Measurements of Occupational Exposure to EMF Emitted by High-Speed Maglev Transportation System and Its Health Effects

Lei Zhang, Zhou Zhou, Lu Yang, Ju Yang, Fang Chu, and Zhengping Yu*
Department of Occupational Health, Third Military Medical University, Chongqing, China
*Corresponding author e-mail: yuzping@yahoo.com

INTRODUCTION

High-speed Maglev transportation system is an advanced technology using magnetic forces to propel, levitate, and guide the train. Shanghai Maglev demonstration line is the first commercially operated Maglev line in the world. The employees engaged in Maglev operating, repairing, maintain, and polling made up of the first population of occupationally exposure to Maglev electromagnetic fields (EMF). Our study was to evaluate the character of EMF emitted by High-Speed Maglev Transportation System and the health effects of occupational exposure to the Maglev EMF.

MATERIALS AND METHODS

The static magnetic field of Maglev EMFs were measured by Narda ETM-1 magnetic field measurement system. The time-varying EMFs of Maglev were evaluated by PMM EMF measurement system. 48 employees exposed to maglev EMF were selected as occupationally exposed group while 54 employees were selected as control with matched age, sex, and shift-work schedule, but without any Maglev EMF exposure. Questionnaires were sent to two groups. Blood samples were collected. Complete blood count was done by hematology analyzer. Blood lipid level was detected by enzymatic method. Thyroid function related hormones (TSH, T3, T4, FT3, FT4) was evaluated by chemical immune assay. Serum melatonin level was measured by an ELISA kit.

RESULTS

EMR on the Maglev vehicle was lower than the safety exposure limits of current international and Chinese national standard. Data acquired near Maglev guideway revealed that EMF attenuated along with the larger distance, and EMFs in different measurement sites were under the current international EMR exposure limits established by ACGIH, IEEE, ICNIRP as well as the current national EMR exposure limits in China. Data acquired at platform, maintenance base, switching station, TS station were also lower than current guidelines and standards.

The symptoms of drowsiness, memory impairment, irritability, alopecia were related to occupational exposure to maglev EMF which suggested that occupational exposure to Maglev EMF may have effects on neuronal function. Abnormal rate of cholesterol and high density lipid protein in exposed group were significantly higher than control. The blood cell counts, thyroid function, and serum melatonin level had no statistical difference between two groups.

CONCLUSIONS

EMF emitted by the High-speed Maglev transportation system in different frequencies
were lower than the exposure limits of current international and Chinese national standard.

Due to the population limits, we can not draw a conclusion that occupational exposure to Maglev EMF may have adverse health effects from the previous data. However, it may gives us a clue that occupational exposure to maglev EMF may result in the alteration of neuronal function and lipid metabolism.

REFERENCES

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