

**Table 1A. Distribution of descendants of first and second dividing 2-cell blastomeres when first blastomere contributed more cells to the blastocyst – 1n\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	49	27	17	76	7	7	22	17	59	8	4	15	47	53	50
2	49	28	19	74	9	5	21	15	67	6	5	15	60	40	45
3	32	17	10	60	5	6	15	11	45	6	4	11	45	55	90
4	32	18	15	73	4	3	14	8	63	5	4	9	44	56	54
5	37	19	16	63	5	4	18	11	64	5	6	10	50	50	67
6	35	18	14	50	6	5	17	11	55	4	7	10	60	40	89
7	27	16	13	85	4	1	11	6	83	4	2	8	50	50	35
8	20	12	7	86	3	3	8	6	50	4	1	7	43	57	65
9	33	18	11	64	6	5	15	10	50	6	4	12	50	50	73
10	34	19	12	83	5	4	15	12	67	5	2	10	50	50	42
11	45	25	19	68	5	7	20	13	46	8	6	13	38	62	‡
12	35	18	15	53	6	4	17	10	60	4	7	10	60	40	80
13	37	20	13	31	6	10	17	13	23	5	9	11	55	45	80
14	50	26	22	27	5	15	24	15	0	8	16	13	38	62	0
Means	36.8	20.1	14.5	64	5.4	5.6	16.7	11.3	52	5.6	5.5	11.0	49	51	59.2
±s.d.	8.7	4.6	4.0	18	1.5	3.5	4.3	3.2	20	1.5	3.7	2.4	7	7	25.3

\*Distribution of dye-labelled cells in blastocysts was determined by estimating the number of cells occupying the boundary zone or crossing to the far side of the boundary zone and lying in the other part of the blastocyst, as described in Methods. The number of cells derived from the early-dividing and late-dividing two cell blastomere were counted by dissociating each blastocyst after three-dimensional confocal imaging, also as described. The number of cells in embryonic and abembryonic parts, defined as being those portions of the embryonic and abembryonic regions exclusive of the boundary zone, was determined by subtracting the boundary zone and boundary zone-crossing cell number estimates from the total number of labelled cells (early or late) then adding the boundary-crossing cells from the opposite part. Abbreviations: BZ, boundary zone between the embryonic and abembryonic parts, consisting of a layer beginning at the blastocoel surface of the ICM and extending into the embryonic region to a depth of approximately one cell (thus including both ICM and polar trophectoderm).

‡Mixed distribution of cells prevented assessment of the tilt in these embryos; s.d., standard deviation. Tilt, the approximate angle between the plane of the boundary zone and the plane of the clonal border (see Materials and Methods).

**Table 1B. Distribution of descendants of first and second dividing 2-cell blastomeres when second blastomere contributed more or even number of cells to the blastocyst – 1*n*\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	32	15	11	45	5	5	17	10	50	6	6	11	45	55	‡
2	24	11	3	33	5	5	13	13	62	3	2	8	63	38	90
3	28	13	10	50	3	5	15	10	50	5	5	8	38	63	‡
4	30	15	12	42	5	5	15	8	38	5	7	10	50	50	85
5	27	10	9	44	5	1	17	9	89	4	5	9	56	44	25
6	32	14	12	58	2	5	18	11	55	7	5	9	22	78	‡
7	31	15	12	50	6	3	16	10	70	3	6	9	67	33	‡
8	32	15	12	42	4	6	17	11	45	5	7	9	44	56	75
9	30	13	13	85	1	1	17	7	86	9	2	10	10	90	10
10	46	21	20	30	4	11	25	15	27	7	14	11	36	64	70
11	28	14	13	8	6	7	14	7	0	2	12	8	75	25	10
12	39	18	15	33	2	11	21	14	21	8	10	10	20	80	0
Means	31.6	14.5	11.8	43	4.0	5.4	17.1	10.4	49	5.3	6.8	9.3	44	56	45.6
±s.d.	5.8	2.9	3.9	18	1.7	3.2	3.2	2.6	26	2.1	3.6	1.1	20	20	37.8

\*Counts of blastocyst cells were performed as described for Table 1A.

