-D (Supplementary Data, Table SXVII). For France no stratification for age was available. In IUI-H, the delivery rate declined with age (9.2% below 40 versus 4.1% above), and multiple deliveries slightly decreased (from 10.6 to 8.9% for twins and from 0.6 to 0.0% for triplets). Similar findings were seen in IUI-D, where delivery rates decreased from 13.3 to 4.1%, twin deliveries from 10.5 to 6.5% and triplets from 0.6 to 0.0%.

## **Cumulative delivery rates**

Supplementary Data, Table SXVII gives an estimation of the cumulative delivery rates per initiated fresh stimulated cycle. This is not the real cumulative delivery rate per couple per cycle, but shows the number of deliveries obtained from the FER cycles added to the deliveries from the stimulated cycles during the same year. Additionally the table shows the rate of multiple deliveries after the 'fresh' cycles and the FER combined. It shows that adding the deliveries after FER increases the delivery substantially (Finland +11.3%, Iceland +10.2%, Sweden +7.9% and Switzerland +9.2%). The overall multiple delivery rate in Finland, Iceland and Sweden were low: 7.5, 13.9 and 5.9%, respectively.

## **Discussion**

The present report is the 10th consecutive, annual European report on ART data. Together these reports cover treatment cycles from 1997 to 2006. It can be argued that as long as data are incomplete, lack uniformity in terms of clinical definitions and are generated through different methods of data collection, they should be interpreted carefully. Therefore, the focus should primarily be on specific country data rather than on summary data. This year, data capture forms have been expanded in order to allow comparisons with data from previous years and to make them more consistent with the forms used by International Committee Monitoring Assisted

Reproductive Technologies (ICMART) in the world report. The latter is important since European data represent more than half of all cycles reported in the world report. The new forms also contain more information on multiple pregnancy risks in ART.

As is evident from the tables, registers from a number of countries have been unable to provide some of the data. In order to standardize definitions and reporting the ICMART glossary has been published (Zegers-Hochschild *et al.*, 2006a, b), and recently revised with WHO (Zegers-Hochschild *et al.* 2009a, b). These recommendations could not have been implemented in all countries in 2006 where the treatments were done, and even if they had, interpretation of the data must still be done with caution.

In 2006, the number of countries reporting to ESHRE's EIM Consortium increased to 32 countries covering the whole of Western Europe. Austria, Cyprus, and Latvia joined the consortium. In Eastern and South Eastern Europe, no data were still available from Estonia, Bosnia, Romania and Slovakia. Moreover, Croatia was unable to give data for 2006.

For 2006, data quality improved, since seven more countries than in 2005 were able to provide full coverage. Moreover, even if still incomplete, 86.0% of all clinics participated, almost 5% more than in 2005. For example, Turkey was able to give a full report, making this country the sixth contributor in relation to number of cycles. Additionally, those clinics that do not report are likely to be smaller in size than those that do report. In Greece only 9 of 50 clinics provided a report, however, efforts are being made to establish a statutory register.

Overall, the number of reported cycles reached 458 759 cycles, and thus increased 9.1% compared with 2005. A part of this increase was due to the fact that more clinics reported data. The present report also includes data from almost 160 000 IUI cycles, 10 000 more than in 2005. Within Europe, the largest number of ART cycles were reported from France (66 000), Germany (55 000), Spain (50 000), the UK (44 000) and Italy (41 000). In comparison, in 2006, 138 198 cycles were reported from the USA (CDC, 2008), and 53 543 cycles from Australia and New Zealand (AIHW, 2008).

Reduction in the re-imburement for ART resulted in a sharp decline in the number of cycles from Germany between 2003 and 2004 (from 102 000 to 57 000), which continued in 2005 (53 000). The present data from 2006 show a marginal increase (almost 55 000 cycles). The German example provides good evidence that a public re-imburement policy of ART has a major impact on the number of treatments.

