

SUPPLEMENTARY INFORMATION

Table S1. Distribution of first-, second- and third-division metaphases among 1,000 cells in 48-, 52-, and 72-h cultures from two donors.

Table S2. Observed frequency of different arm cohesion phenotypes before and after synchronization.

Table S3. RABiT-II DCA yields after in vitro γ -ray irradiation of blood samples derived from four healthy individuals (scored automatically using FluorQuantDic version 3.3).

Table S4. Classical DCA yields and intercellular distribution of dicentric aberrations after in vitro γ -ray irradiation of blood samples derived from four healthy individuals (scored manually).

Fig. S1. Representative images of chromosome spreads obtained from asynchronously growing blood cells arrested in metaphase by colcemid. A variety of chromosomal configurations are observed in different metaphases. Panel A: DNA strands are weakly condensed. Panel B: Progressively condensed chromosomes with long length; chromosome arms keep firm connection. Panel C: Arms begin to open due to cleavage and release of cohesin. Panel D: Chromosomes begin to shorten in length by condensing. Panel E: Chromosomes become very short, arms are completely opened and firm connection remains only at the centromere region (“X-shape”). Panel F: Arms and centromeres are split. Panel G: Other phases. (Inserts are published and modified, with permission, from: Rieder CL, Palazzo RE. Colcemid and the mitotic cycle. J Cell Sci 1992; 102 Pt 3:387–92). White dashed boxes are cropped chromosomes used for Fig. 6A.

Fig. S2. Representative examples of chromosome clusters that lead to errors at low doses.

metaphases in	48 hrs culture			52 hrs culture			72 hrs culture		
	1st cycle	2nd cycle	3rd cycle	1st cycle	2nd cycle	3rd cycle	1st cycle	2nd cycle	3rd cycle
Donor 1 (female, 30)	1049 (99.8%)	2 (0.2%)	0 (0%)	870 (93.4%)	61 (6.6%)	0 (0%)	349 (36.6%)	502 (52.6%)	103 (10.8%)
Donor 2 (male, 35)	987 (100%)	0 (0%)	0 (0%)	948 (94.3%)	57 (5.7%)	0 (0%)	401 (41.1%)	494 (50.6%)	81 (8.3%)
<i>average, %</i>	99.9	0.1	0	93.9	6.2	0	38.9	51.6	9.6

Supplementary Table S1

Cohesion phenotype	Asynchronized		Synchronized	
	0Gy	10Gy	0Gy	10Gy
Undetectable	5	8	1	7
Arm-closed	30	34	87	89
Arm-opened	62	47	12	4
Unpaired	3	11	0	0
<i>% Total</i>	100	100	100	100