‡Mixed distribution of cells prevented assessment of the tilt in these embryos

**Table 2A. Distribution of descendants of first and second dividing 2-cell blastomeres when first blastomere contributed more cells to the blastocyst – 2n CD\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	32	18	13	100	4	1	14	8	88	7	0	11	36	64	10
2	39	20	20	25	7	8	19	8	0	4	15	11	64	36	43
3	37	21	18	83	6	0	16	8	100	5	3	11	55	45	35
4	43	22	16	75	7	3	21	13	77	7	4	14	50	50	45
5	40	21	17	71	6	3	19	11	73	6	5	12	50	50	8
6	39	21	14	71	6	5	18	12	58	7	4	13	46	54	20
7	42	22	14	79	7	4	20	14	71	7	3	14	50	50	19
8	40	21	15	67	6	5	19	14	64	5	5	11	55	45	50
9	43	23	17	65	6	6	20	13	54	7	6	13	46	54	70
10	41	22	14	86	5	5	19	15	67	7	2	12	42	58	60
11	47	24	26	31	8	8	23	9	11	4	18	12	67	33	89
12	35	18	15	53	6	4	17	9	56	5	7	11	55	45	44
13	33	17	15	67	4	3	16	8	63	6	5	10	40	60	70
Means	39.3	20.8	16.5	67	6.0	4.2	18.5	10.9	60	5.9	5.9	11.9	50	50	43.3
±s.d.	4.2	2.0	3.5	21	1.2	2.4	2.4	2.7	27	1.2	5.1	1.3	9	9	24.8

\*Counts of blastocyst cells were performed as described for Table 1A.

**Table 2B. Distribution of descendants of first and second dividing 2-cell blastomeres when second blastomere contributed more or even number of cells to the blastocyst – 2n CD\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	31	15	15	60	3	3	16	7	57	6	6	9	33	67	67
2	42	20	20	60	6	2	22	8	75	8	8	14	43	57	90
3	36	17	13	54	6	4	19	11	64	6	6	12	50	50	75
4	34	16	14	36	4	7	18	11	36	5	9	9	44	56	45
5	36	18	14	71	5	3	18	12	75	5	4	10	50	50	0
6	34	17	11	64	6	4	17	11	64	6	4	12	50	50	19
7	43	21	17	76	6	2	22	14	86	6	4	12	50	50	10
8	42	20	17	59	4	6	22	14	57	7	7	11	36	64	80
9	50	25	22	36	7	10	25	15	33	6	14	13	54	46	50
10	35	17	12	50	5	6	18	13	54	5	6	10	50	50	‡
11	38	18	14	50	6	5	20	12	58	6	7	12	50	50	72
Means	38.3	18.5	15.4	56	5.3	4.7	19.7	11.6	60	6.0	6.8	11.3	46	54	48.4
±s.d.	6.0	2.8	3.4	13	1.2	2.4	2.7	2.5	16	0.9	2.9	1.6	6	6	32.6

\*Counts of blastocyst cells were performed as described for Table 1A.

‡Mixed distribution of cells prevented assessment of the tilt in these embryos

**Table 3A. Distribution of descendants of first and second dividing 2-cell blastomeres when first blastomere contributed more cells to the blastocyst – 2n PB\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	38	21	14	86	7	2	17	13	85	4	2	11	64	36	32
2	47	24	21	67	6	3	23	12	75	7	7	13	46	54	56
3	36	19	16	75	3	4	17	10	60	7	4	10	30	70	24
4	31	16	12	67	4	4	15	9	56	6	4	10	40	60	88
5	43	22	22	64	5	3	21	10	70	6	8	11	45	55	50
6	46	24	24	63	7	2	22	9	78	6	9	13	54	46	0
7	34	19	15	87	4	2	15	10	80	5	2	9	44	56	20
8	32	17	13	77	5	2	15	10	80	4	3	9	56	44	0
9	28	15	12	75	4	2	13	8	75	4	3	8	50	50	0
10	34	20	13	69	7	4	14	10	60	4	4	11	64	36	35
11	35	22	14	50	5	10	13	11	9	5	7	10	50	50	43
12	34	18	13	54	5	6	16	11	45	5	6	10	50	50	40
13	31	16	15	53	5	3	15	8	63	3	7	8	63	38	84
14	53	28	30	53	8	4	25	10	60	5	14	13	62	38	35
15	43	22	19	42	7	7	21	12	42	5	11	12	58	42	87
16	39	21	19	42	6	7	18	8	13	6	11	12	50	50	27
17	35	21	15	73	5	5	14	10	50	5	4	10	50	50	87
18	43	24	19	53	7	7	19	12	42	5	9	12	58	42	71
19	42	24	20	90	5	1	18	11	91	6	2	11	45	55	0
20	24	14	11	55	3	5	10	6	17	4	5	7	43	57	‡
21	32	20	17	88	1	4	12	7	43	7	2	8	13	88	39
22	32	17	15	80	3	2	15	8	75	6	3	9	33	67	26
Means	36.9	20.2	16.8	66	5.1	4.0	16.7	9.8	58	5.2	5.8	10.3	49	51	39.7
±s.d.	6.9	3.5	4.6	15	1.7	2.2	3.8	1.8	23	1.1	3.4	1.8	12	12	30.3

