Dr. Glaser

EFFECT OF ELECTROMAGNETIC WAVES AND MAGNETIC FIELDS ON THE LIPID MODIFICATIONS INDUCED IN THE RABBIT BY ADMINISTRATION OF A HIGH CHOLESTEROL DIET

by

Messrs. Raymond Pautrizel, Antoine Priore, Modeste Dallochio, and Rene Crockett

Extracted from the reports of the sessions of the Academy of Sciences, session of 17 January 1972

Translated May 1974

Report, Academy of Science, Paris, vol. 274, p. 488-491 (17 January 1972)
Series D

EXPERIMENTAL MEDICINE - Effect of electromagnetic waves and magnetic fields upon the lipid modifications induced in the rabbit by the administration of a high cholesterol diet. Report (*) of Messrs. Raymond Pautrizel, Antoine Priore, Modeste Dallochio, and Rene Crockett, presented by Mr. Robert Courrier.

By means of an exclusively physical treatment, it is possible to mitigate markedly the hyperlipemia induced in the animal by a high cholesterol diet. The striking effect, particularly with respect to the cholesterolemia, depends upon the intensity of treatment and endures for a certain period after the cessation of treatment, in spite of the continuation of the diet rich in cholesterol.

The exposure of the rabbit to magnetic and electromagnetic fields results in a stimulation of the mechanisms of defense. After the cure of an experimental parasitosis, a trypanosomiasis caused by Trypanosoma equiperdum, it has been verified that the plasmatic composition returns to an equilibrium approximating that which existed before the infestation (1).

In the case of the animal subjected to a high cholesterol diet, one detects a considerable increase in the value of certain lipidic fractions of the serum, and one can notice important tissue lesions, particularly in the aorta.

Thus, it appeared interesting to us to study the effect of a combination of magnetic fields and electromagnetic waves upon the evolution of an experimental atherosclerosis induced in the rabbit by a high cholesterol diet.

MATERIAL AND METHODS - Forty-two male rabbits, Fauves de Bourgognes, weighing about three kilograms each, are placed in a battery of individual cages, subject to a controlled distribution of granulated, manufactured food.

They are maintained thus for three weeks before being used for experimentation. From the beginning of the experiment, they are fed exclusively on granulated, manufactured food of the same kind but containing more than one percent of cholesterol, amounting to about one gram of cholesterol per animal per day.

The test animals (twenty-four), in groups of two, undergo a treatment which consists of being kept under the device emitting electromagnetic waves and magnetic fields ([1]) each day for 90 minutes, or for certain experiments 180 minutes. They are then replaced in the same enclosure as the control animals and, therefore, in the same conditions of isolation and air-conditioning. For certain experiments, the animals of the two lots (control and treated) are placed in a Faraday coil.

Each week 10 milliliters of blood are drawn from the marginal vein of the ears of the control animals and the test animals. For each sample of serum, and in accordance with the experiments, the total lipids or only certain lipid components are measured.

At the end of the experimentation, for certain experiments (thirty animals), one evaluates the extent of lipid deposits in the aorta (percentage of the aorta surface occupied by the lipid deposits) in the control animals and the test animals.

RESULTS - <u>First series of experiments (12 animals: 6 control, 6 treated).</u> The physical treatment commences the same day as does the administration of the diet rich in cholesterol. The daily sessions of irradiation last 90 minutes. The treatment is applied for 15 days. One observes during the first two weeks a regular increase in the amount of lipids (cholesterol in particular) sensibly identical in the control animals and the treated animals.

Starting with the fourth sampling, that is to say, three weeks after the beginning of the experiment, one observes a distinct difference between the

lipidic compositions of the blood of the control animals and of the test animals. The content of the blood with respect to total lipids, cholesterol, and beta lipoproteins is much lower in the test animals. The difference between the two lots of animals is most pronounced with respect to the cholesterol.

Second series of experiments (18 animals: 6 control, 12 treated). Four lots of animals were made up, three lots of which are subjected to the effect of the apparatus under conditions comparable to those of the preceding experiment. For these three lots, the differences are related to the time during which the treatment is administered. The animals (four) of the first lot are treated for two weeks, the four animals of the second lot for three weeks, and finally the four of the third lot for four weeks. Whatever the duration of treatment, one observes from the third week forward a clear divergence between the lipidic content of the blood of the test animals and that of the controls. After termination of the treatment and in spite of the continuation of the high cholesterol diet, one observes that the cholesterolemia remains at a much lower level in the treated animals than in the experimental (sic) animals. At the end of a certain time, (two to three weeks) which is a function of the duration of the treatment, one notes a resumption of the rise of the cholesterolemia.

In the treated animals, the extent of the macroscopic lipid deposits in the aortas is noticeably lower (20%) than that observed in the control animals (50%).

Third series of experiments (12 animals: 6 controls, 6 treated). The six animals for treatment are subjected to the action of magnetic fields and electromagnetic waves ~~for~~ five weeks after the beginning of the high cholesterol diet. At the start, they had a level of blood cholesterol on the order of six grams per liter.

Under the effect of the treatment, which lasts five weeks, one witnesses a pronounced yielding of the cholesterolemia compared to that of the controls,

whose cholesterolemia continues to rise (see the figure). That abatement is still maintained several weeks after the end of the treatment. Not until three weeks later can one detect a resurgence of the cholesterolemia.

We note that in the animals irradiated 180 minutes (instead of 90) one observes an abatement of the cholesterolemia which is even more pronounced and prolonged.

In the case of the animals having undergone the physical treatment, the macroscopic lipidic lesions of the aortas are half as extensive (15%) as those in the controls (30%).