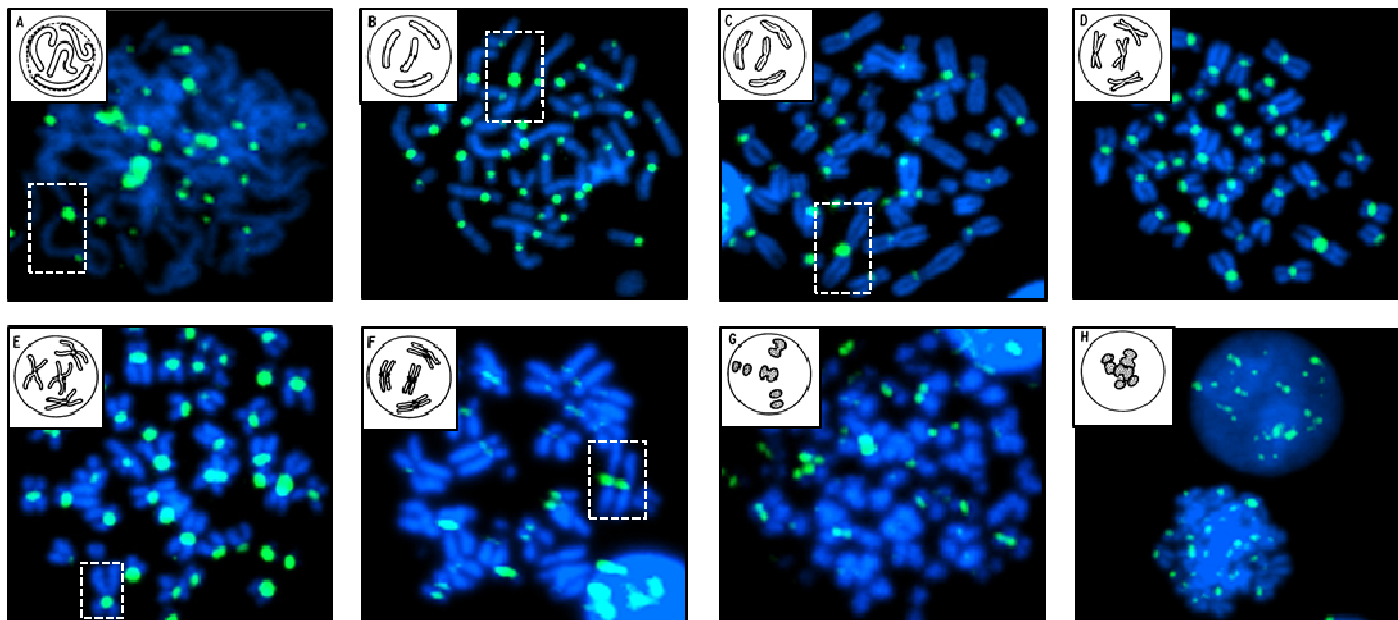
Supplementary Table S2

Dose (Gy)	Donor	Chromosomes	DC	<i>Y ± SE</i>
0	1	1587	9	0.006
	2	1414	18	0.009
	3	1337	32	0.022
	4	659	18	0.018
	Total	4997	77	<i>0.015 ± 0.002</i>
2.0	1	1022	15	0.012
	2	1110	13	0.009
	3	1961	31	0.013
	4	1600	34	0.014
	Total	5693	93	<i>0.016 ± 0.002</i>
4.0	1	1090	30	0.026
	2	1290	28	0.019
	3	1735	39	0.018
	4	764	45	0.033
	Total	4879	142	<i>0.029 ± 0.002</i>
6.0	1	1263	46	0.033
	2	1029	42	0.038
	3	1343	55	0.038
	4	1644	84	0.046
	Total	5279	227	<i>0.043 ± 0.003</i>
8.0	1	657	43	0.056
	2	951	48	0.047
	3	1308	77	0.053
	4	1210	87	0.061
	Total	4126	255	<i>0.062 ± 0.004</i>
10.0	1	562	40	0.068
	2	893	52	0.055
	3	963	86	0.087
	4	644	73	0.109
	Total	3062	251	<i>0.082 ± 0.005</i>

