

ELECTROCARDIOLOGICAL FINDINGS IN WORKERS OCCUPATIONALLY EXPOSED TO MF ELECTROMAGNETIC FIELDS

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INTRODUCTION

The present state of knowledge on the effects of exposure to MF (medium frequency) electromagnetic fields on the circulatory system derives mainly from the reports of Soviet studies (1). These indicated that the exposed people developed such symptoms as heart rate disturbances, impaired conduction, decreased amplitude of ECG recordings and blood pressure changes.

Although considerable progress in ECG methodology has been made, since these studies their results have not been verified so far. In Poland, there are 30 Broadcast Stations employing about 400 people. Major sources of electromagnetic fields in these stations include broadcasting units, feeders and half-wave antenna mast. Although exposure in the AM Broadcast Stations in Poland have not been found to be exceeded, the levels of exposure in particular units differ considerably. Therefore, we thought it desirable to undertake a study to evaluate the bioelectric activity of the heart in workers occupationally exposed to E-M fields of different intensity.

METHOD

The subjects were 40 workers, aged 20-64 years of three AM Broadcast Stations with different exposure levels: station A (18 workers), fairly high level of exposure during work shift (daily cumulative dose-250 Vh/m); station B (11 workers), medium level, 150 Vh/m; station C (11 workers), low level, 50 Vh/m. The duration of their exposure ranged from 2 to 40 years. The controls were workers of radio link stations not exposed to E-M fields. The system and type of work as well as the lifestyle of all the examined workers were highly similar.

In all subjects a general medical examination was performed as well as resting ECG and Holter 24-hour ECG monitoring during normal activity with use of Oxford Medilog 3000 system. The recordings was made from two pre-cordial leads CS₁ and CM₅ and then evaluated according to the criteria adopted at the 3rd Holter Symposium in Vienna in 1988.

RESULTS

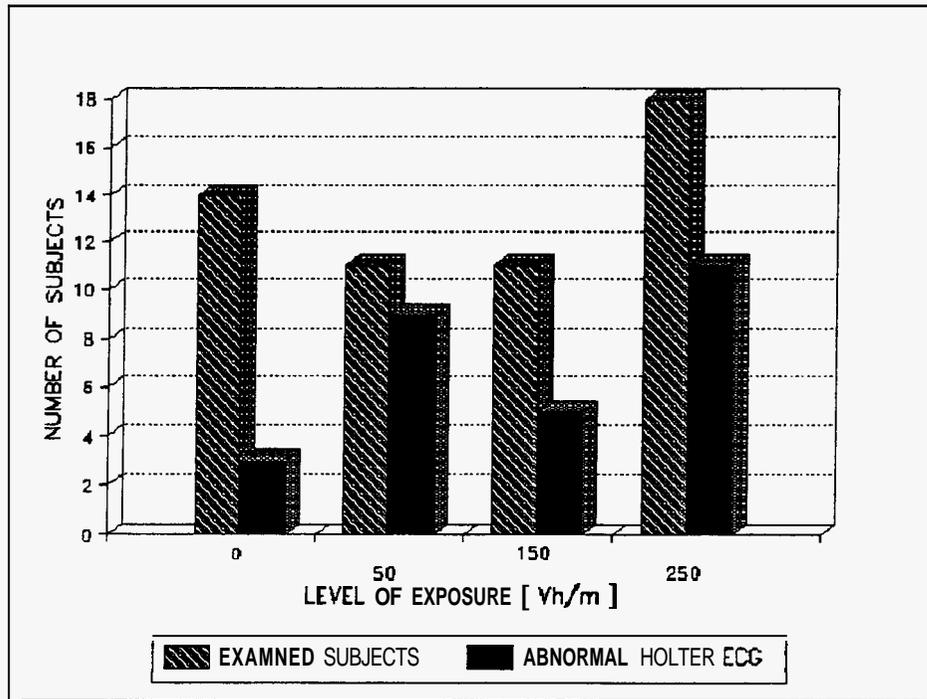
In the study group, abnormal resting ECG recordings were found in 7 subjects. Abnormalities including electrographic features of left or right ventricle hypertrophy were detected in 5 subjects and repolarization disturbances in 2 subjects.

Twenty-five subjects presented abnormalities in 24-hour ECG. Holter ECG recordings revealed conduction impairments in 10 subjects: right branch bundle block (RBBB) - 4 and impaired intraventricular conduction -6. Repolarisation disturbances occurred in 10 subjects, there were ST dows-lopings and/or T-wave inversion. Cardiac rhythm disturbances, the number and form of which allows classifying them as pathological, were found in 8 subjects: premature ventricular excitation (ExV) in 5 and premature supraventricular excitations (ExSV) in 3. In three subjects more than one type of abnormality was detected. However, no decreased amplitude of ECG or heart rate disturbances (mean heart rate from Holter recordings - 78+ 7) were found. No correlation was found between the frequency of abnormal ECG and

the level and duration of exposure to E-M fields (Kruskal-Wallis test). In station A, 11 out of 18 workers presented pathologies in resting and/or Holter ECG, in station B, 5 out of 11 workers and in station C, 9 out of 11 workers (ryc. 1).

In the control group, the frequency of pathological recordings was significantly lower ($p=0.0043$ according to Fisher test); in resting ECG in 2 and in Holter ECG in 3 subjects. Repolarization disturbances occurred in 2 subjects, conduction impairments in 2 subjects and cardiac arrhythmia in 1 subject.

RYC. 1. INCIDENCE OF HOLTER ECG ABNORMALITIES IN CONTROL AND EXPOSED SUBJECTS



CONCLUSIONS

The results indicate a relatively high frequency of abnormalities in Holter ECG recording in E-M exposed subjects. The frequency is similar to that found in the study on people exposed to cardiotoxic agents (2). The background of these ECG abnormalities is not clear. At the present stage of our study we have not found any relationship between the ECG abnormalities and the duration of work under exposure to E-M fields or the exposure levels. The explanation of the observed abnormalities in their possible relation to the exposure to E-M fields will be the subject of our further, follow-up studies.

REFERENCES

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