plus intéressante à remarquer que l'apolyse est normalement déclenchée par l'ecdysone.

D'autre part, les relations étroites du réticulum agranulaire avec les mitochondries (figure, e) tendent à montrer, comme c'est aussi le cas dans les glandes ecdysiales de lépidoptères[4,5], qu'un couplage fonctionnel est réalisé entre ces 2 organites essentiels de la stéroïdogenèse. La localisation du réticulum agranulaire à la périphérie des cellules suggère qu'il joue aussi un rôle dans le transport et la libération des produits élaborés.

En définitive, la démonstration morphologique du développement cyclique du réticulum agranulaire qui est la manifestation la plus marquante du processus de mue tend à confirmer le rôle de ces glandes dans la synthèse et la libération d'ecdysone sous une forme probablement couplée à des protéines.

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Effects of 9.4 GHz microwave exposure on meiosis in mice[1]

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Summary. Exposure to 9.4 GHz pulsed microwaves at low power densities for 1 h/day during 2 weeks induces in adult male Balb/c mice disturbances in meiosis, consisting in an increase of translocations and the appearance of cells with several chromosome pair remaining univalents at MI.

The rapidly expanding industrial, scientific, medical and home uses of numerous devices producing nonionizing radiation (NIR) lead to a steady increase of the amount of NIR in man's environment and cause concern because of potential health hazards[2]. Biological effects of microwave exposure were the subject of numerous investigations[3]. It was shown that exposure to 5-40 MHz waves induces chromosomal aberrations and mitotic abnormalities in somatic cells[4-7]. As far as we are aware, effects of microwave exposure on meiosis have not been investigated. The aim of the present work is to verify whether repeated microwave exposures from a typical radar source will interfere with meiosis, because of grave implications of such phenomena.

Results of analysis of methaphase I

Group	Total number of metaphases analyzed	Number of translocations (metaphases with quadri- or hexavalents)	Number of metaphases with univalents	Number of metaphases with number of bivalents N < 20	N = 20	N > 20
Controls	175	3	2	53	116	6
0.1 mW/cm^2	92	6*	14*	26	61	5
0.5 mW/cm^2	104	3	10*	37	60	7
1.0 mW/cm^2	120	10*	9*	51	63	6
10.0 mW/cm^2	112	9*	34*	36	72	4

* Significant in comparison to controls at 0.001 level (chi^2 test).

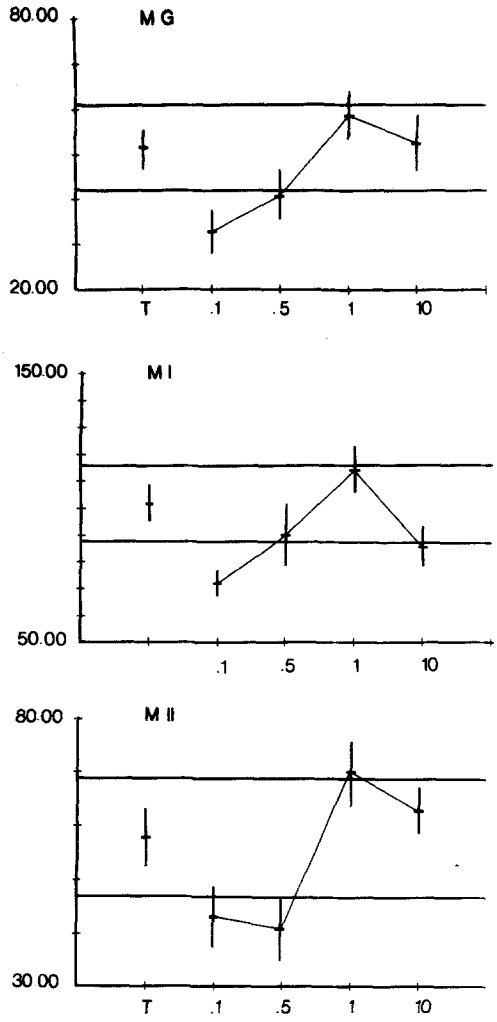

Fig. 1. Means±SE of metaphase I (MI), metaphase II (MII) and spermatogonial metaphase (MG) counts in control animals (T) and animals exposed for 2 weeks at various incident mean power densities (0.1, 0.5, 1.0 and 10.0 mW/cm^2). The limits of the confidence interval for the mean for the control group are indicated by 2 parallel lines. In each instance the decrease in metaphase counts following exposure to 0.1 mW/cm^2 is statistically significant. The MII count following exposure to 0.5 mW/cm^2 differs significantly from that in control animals.

