

Experiment-1 (ED21)

<i>Control (C): no telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

<i>Exposed (E): telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

Experiment-2 (ED21)

<i>Control (C): no telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

<i>Exposed (E): telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

Experiment-3 (ED21)

<i>Control (C): no telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

<i>Exposed (E): telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

Legend: Non-fertilized eggs Dead embryos

ED: embryonic death

P-17A

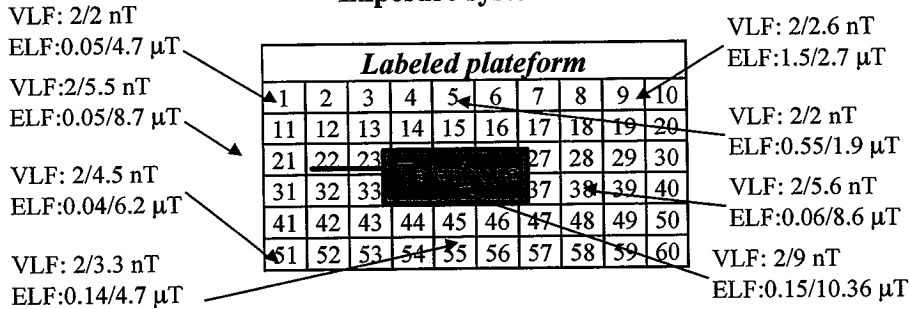
DAMAGE OF CHICKEN EMBRYOS BY EMFS FROM MOBILE PHONES: PROTECTION BY A COMPENSATION ANTENNA. B.J. Youbicier-Simo*, J.C. Lebecq* and M. Bastide*. Laboratoire d'Immunologie et Parasitologie, Faculté de Pharmacie, Université Montpellier I, 34060 Montpellier Cedex 2, France. (Sponsored by R. Santini, INSA, Laboratoire de Biochimie Pharmacologie, 69621 Lyon, France.)

This study was an attempt to cancel the developmental damage caused by continuous exposure of chicken embryos to electromagnetic fields (EMFs) realized by mobile phones. Four groups of 60 eggs each were incubated (21 days, 38 ± 1° C, 45-55% humidity, permanent darkness) and experienced the following electromagnetic exposure schedule: control group (C), incubated in the absence of the telephone; exposed group (E), submitted 24h/24h to EMFs emitted by the switched on telephone placed downwards, 10 mm above the

eggs which were distributed on a 60 location-labeled platform; protected group (P), under the same exposure conditions as their E counterparts, but the telephone being equipped with a compensation antenna; antenna group (A), exposed to the compensation antenna alone. According to manufacturer's specifications, the mobile phone used (Bosch, CARTEL SL 2G2, Germany) radiates in the radiofrequency band with 2 W power. The VLF and ELF values measured at different positions at the level of the eggs decreased from the center to the edge of the platform, in the range of 9-2 nT for VLF and 10-0.05 μ T for ELF. The compensation antenna (patent registration number 93/00546) is designed to compensate the biological effects of exposure to non-biocompatible EMFs. This device contains a saline solution that requires an electromagnetic treatment to become operational. Upon treatment, the absorptivity in UV spectrum drops at 200 nm (measurements performed with three different models of spectrophotometer), and increases in IR spectrum at 1639 cm^{-1} (by ATR with a ZnSe rod), the latter being the well-known in plane H-O-H distortion. Although weak (about 2%), these changes reflect modifications in water structure. These data correlate with SQUID measurements which pointed out an magnetic oscillation of the saline solution in the ELF band. Embryonic mortality was evaluated by candling the eggs and numbering dead embryos at two-day intervals from embryonic day 3 (ED3) to embryonic day 13 (ED13): ED3, ED5, ED7, ED9, ED11, ED13, and by opening the eggs from which chicks did not hatch at ED21. Embryonic mortality was expressed either as cumulative mortality (previous + current counts) or as total death rate (percentage of necropsied embryos from ED 3 to ED 21). Two independent experiments were carried out with similar results. The data presented in Table 1 and page 2 deal with experiment 1 only. Embryonic death was 5-fold higher in the EMF-exposed than in the control group (57.6% vs. 10.9%; Table 1, 59.3% vs. 11.9% in experiment 2). Consistently, necropsy distribution in the exposed group was essentially concentrated in the vicinity of the mobile phone, which contrast with rather sparse distribution in the control group (see CM-1 and CM-2 in page 2). Conversely, the compensation antenna effectively shielded the embryos against the telephone electromagnetic emissions, since the death rate markedly dropped in the presence of the antenna (57.6% vs. 29.3%, Table 1; 59.3% vs. 25.5% in experiment 2). Besides, the mortality distribution in the P group was closer to that observed for the controls (see CM-1 and CM-3 in page 2). Interestingly, comparable levels of embryonic mortality (10.9% vs. 15.5%), as well as similar profiles of mortality distribution were observed for both Control (C) and the antenna exposed (A) groups (Table 1; see CM-1 and CM-4 in page 2). The latter observation suggests that the compensation antenna is by itself not health hazardous. Taken together these data demonstrate that the compensation antenna harmlessly and effectively shields embryos against damage by EMFs radiated by mobile phones, making the latter biocompatible. Complementary experiments are underway in our laboratory to ascertain these findings.

Mortality distribution at ED 21: cumulative mortality (Experiment-1)

Exposure system and EMF values



CM-1: Control

<i>Control (C): no telephone</i>									
	2	3	4	5	6	7	8	9	10
11	12	13	14	15		17	18	19	20
21	22	23	24	25	26	27	28	29	
31	32	33		35	36	37	38	39	40
41	42	43	44	45	46	47		49	50
51	52	53	54	55	56	57	58	59	60

CM-2: Pathology

<i>Exposed (E): telephone</i>									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51		53	54	55	56	57	58	59	60

CM-3: Compensation

<i>Protected (P): phone + antenna</i>									
1	2		4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38		40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55		57	58	59	60

CM-4: Harmlessness

<i>Antenna alone (A): no phone</i>									
1	2	3	4	5	6	7	8	9	10
11	12		14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36		38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

Legend: No fertilized eggs (white square); Dead embryos (black square)

Age (days)	Control (C)	Exposed (E)	Protected (P)	Antenna (A)
NFE: ED3	5	1	2	2
ED3	0	7	2	1
ED5	0	8	2	3
ED7	0	8	3	4
ED9	0	10	3	4
ED11	0	17	4	4
ED13	0	17	4	4
ED21	6	34	17	9
TDR 21 (%)	10.9	57.6	29.3	15.5

NFE: non-fertilized eggs; ED: embryonic day; TDR 21: total death rate on day 21.