As shown in Table I in countries with a full report, the average number of treatment cycles per million inhabitants ranged from 122 in Latvia to 2268 in Denmark. A better way to define the availability of ART is to report ART cycles in women of reproductive age (15–49 years), which eliminates the impact of age differences across the countries (Table I). Again, there were huge differences, from 475 cycles per million women in Latvia, to 10 132 in Denmark (Table I). Finally, the percentage of newborns conceived through ART varied from 0.8% in Montenegro to 4.1% in Denmark (Table II). It is difficult to explain those differences that may be related to several factors like cost, re-imburement, legal or sociological aspects, and medical strategies in the use of ART to infertile couples. These factors also may play some role in the differences observed in pregnancy and delivery rates between countries,

**Table IV** IUI-H or IUI-D semen in 2006.

Country	IUI-H						IUI-D					
	Cycles	Deliveries	Deliveries (%)	Singleton (%)	Twin (%)	Triplet (%)	Cycles	Deliveries	Deliveries (%)	Singleton (%)	Twin (%)	Triplet (%)
Albania	31	4	12.9	100.0	0.0	0.0						
Bulgaria	1045	103	9.9	96.1	3.9	0.0	373	60	16.1	90.0	10.0	0.0
Cyprus	719						34					
Denmark	9684	669	6.9	87.7	12.0	0.3	4410	206	4.7	89.3	10.7	0.0
Finland	3652	258	7.1	88.8	10.9	0.4	758	100	13.2	95.0	5.0	0.0
France	49 039	4702	9.6	88.3	10.6	0.5	4092	607	14.8	86.2	12.2	0.8
Greece	368	75	20.4	88.0	10.7	1.3	148	20	13.5	95.0	5.0	0.0
Hungary	1977	165	8.3	82.4	17.0	0.6	145	16	11.0	75.0	25.0	0.0
Ireland	1099	93	8.5	95.7	4.3	0.0	179	29	16.2	89.7	10.3	0.0
Italy	29 162	1764	6.0	87.4	11.1	1.5						
Latvia	58						71					
Lithuania	47	6	12.8	66.7	16.7	16.7						
Macedonia	682	57	8.4	89.5	7.0	3.5	15	5	33.3	100.0	0.0	0.0
Poland	5599	715	12.8	93.3	6.4	0.3	1401	202	14.4	92.6	6.9	0.5
Portugal	1308	106	8.1	87.7	7.5	4.7	211	35	16.6	82.9	14.3	2.9
Russia	3423						1759					
Serbia	328	38	11.6	65.8	34.2	0.0						
Slovenia	542	48	8.9	91.7	6.3	2.1						
Spain	23 976	2024	8.4	87.5	11.7	0.7	5790	865	14.9	86.7	12.6	0.7
Sweden							506	91	18.0	0.0	0.0	0.0
Ukraine	1522	225	14.8	92.4	6.7	0.9	736	149	20.2	95.3	4.7	0.0
UK							3711	411	11.1	92.0	7.3	0.7
All*	134261	11 052	8.5	88.4	10.6	0.8	24 339	2796	12.4	86.0	10.0	0.6

\*Totals refer only to these countries where data were reported and mean percentage were computed on countries with all information.

IUI-H: for Austria, Belgium, Czech Republic, Germany, Iceland, Montenegro, Norway, Sweden, Switzerland, The Netherlands, Turkey and the UK, no data available. Denmark: 562 pregnancies lost to follow-up. Finland: no info from two clinics. France: 28 cycles multiplicity not known. Italy: missing data for 739 cycles and 146 pregnancies, no data on deliveries in specific age groups. Lithuania: from 480 cycles and 62 pregnancies, details on age categories are missing and no data on the deliveries is known.

IUI-D: for Austria, Belgium, Czech Republic, Germany, Iceland, Montenegro, Norway, Sweden, Switzerland, The Netherlands, Turkey and the UK, no data available.



The proportion of ICSI versus standard IVF procedures continues to increase (49% in 2004, 63% in 2005 and 66.5% in 2006). A similar trend has been observed in the USA (Jain and Gupta, 2007). As recently reviewed, the trend towards increased use of ICSI has been observed throughout the world (Nyboe Andersen *et al.*, 2008; ICMART, 2009). In Australia and New Zealand, 58.5% of all cycles used ICSI in 2006 and in the USA the corresponding figure was 62.3%, so there is a uniform development in those three regions. However, within Europe a marked variation exist regarding the distribution between IVF and ICSI. As can be seen in Table I, 11 countries used ICSI in more than 75% of cases, the highest being Turkey (97.2%). In contrast, in the Nordic countries, the Netherlands, Russia, Ukraine, Ireland, the UK and a few other countries, IVF remain the dominant technology. As recently analysed (Nyboe Andersen *et al.*, 2008), the marked increase in the use of ICSI cannot be explained by a similar increase in male infertility but rather to a more frequent use of ICSI in cases with mixed caused of infertility, unexplained infertility and mild male factor infertility. This is, however, unlikely to fully account the differences between the countries, which can only be explained by different professional approaches.