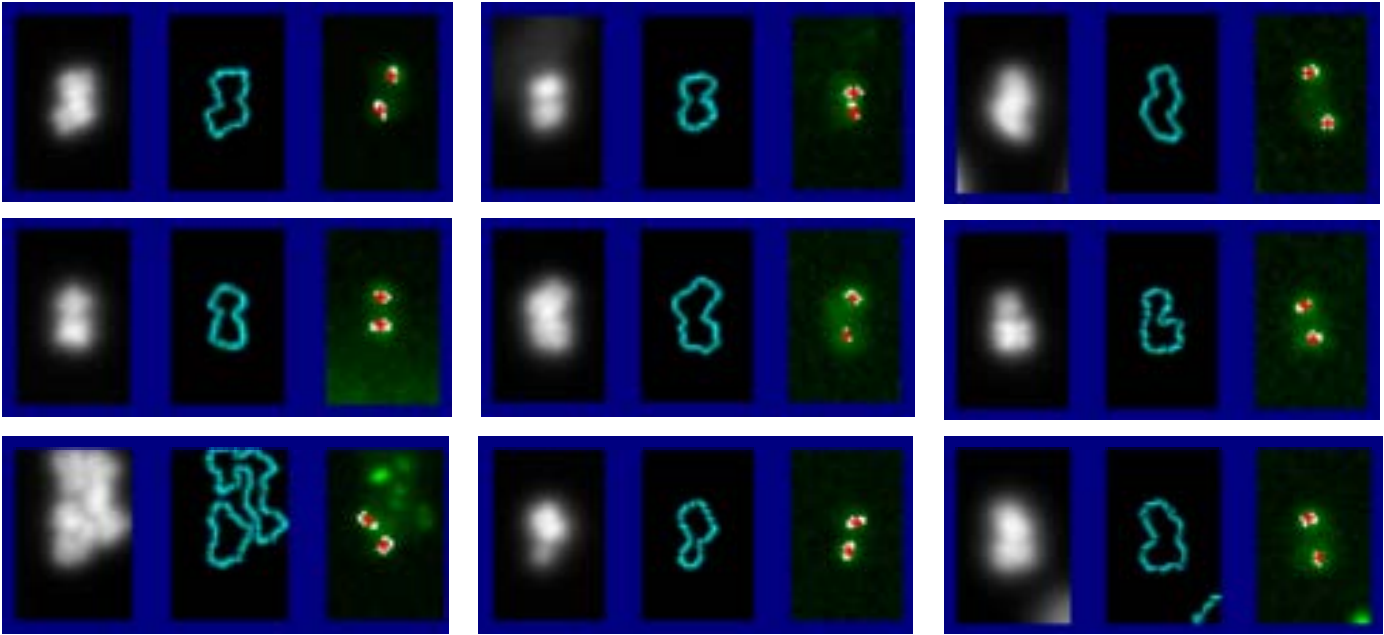
Supplementary Table S3

Dose (Gy)	Donor	Cells	Distribution of dicentrics											Y ± SE		
			DC	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9			
0	1	50	0	50	0	0	0	0	0	0	0	0	0	0	0	0.000
	2	50	0	50	0	0	0	0	0	0	0	0	0	0	0	0.000
	3	50	0	50	0	0	0	0	0	0	0	0	0	0	0	0.000
	4	50	0	50	0	0	0	0	0	0	0	0	0	0	0	0.000
	Total	200	0	200	0	0	0	0	0	0	0	0	0	0	0	0.000 ± 0.000
2.0	1	50	14	37	12	1	0	0	0	0	0	0	0	0	0	0.280
	2	50	13	37	13	0	0	0	0	0	0	0	0	0	0	0.260
	3	50	8	42	8	0	0	0	0	0	0	0	0	0	0	0.160
	4	50	18	34	14	2	0	0	0	0	0	0	0	0	0	0.360
	Total	200	53	150	47	3	0	0	0	0	0	0	0	0	0	0.265 ± 0.036
4.0	1	50	57	16	19	9	4	2	0	0	0	0	0	0	0	1.140
	2	50	54	19	16	8	6	1	0	0	0	0	0	0	0	1.080
	3	50	32	26	18	4	2	0	0	0	0	0	0	0	0	0.640
	4	50	45	20	17	11	2	0	0	0	0	0	0	0	0	0.900
	Total	200	188	81	70	32	14	3	0	0	0	0	0	0	0	0.940 ± 0.069
6.0	1	50	101	4	11	20	12	2	0	1	0	0	0	0	0	2.020
	2	50	92	7	17	13	8	0	5	0	0	0	0	0	0	1.840
	3	50	87	5	17	18	8	1	0	1	0	0	0	0	0	1.740
	4	50	102	3	15	19	7	4	1	0	1	0	0	0	0	2.040
	Total	200	382	19	60	70	35	7	6	2	1	0	0	0	0	1.910 ± 0.098
8.0	1	50	129	5	8	15	8	7	5	1	0	1	0	0	0	2.580
	2	50	141	1	9	10	17	7	4	1	1	0	0	0	0	2.820
	3	50	114	9	6	12	14	5	2	2	0	0	0	0	0	2.280
	4	50	142	3	7	11	13	9	4	3	0	0	0	0	0	2.840
	Total	200	526	18	30	48	52	28	15	7	1	1	0	0	0	2.630 ± 0.115
10.0	1	50	205	0	2	10	9	8	7	10	3	1	0	0	0	4.100
	2	50	210	0	2	5	8	12	17	3	1	2	0	0	0	4.200
	3	50	153	2	3	15	16	6	3	2	3	0	0	0	0	3.060
	4	50	221	0	0	3	12	12	15	3	3	1	1	0	0	4.420
	Total	200	789	2	7	33	45	38	42	18	10	4	1	0	0	3.940 ± 0.140

Supplementary Table S4



Supplementary Figure S1.



Supplementary Figure S2.