

Case Study: Effect of Radio Frequency Radiation (RFR) and the Aires Defender Infinity on Endogenous Electromagnetic Energy of a 52-year old Female.

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REPORT ON ORIGINAL RESEARCH

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ABSTRACT

The effect of Aires *Defender Infinity* (i.e. shield), a product that the manufacturer claims protects against harmful electromagnetic radiation, was tested with a 52-year old female who suffers from self-diagnosed electrohypersensitivity. She was exposed in a double blind, placebo-controlled study to radio frequency radiation (RFR) generated by a 2.4 GHz cordless phone base station. Maximum exposure was approximately 120 mW/m². The shield did not change the amount of RFR in the environment; nor did it affect low frequency electric and magnetic fields, dirty electricity or the amount of body current, all of which were low to begin with. Blood pressure increased with RF exposure but was not altered by the shield. Subject experienced adrenal exhaustion and was unable to mount a response to any type of external stressors based on heart rate variability orthostatic testing. However, what did improve with the shield was the cardiovascular response measured by MaxPulse, an FDA class II medical device. Improvements were noticed in the DPI (differential pulse wave index that represents overall cardiovascular health); EC (eccentric constriction or the constriction power of vessels from the left ventricle; AE (arterial elasticity); and RBV (remaining blood volume in vessels after systolic contraction of the heart). Live blood analysis showed an improvement in rouleaux formation attributable to the shield during RF exposure. In conclusion, the Aires *Defender Infinity*, worn around the neck, did not change the electromagnetic environment in a way that we could measure but it did improve cardiovascular and blood response to RFR. Additional testing is recommended to determine the replicability of these results.

INTRODUCTION

A large population, exposed to various forms of electromagnetic energy, is becoming ill. This “illness” has been referred to as microwave sickness, neurasthenia, idiopathic illness, and—more recently—electrohypersensitivity (EHS). Many products to help people tolerate an electrosmog environment are available but few of them are independently tested by a third party to ensure they meet manufacturers’ claims. The purpose of this research is to test claims made by American Aires Inc, that their “products provide protection from harmful electromagnetic radiation.” One product, the *Aires Defender Infinity* (hence forth referred to as the shield), was the subject of this research. A 52-year old female who complains of being electromagnetically hypersensitive was tested and her reactions to radio frequency radiation (RFR), generated by a 2.4 GHz cordless phone base station with the shield and with a placebo shield in a double-blinded study were recorded.

METHODS

American Aires Inc (Defender Infinity)

Aires Technologies (www.airestech.com) provides a number of different products that “neutralizes harmful electromagnetic radiation.” We tested one of their products, *Aires Infinity*, which is part of their *Defender* series ([Figure 1](#)). According to the company,

Aires Defender product range includes devices that provide universal protection for the human body. These devices are designed as personal protectors, which are worn by the individual. Utilizing the full range of devices will help you reduce the harmful effects of electromagnetic radiation that are impacting your health today.



Figure 1. *Aires Defender Infinity* is worn around the neck in a pouch and has the size and weight of a credit card.

We conducted a double-blind, placebo-controlled experiment where neither the person being tested nor the doctor conducting the interpretation of the Nerve Express

HRV were aware of the exposure treatment. In addition to a reference analysis done prior to any exposure, the subject was exposed to RFR with the Aires *Defender Infinity* and with a placebo shield that had the same size and weight of the *Infinity*. The placebo shield consisted of two credit cards placed inside the Aires pouch on a fabric cord that hung around the neck just below the clavicle. The same pouch was used during testing of both the shield and the placebo shield.

Monitoring Electromagnetic Fields in the Environment

Research was conducted in the afternoon of August 18, 2015 in an electromagnetically clean lab at Trent University as part of Research of Subtle Energy (ROSE). Several electrosmog exposures were monitored including dirty electricity (Stetzerizer microsurge meter, Model GS-M300-A, Graham Stetzer International Inc.); radio frequency radiation (electrosmog meter, range 10 MHz–8 GHz, on Max hold); and both electric and magnetic fields (Gigahertz Solutions NFA 1000-3D-NF Analyzer, for 5 Hz – 1000 kHz).