\*Counts of blastocyst cells were performed as described for Table 1A.

‡Mixed distribution of cells prevented assessment of the tilt in these embryos

**Table 3B. Distribution of descendants of first and second dividing 2-cell blastomeres when second blastomere contributed more or even number of cells to the blastocyst – 2n PB\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	46	20	22	14	7	10	26	11	9	6	19	13	54	46	17
2	38	19	14	71	7	2	19	12	83	5	4	12	58	42	0
3	41	20	15	53	8	4	21	13	69	5	7	13	62	38	51
4	38	18	16	31	6	7	20	10	30	6	11	12	50	50	30
5	24	10	10	30	4	3	14	6	50	4	7	8	50	50	35
6	38	15	16	38	5	4	23	10	60	7	10	12	42	58	69
7	28	11	15	0	5	6	17	6	0	2	15	7	71	29	35
8	32	16	13	15	5	9	16	10	10	4	11	9	56	44	25
9	29	14	15	73	2	1	15	6	83	6	4	8	25	75	41
10	34	14	14	7	5	8	20	11	27	4	13	9	56	44	34
11	30	12	12	67	2	2	18	9	78	7	4	9	22	78	0
Means	34.4	15.4	14.7	36	5.1	5.1	19.0	9.5	45	5.1	9.5	10.2	50	50	30.6
±s.d.	6.5	3.6	3.0	26	1.9	3.1	3.5	2.5	32	1.5	4.9	2.2	15	15	20.3

\*Counts of blastocyst cells were performed as described for Table 1A.

**Table 4A. Distribution of descendants of first and second dividing 2-cell blastomeres when first blastomere contributed more cells to the blastocyst – NO SEP\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	31	17	13	54	6	4	14	8	50	4	6	10	60	40	‡
2	38	21	14	50	7	7	17	12	42	5	7	12	58	42	72
3	39	22	15	27	8	10	17	11	9	5	11	13	62	38	17
4	27	14	12	25	4	7	13	7	0	4	9	8	50	50	17
5	41	21	16	63	7	4	20	12	67	6	6	13	54	46	‡
6	31	16	12	25	5	8	15	10	20	4	9	9	56	44	15
7	30	17	12	58	5	5	13	9	44	4	5	9	56	44	80
8	32	19	14	86	4	3	13	10	70	4	2	8	50	50	‡
9	34	19	15	47	6	6	15	9	33	4	8	10	60	40	‡
10	27	14	10	80	4	2	13	9	78	4	2	8	50	50	0
11	36	21	13	85	6	4	15	12	67	5	2	11	55	45	15
12	27	14	11	55	5	3	13	8	63	3	5	8	63	38	90
13	34	18	13	23	6	9	16	11	18	4	10	10	60	40	40
14	37	20	15	60	4	7	17	11	36	7	6	11	36	64	60
Means	33.1	18.1	13.2	53	5.5	5.6	15.1	9.9	43	4.5	6.3	10.0	55	45	40.6
±s.d.	4.6	2.8	1.7	22	1.3	2.4	2.1	1.6	24	1.0	2.9	1.8	7	7	32.3

\*Counts of blastocyst cells were performed as described for Table 1A.

