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"Effetti biologici delle onde di Hertz"

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Castaldi

IO-BIOLOGIA

einem ontogene-
ogischen Gewebe
hat (dabei muss
t), so ergibt sich,
kurzen und Mi-
morphologischen
elt Reizzustände
den Hemmungen
und Gewebe eine
ismus der Hem-
ungen stellen ein
ten, an der Hand
ommt.

der kurzen und
Wachstum und
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e bösartigen Ge-
ie wichtige endo-
ie unterscheidet.
e Keime, Toxine,
die zahlreichen
Man kann von
arten; es wäre zu
er mehr für den

Erfahrungen die
in Schwingkreise
nergie, die kurze
en den früheren,
auch von gerin-
kmässiger, da die
ganismen weniger
i den Hertzschen
ist, und wo die
filien.

Erfahrungen noch
doch behaupten,
und des Körpers
en wird über die
hervorrufen, viel
die Erwärmung
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ung berechtigt zu
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Studien, speziell

SUMMARY

In the last few years there has been accumulated a great deal of literature on the biological effects at a distance of Hertzian waves, both as scientific experimental studies on animals and plants as well as practical medical applications in man. The number of articles already in circulation has already passed three hundred.

In this article these works are summarized according to topic, in a manner to present a synthetic picture of the actual state of the many problems which have already been studied.

The Author passes in revue the publications which have appeared on the biological effects of the medium length waves; however their use has been abandoned to take up that of the short and ultra short waves (between 100 m. and 1 m.), in which field the literature is much more abundant. Many of the first experiments with these last mentioned waves have resulted lethal for animals and plants, perhaps because of the use of wave lengths not adapted to that certain organic species irradiated, or perhaps because the doses were too large in regards to either the duration or the intensity. It was possible to notice in this way the damaging histological sequence to this far too violent treatment. It is perhaps useful, though, to follow the inhibitory results as far as the destruction, in the battle against pathological microorganisms or neoplastic tissue, and it is hoped that we may better define the conditions of irradiation necessary to combat them.

Acting under more opportune conditions of wave length, of duration, of intensity of irradiation, of organic species and of ontogenetic state, of normal as well as of pathological tissue, of substrata upon which rest the irradiated organisms (each of the above conditions acts as a causal agent for the differences in results obtained), the Hertzian waves, be they medium, short, ultra short, extremely short or micro waves, may have an exciting action at a distance on morphological and functional phenomena in both plants and animals. In both the exciting as well as inhibiting effects, it is possible to demonstrate a selectivity of action for determined conditions of wave length, of organisms, and of tissues. Moreover, these antagonistic exciting and inhibiting actions under different circumstances is an example of the general behaviour which could be demonstrated for all the gamma of the radiations.

In this article the effects of the Hertzian waves on cellular multiplication and therefor on the developement and the growth of organisms, on the morphological and chemical composition of blood, on malignant neoplasms, on the nervous system, on the circulatory system, on the important endogenous heating, which is differant from the ordinary diathermy, on organic exchange, on pathogenic organisms, on toxins, on poisons, on sierilogic reactions, on the ferments and on the numerous applications made in human therapy, are studied in order. For this therapy, the author sees expansive

use in the future: and due to the real advantages that may be had from its use, he urges the extension of it's study.

One chapter of this paper takes into consideration the experimental results obtained by placing organisms, animal or plant, in an oscillating circuit using ultra short waves from the atmosphere, without a local source of energy. The effects are of the same order as those of preceding experiments with waves produced by generators, but on a smaller scale due to the smaller amount of energy used. However these experiments have been opportune since the organisms placed within the circuit are in a more natural atmosphere than they would be placed within a circuit where the waves are being artificially generated in an intensity which is far above the natural one.

Despite the fact that there remain some uncertainties as well as contradictions it is possible nevertheless to consider as a certainty a great number of morphological and functional results for determined conditions of wavelength, dose, organism, etc. The problem of how the Hertzian waves act to produce these effects which certain authors hold due to a simple heating, is greatly discussed. Certain other authors attribute these effects to a specific vibratory action of the wave itself. It seems that the prevalent opinion is of those who hold, basing their opinions on many suggestive experimental results, that a part of the effects is secondary to the heating and another part is really due to the direct specific action of the wave, or at least some part or quid still unknown.

More recently there have appeared a few works on the biological effects of Hertzian waves of 1 m. and 1 ess. These works are spoken of briefly in this article. Fundamentally they are of the same order as those produced by the other waves of lesser frequency. It would be, however, more opportune to intensity the experimental studies especially on the effects of the microwaves, because literature on this subject is still scarce and also because it would be easier to understand their real mechanism of biological action since they produce no raise in temperature.

KOPACZEWSKI. - Je crois que les travaux de D'Arsonval aussi aujourd'hui qu'il y a 45 ans, sont à la base de nos connaissances sur l'action biologique des courants de haute fréquence. Mais, avant de les résumer je tiens à compléter un point historique de cette question. Dans son rapport, par ailleurs très objectif et très complet, Mr. Castaldi croit que les travaux de D'Arsonval datent depuis la découverte de Hertz; il n'en est rien: D'Arsonval a commencé ses études sur l'action du courant électrique du nerf, en 1876; après avoir démontré, successivement, l'importance de la forme de l'onde électrique, il a constaté qu'en augmentant le nombre d'interruptions, l'excitation faiblit et, finalement, avec 10.000 interruptions à la seconde, elle est presque supprimée. Donc, les courants d'une certaine fréquence ont une action nulle. L'application ultérieure, en 1891, de l'oscillateur de Hertz, a permis de confirmer cette conclusion; en étudiant diverses longueurs d'onde, allant jusqu'à 100 mètres.

Après avoir fixé ce point historique, je vous résumerai les actions biologiques des courants de haute fréquence, établies par D'Arsonval depuis 1894. Elles consistent en effets variés: 1) analgésique; 2) termique; 3) vasodilatateur; 4) abiotique; 5) modificateur de la structure colloïdale; 6) accélérateur de la nutrition.