The base of a cordless phone (2.4 GHz digital AT&T 2230) was used to generate radio frequency radiation (RFR). When the base is plugged into an electric outlet, the RFR begins and is relatively constant not requiring any one to talk to keep it activated. When it is unplugged the radiation stops immediately. The phone was not visible to the subject (covered with paper) and the subject was blindfolded and did not know where or what was the source of her exposure or when it was on or off. The base of the cordless phone was placed within 20-30 cm of the subject's right arm while reclining during the HRV orthostatic test. When subject stood up the phone was further away.

RFR and lower frequency magnetic fields were monitored at the subject's chest near her heart. Electric field was measured in the middle of the chair when subject stood up. Dirty electricity was measured in a nearby electrical outlet.

Monitoring Electromagnetic Fields Associated with the Body

The EM fields associated with the subject's body were also measured using a Russian B & E meter (BE-METP-AT-002) that gives readings for both electric and magnetic fields that are below and above 2 kHz as these frequencies react differently with the body.

Body current was monitored by attaching one lead from a Fluke 187 scope meter (true RMS Multimeter) to the electrical ground and the other lead to a medical ECG patch near the upper part of the sternum. This second lead, held in the air and not attached to the body, was used as a background reference.

Monitoring Endogenous Electromagnetic Fields and Physiological Parameters

Heart rate and blood pressure were measured with a digital blood pressure monitor (Life Source UA-767 Plus, A&D Medical). Heart health was measured with MaxPulse an FDA approved class II medical device. Orthostatic HRV was monitored using Nerve Express, which is an FDA 510K cleared device for investigational use only in the U.S. Live blood was assessed with a pinprick to the finger and immediately viewed under a Celestron microscope.

RFR Exposure

Subject was exposed the RFR during the HRV orthostatic test. The testing was done in the following order: orthostatic HRV, B&E, body current, live blood, MaxPulse, blood pressure and heart rate. During the testing the source of the RFR was kept on or off depending on treatment. The exposure of the subject would be similar to having a cordless phone at work or at home and moving around within a confined space. Consequently the exposures differed depending on the distance of the subject from the base station. The subject was exposed for a total of approximately 30 minutes, although some of the testing (HRV) was completed after only 10-minutes exposure.

RESULTS & DISCUSSION

Test Subject: The test subject is a 52-year old female who complains of electrohypersensitivity (EHS) and believes she has been sensitive for the past ten years. The following wellness indicators are based on her response to a questionnaire.

Her symptoms have improved since she started using the Aires *Defender Infinity*. She is taking prescription medication for blood pressure and is taking blood thinners. She has an enlarged thyroid, is often tired, and sometimes experiences digestive problems and feeling ill at ease. She sometimes experiences anxiety, depression, difficulty concentrating, insomnia, sleep disturbances, irritability, joint pain, and nausea. Her vision is deteriorating, and she sometimes experiences pain in teeth, ear pressure and pain, and ringing in the ears. She often experiences heart palpitations and an irregular heartbeat and sometimes experiences changes in blood pressure, pain/pressure in chest, and shortness of breath. She sometimes has breathing difficulties; crackling voice, dry cough and needs to clear her throat. She sometimes has aches and pains and experiences stiffness/tightness of muscles and joints.

When asked *where* her symptoms are triggered, her response was everywhere, at home, work, while shopping, in restaurants, during transit, near cell phone and

broadcast antennas. The following items trigger her symptoms: cell phone, cordless phone computer, television and fluorescent light bulbs. Her exposure to electricity, RFR, and dirty electricity are lower now than in the past. She seldom exposes herself to sunlight.

Testing Environment: The research was conducted in an electromagnetically clean environment with low levels of radio frequency radiation (RFR), dirty electricity (DE), extremely low frequency (ELF) electric field (EF) and magnetic field (MF) (Table 1). Dirty electricity was lower than in most places due to the installation of two GS filters in electrical outlets. Nearby Wi-Fi routers were disconnected and thick concrete walls kept RFR low. There were no visible cell towers or other sources of RFR and trees and vegetation absorbed what little there was in the environment. Lights were off during testing and only two computers were functioning so levels of ELF EMF were also low.