Material and methods. Adult male Balb/c mice were exposed 1 h/day for 2 consecutive weeks (5 days a week) to 9.4 GHz pulsed microwaves (pulse width 0.5 μsec, repetition rate 1000 Hz) in far field conditions in an anechoic chamber at incident mean power densities of 0.1, 0.5, 1.0 and 10.0 mW/cm^2. 4 animals were exposed at each power density (16 animals in total), 7 mice serving as controls. After exposure the animals were sacrificed, testicles were extracted and examined according to the technique of Meredith[8] modified by Leonard[9]. Seminiferous tubules were separated in 1% sodium citriate solution, left for 30 min at room temperature, fixed in methanol: acetic acid (3:1) for 30 min and the fixing solution was replaced by 60% acetic acid to dissolve the tubules and to liberate the cells. Subsequently methanol was added, and the suspended cells were spread out on slides and stained with Giemsa reagent in phosphate buffer (pH 6.7). The number of meiotic metaphases (MI and MII) and spermatogonial metaphases (MG) was counted on 3 slides. The number and structure of chromosomes in MI were analyzed on microphotographs.

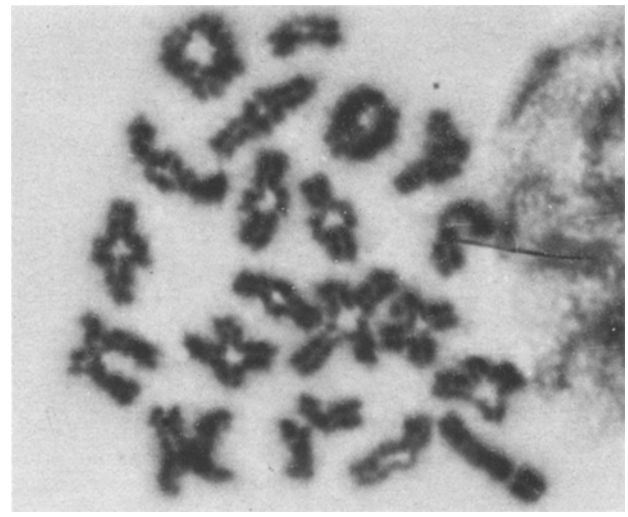

Fig. 2. Normal aspect of bivalents at meiotic metaphase I.

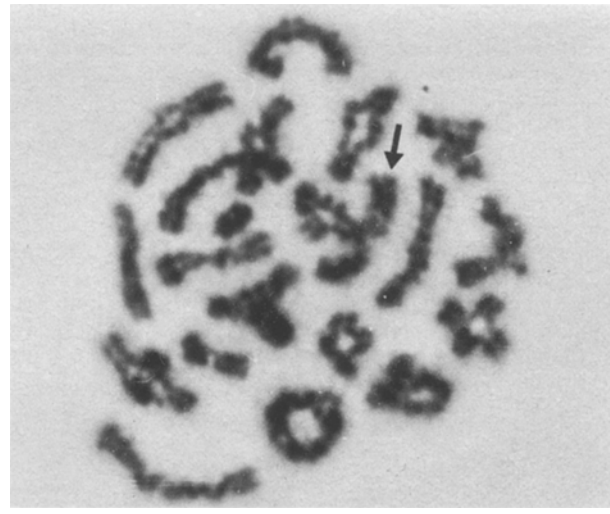

Fig. 3. Quadrivalent formed by 2 autosomal bivalents (exposure to 1.0 mW/cm^2): arrow.

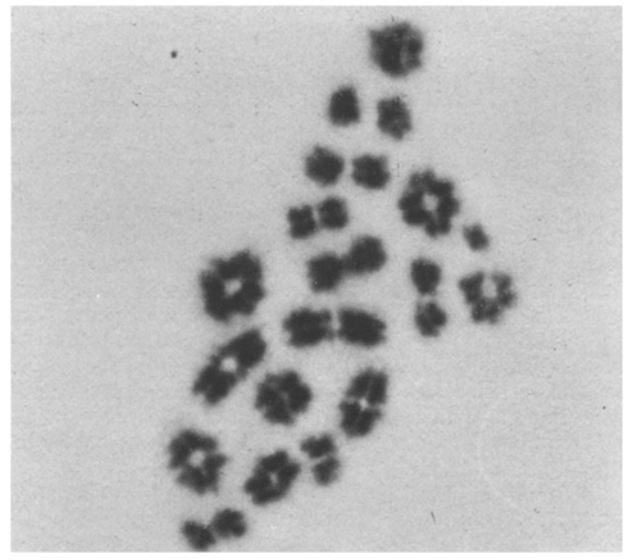

Fig. 4. Metaphase with several univalents (exposure to 10.0 mW/cm^2).