‡Mixed distribution of cells prevented assessment of the tilt in these embryos

SEP, sperm entry position

**Table 4B. Distribution of descendants of first and second dividing 2-cell blastomeres when second blastomere contributed more or even number of cells to the blastocyst – NO SEP\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	33	16	12	50	3	7	17	11	36	7	6	10	30	70	54
2	32	16	14	64	3	4	16	9	56	6	5	9	33	67	42
3	31	15	13	46	2	7	16	10	30	6	7	8	25	75	60
4	33	14	16	38	2	6	19	8	25	7	10	9	22	78	‡
5	27	13	11	36	4	5	14	8	38	4	7	8	50	50	84
6	42	17	18	33	5	6	25	12	50	7	12	12	42	58	‡
7	25	11	9	67	3	2	14	8	75	5	3	8	38	63	20
8	33	16	15	73	5	0	17	8	100	5	4	10	50	50	20
9	30	14	12	33	4	6	16	10	40	4	8	8	50	50	40
10	30	14	12	67	3	3	16	11	73	4	4	7	43	57	85
11	30	13	12	33	4	5	17	10	50	4	8	8	50	50	89
12	31	15	15	47	4	4	16	7	43	5	8	9	44	56	82
13	32	16	15	80	3	1	16	8	88	6	3	9	33	67	33
Means	31.5	14.6	13.4	51	3.5	4.3	16.8	9.2	54	5.4	6.5	8.8	39	61	55.4
±s.d.	4.0	1.7	2.4	17	1.0	2.3	2.8	1.5	23	1.2	2.7	1.3	10	10	26.4

\*Counts of blastocyst cells were performed as described for Table 1A.

‡Mixed distribution of cells prevented assessment of the tilt in these embryos

SEP, sperm entry position



**Table 5A. Distribution of descendants of first and second dividing 2-cell blastomeres when first blastomere contributed more cells to the blastocyst – control NO SEP\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	23	12	10	100	2	0	11	6	100	5	0	7	29	71	0
2	26	14	10	100	4	0	12	8	100	4	0	8	50	50	24
3	26	15	14	86	3	0	11	5	100	4	2	7	43	57	28
4	26	14	8	88	3	4	12	11	64	4	1	7	43	57	52
5	26	16	12	92	3	2	10	7	71	4	1	7	43	57	48
6	32	18	16	69	3	4	14	7	43	6	5	9	33	67	54
7	28	16	9	100	3	4	12	12	67	4	0	7	43	57	50
8	24	15	13	92	3	0	9	4	100	4	1	7	43	57	11
9	36	20	17	82	4	2	16	9	78	6	3	10	40	60	28
10	26	14	10	90	4	1	12	8	88	4	1	8	50	50	18
11	45	25	17	82	9	2	20	16	88	3	3	12	75	25	27
12	33	18	16	75	3	3	15	8	63	6	4	9	33	67	35
13	37	19	15	87	6	0	18	10	100	6	2	12	50	50	20
14	45	27	21	90	5	3	18	12	75	7	2	12	42	58	26
15	37	22	13	62	6	8	15	12	33	6	5	12	50	50	64
16	29	15	9	33	5	7	14	10	30	5	6	10	50	50	18
17	38	20	15	93	5	1	18	12	92	6	1	11	45	55	11
Means	31.6	17.6	13.2	84	4.2	2.4	13.9	9.2	76	4.9	2.2	9.1	45	55	30.2
±s.d.	6.8	4.1	3.6	17	1.7	2.4	3.2	3.1	24	1.1	1.9	2.1	10	10	17.8

\*Counts of blastocyst cells were performed as described for Table 1A.

SEP, sperm entry position

**Table 5B. Distribution of descendants of first and second dividing 2-cell blastomeres when second blastomere contributed more or even number of cells to the blastocyst – control NO SEP\***

Name	Total cells	Total early	Total embryonic	% Embryonic early	Early in BZ	Early crossing BZ to abembryonic	Total late	Total abembryonic	% Abembryonic late	Late in BZ	Late crossing BZ to embryonic	Total BZ	%BZ early	%BZ late	Tilt
1	28	13	11	55	3	4	15	10	60	4	5	7	43	57	35
2	28	10	13	38	3	2	18	8	75	4	8	7	43	57	64
3	20	10	7	57	3	3	10	6	50	4	3	7	43	57	43
4	37	17	16	19	3	11	20	11	0	7	13	10	30	70	42
5	31	15	15	27	3	8	16	8	0	5	11	8	38	63	0
6	25	12	12	50	3	3	13	6	50	4	6	7	43	57	79
7	23	9	8	50	4	1	14	6	83	5	4	9	44	56	52
Means	27.4	12.3	11.7	42	3.1	4.6	15.1	7.9	45	4.7	7.1	7.9	40	60	45.0
±s.d.	5.6	2.9	3.4	15	0.4	3.6	3.3	2.0	33	1.1	3.7	1.2	5	5	24.8

\*Counts of blastocyst cells were performed as described for Table 1A.  
SEP, sperm entry position