The number of embryos transferred in IVF and ICSI cycles differed substantially between countries, but there is a clear trend during the years of observation towards transfers with fewer embryos (Table III). The mean percentage of SETs increased from 12.0% in 2001 to 15.7% in 2003, 20.0% in 2005 and 22.1% in 2006. The proportion of DET increased by 2% since 2005, and the proportion of three (19.0 versus 21.5%) and four (1.6 versus 2.3%) embryo transfers continued to decrease in 2006. In conclusion, the trend towards reduction in the number of embryos transferred continued in 2006.

This report is unable to define the number of elective SET (eSET) versus SET but the rise in the number of transfers of one embryo is undoubtedly due to a rise in eSET. As seen in Table III there were four countries that reported transfer of a single embryo in more than 45% of all transfers: Sweden (69.6%), Finland (54.7%), Belgium (49.2%) and Norway (48.0%), all with an increase from 4 to 6% since 2005. For comparison single embryo transfer was done in 62 and 40% of cycles in Australia and New Zealand for women aged less than 38 years or 38 or more, respectively (AIHW, 2008).

The consistent trend towards transfer of fewer embryos is also reflected in the overall occurrence of multiple deliveries after IVF and ICSI. In 2000, the average multiple delivery rate was 26.9%, declining to 24.5% in 2002, 21.8% in 2005 and now 20.8% in 2006. During the 10 year period of EIM reporting the most remarkable finding regarding multiples has been the reduction in triplet deliveries from 3.6% in 1997 to 0.9% in 2006. As it is evident from Table III, however, major differences in triplet rates are still evident across countries. We have included data describing preterm birth rates according to the number of fetuses of the pregnancy (Supplementary Data, Table SXIV). It was completed by half of the reporting countries. The risk of extreme preterm birth (<28 weeks) was increased 3-fold for twins and by almost 10-fold for triplets. The risk of very preterm (28–32 weeks) birth are increased almost 5 for twins and 15-fold for triplets.

Fetal reductions are almost always only done in triplet or higher order gestations. Thus, when analysing the range of triplet delivery rates in different countries, the number of fetal reductions should

also be considered. A total of 466 procedures were reported, the largest numbers coming from the UK (102), Spain (95), Czech Republic (89) and Ukraine (78). However, the total number is likely to be an underestimate since several countries, including large countries as Germany and France did not report them in 2006. Without this intervention, the proportion of triplet deliveries would have been higher, given that a number of countries did not report on fetal reductions, and that the number reported is higher than the number of recorded triplet deliveries (230 in total).

Despite the decrease in the number of transferred embryos, pregnancy rates increased marginally from 2005 to 2006 (26.9–28.9% per aspiration for IVF, 28.5–29.9% per aspiration for ICSI and 17.3–19.1% per thawing for FER).

The pregnancy rates in Europe remain lower than in the USA where 35.0% of cycles from non-donor cycles resulted in a pregnancy (CDC, 2008). However, the pregnancy rates in Europe are very similar to what is achieved in Australia and New Zealand, where the clinical pregnancy rate per transfer was 30.6% after fresh cycles and 21.5% after FER transfers in 2006 (AIHW, 2008).

The data on pregnancy and delivery rates presented in the EIM reports were overall results for all age groups until 2005. At the EIM Consortium meeting in Barcelona, July 2008, it was decided to collect European data in a way that would permit stratification of the pregnancy and delivery rates by female age. Thus, for IVF, the pregnancy rates per initiated cycles decreased from 28.2% in women aged <35, to 22.2% in those aged 35–39 and 9.6% in those aged 40 or more (Supplementary Data, Table SVIII). Similar trends existed for ICSI and FER (Supplementary Data, Tables IX and X), but not for ED (Supplementary Data, Table SXI). Those tables also give the delivery rates per cycle. These tables are important to consider since they better allow comparing the countries, as age is a major prognostic factor that is unequally distributed across the countries.