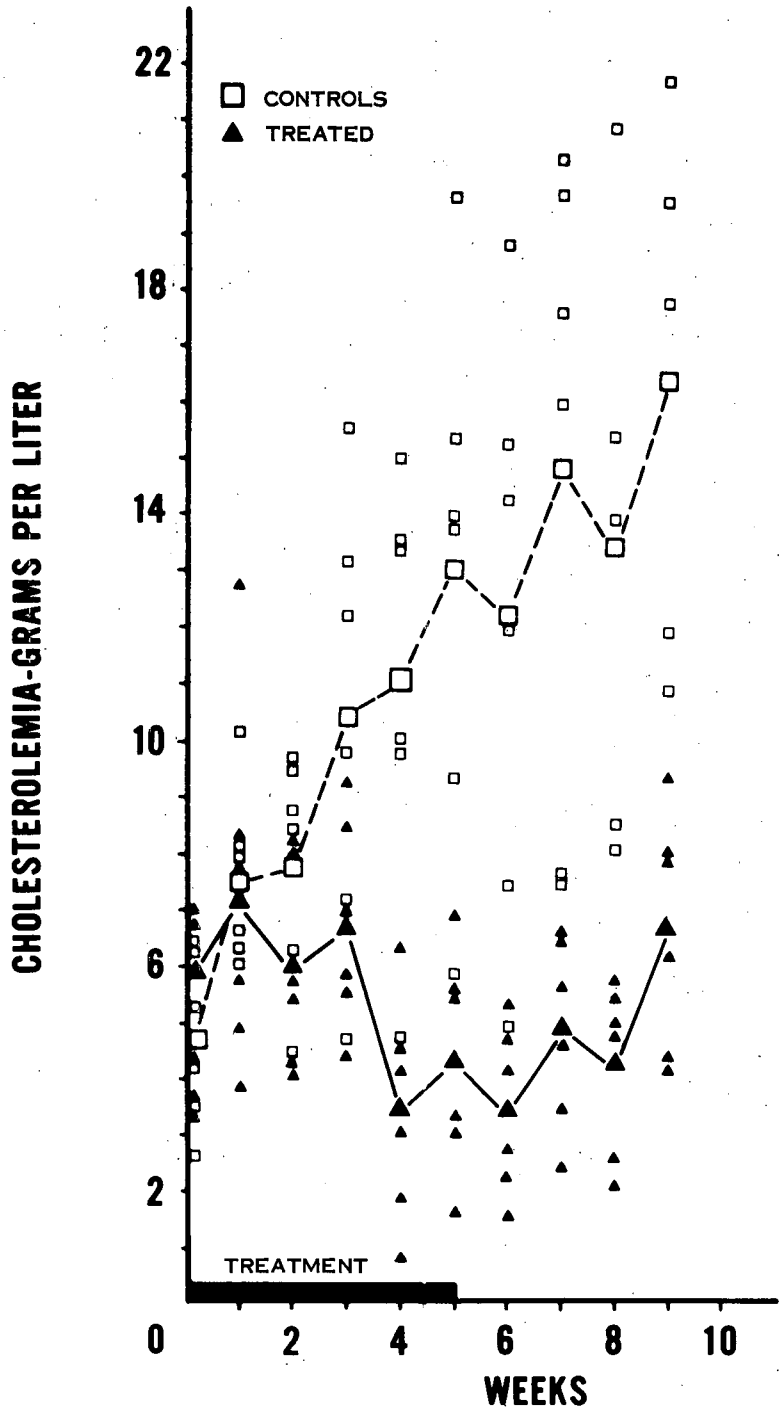
DISCUSSION - The increase of the cholesterolemia induced by a diet rich in cholesterol is partly inhibited among the rabbits subjected during a certain period to the action of magnetic fields and electromagnetic waves.

If the animals are subjected to the physical treatment from the beginning of the high cholesterol regime, it is necessary to wait for more than two weeks of treatment to establish, by comparison with the controls, a clear diminution of the cholesterolemia.

The remission of the cholesterolemia is more rapid when the physical treatment is used upon animals previously rendered hypercholesterolemic.

The inhibitory effect of the treatment is maintained, in spite of the pursuit of the cholesterol diet, several weeks after the end of the physical treatment.

This spectacular effect could be due to the initiation of a lipidic catabolism. In fact, if one stops the high cholesterol regime several weeks after the end of the physical treatment, one observes that the return to a normal level of the cholesterol content occurs more rapidly among the animals subjected to the physical treatment.



Evolution of cholesterolemia in two lots of rabbits subjected to a high cholesterol diet. In the treated animals (▲——▲) the physical treatment commences (sic) five weeks after the start of the high cholesterol diet and brings an abatement of the cholesterolemia, which is maintained three weeks after the end of the physical treatment, in spite of the pursuit of the high cholesterol diet.

Moreover, the anatomical findings based on the aorta are in agreement, on the whole, with the biological facts.

The treated animals, whose hypercholesterolemia was less elevated and less prolonged than that of the controls, show less extensive lipid deposits in the aorta.

(*) Session of 20 December 1971.

(1) R. Pautrizel, A. Priore, F. Berlureau, and A.N. Pautrizel, Comptes rendus, 271, Series D, 1970, p. 877.

UER Médicale, Laboratoire d'Immunologie et de Biologie Parasitaire, place de la Victoire, 33-Bordeaux, Gironde;
Unité de Recherches sur l'Immunologie des Affections Parasitaires (INSERM), Domaine de Carreire, rue Camille-Saint-Saëns, 33-Bordeaux, Gironde;
Unité de Recherches de Cardiologie (INSERM), Hôpital du Tondu, rue Eugène-Jacquet, 33-Bordeaux, Gironde.

3 - Printer - JOUVE, 12, rue de Tournon, Paris (6e)
Printed in France.