Results. The results of metaphase counts are presented in figure 1, their significance was examined using Wilcoxon's test. Differences between control and exposed animals are significant at the 0.05 level in each instance following exposure to 0.1 mW/cm^2.

The results of qualitative analysis of MI are shown in the table. Aneuploid metaphases were encountered. Hypoploid metaphases were seen both in control and experimental animals, no significant differences were, however, noted in their frequency. In control animals, the presence of quadrivalents was noted in 3 metaphases out of 175. In 2 metaphases besides bivalents, 2 and 4 univalents were seen.

Following exposure to 0.1, 1.0 and 10.0 mW/cm^2, the incidence of metaphases with quadrivalents (and in some instances of hexavalents) increased significantly. The chromosome associations (translocations) occurred at random and no particular chromosome pairs demonstrated a tendency for translocations. Metaphases with one or more (up to 6) chromosome pairs remaining at MI as univalents were significantly (chi^2 test) more frequent in all groups of exposed animals. The largest proportion of such metaphases was seen following exposure to 0.1 and 10.0 mW/cm^2, 15.2% and 30.4% respectively. Figures 2–4 illustrate the MI findings.

Discussion and conclusions. The findings presented above obviously need confirmation on larger number of animals, other mice strains and other animal species. However, the data obtained seem to indicate that repeated microwave exposure at incident power levels equal to or lower than values accepted as maximum exposure levels[3] may interfere with the normal course of meiosis. Similarly as ionizing radiation[10,11] or chemical mutagens[12,13] microwave exposure may lead to an increase in translocations and the occurrence of chromatid breaks, in spite of the difference in the primary mode of interaction with living matter. The high incidence of metaphases with the presence of univalents, instead of bivalents, may indicate that microwave exposure interferes somehow with chiasma formation and/or behaviour.

Possible consequences of the observed phenomena in terms of reduced fertility or hazards to offspring, remain to be verifield in specially designed experiments.

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Quantitative ultrastructural features of maturing mononuclear phagocytes in rat peritoneal fluids[1]

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Summary. Ultrastructural features of the in vivo transformation of macrophage congeners in resident and adjuvant-induced peritoneal populations are evaluated by stereological methods. Maturation involves an increase in cell size by the differential hypertrophy of subcellular compartments, notably remaining cytoplasm, nucleus and lysosome-like granules. Larger cells have more and larger granules, more mitochondria and a greater plasmalemmal surface. In contrast, adjuvant activation tends to produce fewer granules and a nett loss of surface membrane.

Studies of the morphology, functional properties, cytochemistry and life history of mononuclear phagocytes have demonstrated that monocytes can transform in vivo and in vitro into cells resembling tissue macrophages[2–4]. The process is referred to as a maturation or differentiation of cells and is characterized by increases in cell size, complexity and functional activity. The changes can be viewed in the context of an overall sequence which begins with a haemopoietic stem cell in bone marrow and proceeds, via the circulating monocyte, to an activated macrophage at an inflammatory locus[5–8].

Large numbers of cells at various stages of maturity may be obtained by peritoneal lavage, particularly after administration of an inflammatory agent. The functional maturity of these cells may be assessed by studying their morphology. In the resident population and in inflammatory exudates, smaller cells may be distinguished from larger, more mature forms containing many lysosomal granules and mitochondria and with a more extensive cell surface[4,9–12]. Many small cells resemble blood monocytes but have more granules and surface processes, presumably reflecting prior endocytic activity in their new environment. Similar differences exist between resident and induced cells following activation by certain stimuli[9,10] but not by others[13,14].

Many of the earlier reports are subjective studies, concentrating on the differences between resident and induced cells, and there has been no detailed attempt to quantify the morphological variation which exists within a given population. The present report tries to fill this gap and describes a stereological analysis[13–15] of mononuclear phagocytes in rat peritoneal fluids. Cells are classified as small or large on the basis of profile area and the 2 groups