With the noticeable decline in the number of embryos transferred, the cumulative delivery rate per started cycle may be a most relevant endpoint for ART (Supplementary Data, Table SXVIII). In fact, the calculation of this cumulative delivery rates is not methodologically correct since it simply adds the fresh and FER pregnancies obtained in the same year rather than the FER pregnancies accruing from one oocyte aspiration procedure. It should, however, be stressed that the correct figure can only be obtained a few years after the initial oocyte aspiration and, in a steady state situation this calculation will give a reasonable estimate of the true cumulative delivery rate. In several countries the addition of FER deliveries added a substantial increase to the delivery rates per cycle: Finland (20.6–31.9%), Sweden (23.1–31.0%) and Switzerland (17.0–26.2%), justifying the transfer and freezing policies performed in those countries.

PGD/PGS activity was recorded from 13 countries and included 6561 cycles resulting in 802 deliveries (14.0% per aspiration). Detailed analysis of PGD/PGS in Europe will be published separately by ESHRE's PGD Consortium (Sermon *et al.*, 2007).

The major differences between countries in the numbers of some techniques, such as ED or PGD, must be viewed as markers of cross-border reproductive care: couples who do not have access to ART in their home countries and travel to another country to get treated. This phenomenon raises important public health questions needing more information for proper evaluation, which will be addressed by EIM in the next future.

Regarding direct risks of ART, OHSS was recorded in 0.8% of cycles; less than in 2005 (1.2%). This could be due to a possible increased use of milder stimulation in Europe, changes in triggering of ovulation, and/or an underreporting of OHSS.

For the fifth consecutive year the present report includes European data on treatments with IUI-H (134 000 cycles) and IUI-D (24 000 cycles), thus showing an increase in IUI-H (+6000) and in IUI-D (+3000), compared with 2005. The coverage of IUI activities by the national registers is less comprehensive than for the *in vitro* techniques. In women below 40 years of age the delivery rate was 9.2% for IUI-H and 13.3% for IUI-D.

After IUI, both for husband and donor insemination, twin pregnancies were observed in approximately half as many cases compared with after ART, but triplet pregnancies were at similar rates.

In summary, the present 10th ESHRE report on ART for Europe in 2006 shows a continuing expansion of numbers of participating clinics, countries and treatment cycles reported. The rise in the use of ICSI continued and reached 66.5% in 2006. Pregnancy rates after IVF and ICSI showed marginally increase compared with 2005, although fewer embryos were transferred and SET reached 22.2% in 2006. As a consequence the multiple delivery rates continued to decline to 20.8% of all deliveries after IVF and ICSI.

## Supplementary data

Supplementary data are available at <http://humrep.oxfordjournals.org/>.

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## Appendix

EIM Committee: Chairman: J.M.; Chairman elect, A.P.F.; Past chairman A.N.A.; Members, S.B., J.A.C., V.K., M.K., K.G.N.; V.G. is Science Manager at ESHRE Central Office, Brussels. See Appendix

for contributing centres and contact persons representing the data collection programmes in the participating European countries.

**Contact persons representing data collection programmes in participating European countries, 2006.**

**Albania**

Prof. Orion Glozheni, University Hospital for Obstetrics & Gynecology, Bul. B. Curri, Tirana, Albania. Tel.: +355-4-235-870; Fax: +355-4-257-688; Mobile: +355-68-20-29313; E-mail: gliorion@icc-al.org.

**Austria**

Prof. Dr Heinz Strohmer, Kinderwunschzentrum Private Hospital Goldenes Kreuz, Lazarettg. 16–18, 1090 Wien, Austria. Tel.: +43-1-40111-1400; Fax: +43-1-40111-1401; E-mail: heinz.strohmer@kinderwunschzentrum.at.

**Belgium**

Dr Kris Bogaerts, I-Biostat, Kapucijnenvoer 35 bus 7001, 3000 Leuven, Belgium. Tel.: +32-16-33-68-90; Fax: +32-16-33-70-15; E-mail: kris.bogaerts@med.kuleuven.be.

**Bulgaria**

Prof. Stanimir Kyurkchiev, SAGBAL Dr. Shterev Hospital, Molecular Immunology, 25–31, Hristo Blagoev str., 1330 Sofia, Bulgaria. Tel.: +359-2-920-09-01; Fax: +359-2-920-18-27; E-mail: skyurkchiev@mail.bg.

