Report on the project " Influence of the cell phone on humans with and without TecnoAO protection"

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Introduction

Endogenous nitric oxide (NO) plays an important role in a large number of biochemical processes in human body. These molecules are involved in the transmission of nervous impulses, regulation of vascular tension and the development of inflammation. The NO analysis may be of value for the diagnosis of certain diseases and disorders complicated by inflammation. For example, detection of gaseous NO produced in upper airways and presented in exhaled air is useful for the detection of inflammation processes in patients with respiratory diseases (bronchial asthma, bronchitis etc.). For this reason, a possibility to use endogenous NO in breath as gaseous bio-marker for noninvasive diagnosis of complications and disorders caused by or related with an influence of electro-magnetic fields generated by mobile (cell) telephones (MT) and computer monitors is of the top interest.

Aims

To conduct a pilot study of a possibility to use exhaled NO as a gaseous bio-marker of health complications caused by electro-magnetic fields of mobile telephones.

To detect possible variations of endogenous NO content in breath that could be caused by or related with exposure to electro-magnetic fields generated by MT.

To observe an effect of the TecnoAO protection on the level of endogenous NO content in breath in course of chronic exposure to electro-magnetic fields generated by MT.

Materials and Methods

10 healthy subjects were involved in the studies.

Motorolla-M3888 mobile telephones of GSM standard working in the 900/1800 MHz radio-frequency region were used.

UF-chemoluminescence NO analyzer was used for the end-tidal detection of endogenous NO content in exhaled air. Sensitivity of the NO detection with this technique was about 0.5 ppb (part per billion), response time was better than 0.1 second.

TecnoAO mobile telephone antennas was used to protect participating subjects from MT electro-magnetic fields.

Ergonomic and environmental symptom checks were conducted for every participating person to estimate health condition of the tested subjects in the course of the experiment.

Patients Population (inclusion and exclusion)

10 studied subjects with no any chronic diseases were aged from 27 to 50, female 70%, male 30%. All of them were medical doctors from the Institute of pulmonology of the Russian Medical Academy of Sciences.

Study Design

Preliminary control measurements of the end-tidal NO in breath during 5 days before the start of the experiment were conducted for all patients. Individual level of endogenous NO content in breath and temporal variations were observed.

All subjects were asked to use MT 45 minutes every day during an active phase of the experiment (about four weeks, 26 days).

First two weeks of the active period they do not use any protection from the MT electro-magnetic fields.

Second two weeks of the experiment all tested subjects were using MT with TecnoAO mobile telephone antennas being attached to their telephone tubes.

Measurements of the end-tidal NO level for every subject were conducted every working day in the time interval between 10:00 and 12:00 a.m.

Ergonomic and environmental symptom checks were conducted for every subject once a week at Friday (5 checks for every person total).

Methodology for Diagnosis

To measure the level of the end-tidal NO in breath a special respiration maneuver was used. After drawing a deep breath, tested person was asked to exhale slowly with constant flow-rate to the NO analyzer against a standard respiration resistance. Readings for the end-tidal NO level were taken at an NO plateau usually taking place between 15th and 20th seconds of the used respiration maneuver. This NO corresponds to bronchial part of the exhaled air.

Results

Data on day-by-day variations of the end-tidal breath NO level for all tested subjects are summarized in Table 1.

Average NO level in control is in the region from 4.5 to 14.5 ppb.

Up to 30% quasi-periodic weekly variations of the studied NO level were observed for every subject.

For a tested person (Aisanov) who was subjected to acute virus respiration infection during the experiment the NO variations were in the range from 10 to 35 ppb. In this case the highest NO level was reached three days after the beginning of the disease (Fig.1). These data were excluded from further consideration, but nevertheless they could be used as some scale to compare and to distinguish virus respiratory inflammation from an affect of MT.

Some trend to increase of the end-tidal breath NO level was observed for most of the studied subjects after two weeks of MT usage (maximum exposure to MT electro-magnetic fields without protection). Maximum NO level in the group of health subjects at that time reached more than 23 ppb.

In about 10 days after the beginning of the protection a slight decrease of the NO content in breath to the initial level was observed.

Analysis of results

Obtained data were subjected to some simple treatment to clarify these trends in the values of breath NO content. This data handling and refinement includs:

Some filtering of data taking into account possible human factors was applied:

1. Data on the subject with acute respiratory infection (Aisanov) was not included;

2. Data on two subjects with strong fluctuating (unstable) readings was omitted (Tcherniaev and Baranova), a reason for such strong fluctuation is a item for further consideration and studies;

3. Data on a person (Maracheva) that was need to break her participation in the experiment were omitted.

Then only data on 6 persons were taken into consideration.

A plot for the average of normalized values of NO content in breath over 6 subject in this group is shown on Fig.2. About 40% increase of this average value is obvious for the time interval corresponding to the maximum exposure to MT electro-magnetic fields without protection (the beginning of the third week of the active stage of the experiment). Standard deviation is +/-35%. In 10 days after the beginning of the TecnoAO protection application the NO level has returned to the initial level (+/-25% sd).

The observed NO content variations (rise and drop) become much more clear if filtering of the quasi-periodical weekly fluctuations mentioned above could be applied (see Fig.3). The correctness of this procedure is a question for further consideration and studies and could be demonstrated in an experiment with correct control group not using MT.

We would like to note that effect of MT on NO and protective ability of Tecno AO are not the consequence of our filtering of data obtained. Fig.4 demonstrates the result of averaging over all the persons tested. The only data were removed of Aisanov during a week of his respiratory disease, 4 points. As is seen, the biological effects of mobile phones and Tecno AO protection are saved, though at some lower level, about 7%.

Discussion

Thus some increase in the level of end-tidal NO level in breath was observed after two week exposure to MT electro-magnetic fields when using MT without protection. These data correlate with the results of the ergonomic and environmental symptom check (see the Excel datasheets attached).

Application of the TecnoAO protection antennas has returned the NO level to the initial state.

Conclussion

Measurements of endogenous NO produced in the upper airways could be an easy technique for noninvasive diagnostics of an effect of electro-magnetic fields generated by MT.

Two week exposure to electro-magnetic fields of MT when talking 45 minutes a day causes about 7 to 40% increase in the endogenous end-tidal NO excretion that could be related with some sort of health complications, for example, beginning of slight inflammation processes in upper airways.

Application of TecnoAO protection antennas decreases generation of NO that could manifest a protective action of these devices.