**Cyprus**

Dr Michael Pelekanos, Fertility Centre Aceso, 1, Pavlou Nirvana str., 3021 Limassol, Cyprus. Tel.: +357-99645333; E-mail: pelekanos@akeso.com.

**Czech Republic**

Dr Karel Rezabek, Charles University Prague, Gyn/Ob department, Apolinarska 18, 12000 Prague, Czech Republic. Tel.: +420-271028301; E-mail: krezabek@vfn.cz.

**Denmark**

Dr Karin Erb, Fertility Clinic, Odense University Hospital, Sdr. Boulevard 29, 5000 Odense C, Denmark. Tel.: +45-65-41-23-24; Fax: +45-65-90-69-82; E-mail: karin.erb@ouh.regionsyddanmark.dk.

**Finland**

Dr Mika Gissler, Nat. Research and Develop. Centre for Wa, P.O. Box 220, 00531 Helsinki, Finland. Tel.: +385-9-39672099; Fax: +385-9-39672459; E-mail: mika.gissler@thl.fi.

**France**

Dr Jacques de Mouzon, INSERM, 15, Rue Guilleminot, 75014 Paris, France. Tel.: +33-1-5841-2268; Mobile: +33-6-62-06-22-74; Fax: +33-1-5841-1539; E-mail: jdemouzon@noos.fr; jacques.demouzon@inserm.fr.

Dr Taraneh Shojaei, Agence de la Biomédecine, 1 Av du stade de France, 93212 Saint-Denis La Plaine Cedex, France. Tel.: +33-1-55-93-64-02; E-mail: taraneh.shojaei@biomedecine.fr.

**Germany**

Dr Klaus Bühler, Center for Gynaecology, Endocrinology and Repr Med, Ostpassage 9, 30853 Langenhagen, Germany. Tel.: +49-511-97230-40; Fax: +49-511-97230-18; E-mail: k.buehler@kinderwunsch-langenhagen.de.

**Greece**

Prof. Dr Basil Tarlatzis, Papageorgiou Hospital, Unit of Human Reproduction, Periferiakis Odos, Neas Efkarpas, 56403 Thessaloniki,

Greece. Tel.: +30-231-09-91-508; Mobile: +30-694-431-53-45; Fax: +30-231-0991510; E-mail: basil.tarlatzis@gmail.com.

**Hungary**

Prof. G. Kosztolanyi, University of Pecs, Dept. of Medical Genetics and Child development, Jozsef A.u.7., 7623 Pecs, Hungary. Tel.: +36-7-2535977; Fax: +36-7-2535972; E-mail: gyorgy.kosztolanyi@aok.pte.hu.

**Iceland**

Mr H. Bjorgvinsson, Art Medica, IVF Unit, Baejarlind 12, 201 Kopavogur, Iceland. Tel.: +354-515-8100; Fax: +354-515-8103; E-mail: hilmar@artmedica.is.

**Ireland**

Dr Edgar Mocanu, HARI Unit, Rotunda Hospital, Dublin 1, Ireland. Tel.: +35-31-8072-732; Fax: +35-31-8727-831; E-mail: emocanu@rcsi.ie.

**Italy**

Dr Guilia Scaravelli, Registro Nazionale Medicalmente Assistita, CNESPS, Istituto Superiore de Sanita, Viale Regina Elena, 299, 00161, Roma. Tel.: +39-49904319; Fax: +39-49904324; E-mail: guilia.scaravelli@iss.it.

**Latvia**

Dr Voldemars Lejins, EGV Clinic, Dept. of IVF, Gertrudes Str. 3, LV 1010 Riga. Tel.: +373-7-320603; Fax: +373-72-22914; E-mail: egv@apollo.lv.

**Lithuania**

Dr Zivile Gudleviciene, Baltic American, IVF Laboratory, Nemencines rd 54A, 10103 Vilnius, Lithuania. Tel.: +370-52342020; E-mail: zivile.gudleviciene@gmail.com.

**Macedonia**

Dr Slobodan Lazarevski, SHOG 'Mala Bogorodica', Londonska 19, 1000 Skopje, Macedonia. Tel.: +389-2-30-73-335; Mobile: +389-70-246-089; Fax: +389-2-30-73-398; E-mail: dr.lazarevski@mbogorodica.com.mk.

**Montenegro**

Dr Tatjana Motrenko Simic, Medical Center Cetinje, Human Reproduction, Vuka Micunovica 4, 81310 Cetinje, Montenegro. Tel.: +382-86232690; Fax: +382-86231336; E-mail: motrenko@t-comm.me.

**The Netherlands**

Dr Cornelis Lambalk, Free University Hospital, Reproductive Medicine, de Boelaan 1117, P.O. Box 7057, 1007 MB Amsterdam, The Netherlands. Tel: +31-20-444-00-70; Fax: +31-20-444-00-45; E-mail: cb.lambalk@vumc.nl.

**Norway**

Dr Johan T. Hazekamp, Volvat Medisinske Senter, A.S., P.O. Box 5280 Majorstua, 0303 Oslo, Norway. Tel.: +47-22-95-75-00; Fax: +47-22-93-24-02; E-mail: johan.hazekamp@volvat.no.

**Poland**

Mr Waldemar Kuczynski, Medical Academy I, Dept. of Ob/Gyn, Pulaski 14, 15–338 Bialystok, Poland. Tel.: +48-502-273-923; Fax: +48-85-744-13-78; E-mail: kuczynski@amb.edu.pl.

**Portugal**

Prof. Dr Carlos Calhaz-Jorge, Human Reproduction Unit, Dept of Ob/Gyn, Hosp. de Santa Maria, Av. Prof. Egas Moniz, 1649-028 Lisboa, Portugal. Tel.: +351-21-72-64-229; Fax: +351-21-78-05-621; E-mail: calhazjorge@mail.telepac.pt.

**Russia**

Dr Vladislav Korsak, President of Russian Association of Human Reproduction, Director General of International Centre for Reproductive Medicine, Post box 191, 199034 St-Petersburg, Russia. Tel.: +7-812-327-1951; Fax: +7-812-327-1952; Mobile: +7-921-965-19-77; E-mail: korsak@mcrum.ru.

**Serbia**

Prof. Nebojsa Radunovic, Institute for Obstetrics and Gynecology, Visegradska 26, 11000 Belgrade. Tel.: +38-111-36-15-592; Fax: +38-1113615603; E-mail: radunn01@gmail.com.

**Slovenia**

Dr Tomaz Tomazevic, University Medical Centre Ljubljana, Obstetrics Gynecology Reproduction, Slajmerjeva 3, 61000 Ljubljana, Slovenia. Tel.: +386-1-522-60-13; Fax: +386-1-431-43-55; E-mail: tomaz.tomazevic@guest.arnes.si.

**Spain**

Dr Juana Hernandez Hernandez, Hospital San Millan, Servicio de Ginecologia y Obstetricia, Avda. Autonoma de la Rioja 3, 26001 Logrono, Spain. Tel.: +34-94-12-73077; Fax: +34-94-12-73-081; E-mail: jhernandezh@telefonica.net.

**Sweden**

Dr Per-Olof Karlstrom, Akademiska Hospital, Dept. Of Ob/Gyn, 751 85 Uppsala, Sweden. Tel.: +46-611-2838; Fax: +46-211-31611; E-mail: per-olof.karlstrom@karolinska.se.

**Switzerland**

Ms Maya Weder, Administration FIVNAT, Postfach 89, 3122 Kehrsatz, Switzerland. Tel.: +41-31-819-76-02; Fax +41-31-819-89-20; E-mail: administration.sgrm@bluewin.ch.

**Turkey**

Prof. Dr Timur Gurgan, Gurgan Clinic, Infertility, Cankaya caddesi, 20/3, 06680 Cankaya-Ankara, Turkey. Tel.: +90-312-4427404; Fax: +90-312-4427407; Mobile +90-532-231-7706; E-mail: turgan@gurganclinic.com.tr.

**Ukraine**

Dr Viktor Veselovsky, Clinic of Reproductive Medicine Nadija, 28-A, Andriivskyyuzviz str., 01025 Kyiv, Ukraine. Tel.: +380-50-311-47-38; Fax: +380-44-5327-75-99; E-mail: v.veselovskyy@ivf.com.ua.

**UK**

Mr Richard Baranowski, Deputy Information Manager, Human Fertilization and Embryology Authority (HFEA), 21 Bloomsbury Street, London WC1B 3HF, UK. Tel.: +44-20-7539-3329; Fax: +44-20-7377-1871; E-mail: richard.baranowski@hfea.gov.uk.