Table 1. EMF levels in the environment and near and on the body.

Treatments		Environment				2 cm from chest				Current	
RFR source	Shield	RFR chair	DE outlet	MF chest	EF chest	EF < 2 kHz	EF > 2 kHz	MF < 2 kHz	MF > 2 kHz	skin	air
		mW/m ²	GS units	nT	V/m	V/m		nT		microAmps	
off	none	0	153	30	4.4	0	0.2	0.1	0	0.35	nd
on	Infinity	123	158	60	8.9	0	0.01	0.01	0	0.38	nd
on	placebo	100	158	80	7.7	1	0.2	0.2	0	0.36	0.35

RFR	radio frequency radiation	MF	magnetic field
DE	dirty electricity	Ef	electric field

When the 2.4 GHz base station for the cordless phone was plugged into an electrical receptacle, levels of RFR increased to approximately 123 mW/m² on the chair where the person sat during her orthostatic HRV test. This level is below [Health Canada's Safety Code 6 Guidelines \(2015\)](#) (4,400 mW/m²) but well above the Russian guideline (100 mW/m²), the Salzburg and BioInitiative (2007) guidelines (1 mW/m²), and the Building Biology guideline (0.0001 mW/m²) (see [Appendix I](#)).

The ELF magnetic field and electric fields increased slightly when the cordless phone base was connected to the outlet (Table 1). These values for ELF magnetic field and electric field respectively, were below Canada's limit (833 mG and 5,000 V/m); were at the BioInitiative limit (1 mG); and were above the strictest guidelines in the world for Building Biology–Germany for sleeping guidelines (0.2 mG and 0.3 V/m) ([Appendix II](#)).

Based on our measuring protocol, the shield did not alter the amount of RFR in the environment; nor did it affect ELF EMFs, dirty electricity or the amount of body current flowing along the skin.

Subject's Response to RFR and Shielding: Both heart rate and blood pressure increased during RF exposure, however, the shield had no effect on either ([Table 2](#)).

Based on the HRV orthostatic test, subject had a high *chronotropic reaction* (>0.7) indicating exhausted adrenals and had a poor *fitness score* 11:6 that did not change appreciably during treatments of either RF or shielding. Such subjects have difficulty mounting a response to stress due to lack of energy ([Havas and Marrongelle 2012](#)). This person is experiencing chronic degenerative inflammation heading towards exhaustion and is not a good candidate for this type of testing ([Appendix III](#)). This is confirmed by the ChMR (chronotropic myocardial reaction), VC (vascular compensation), and TI (tension index).

The ChMR is the basis for evaluating the level of cardiac adaptation reserves represented by the downward dip during the transition period (change from supine to upright). The normal range is 0.59 to 0.63 (Riftine, nd) and the smaller the value the better the state of one's cardiovascular system.

VC characterizes the upward part of this "curve" indicating "recovery" from the stress of standing up and the normal range is within the ChMR range or slightly higher.

TI determines the tension of the HRV regulating mechanisms. The TI is an integral index of decrease in variability with a range from 10 to 10,000 and a normal range between 10 and 120. TI approached normal during RFR with shield and then increased again with placebo shield and RFR ([Figure 2](#)).

Subject had sympathetic dominance with a depressed parasympathetic mode (SNS:PNS of 1:-3). Her HF/LF ratios for supine and upright respectively were 1.06 and 2.43 (reference); 0.42 and 2.75 (RFR with shield); and 1.94 and 1.59 (RFR with placebo shield) ([Figure 2](#)).

Based on the subject's medical history, her prescription medication may block her reaction to external stressors and thus interfere with the orthostatic HRV testing resulting in a stable sympathetic response.

Table 2. Heart rate and blood pressure during various RF treatments and shielding.

Treatments		Blood Pressure	Heart Rate
RFR source	Shield		
off	none	122/87	69
on	Infinity	136/98	75
on	placebo	138/95	76

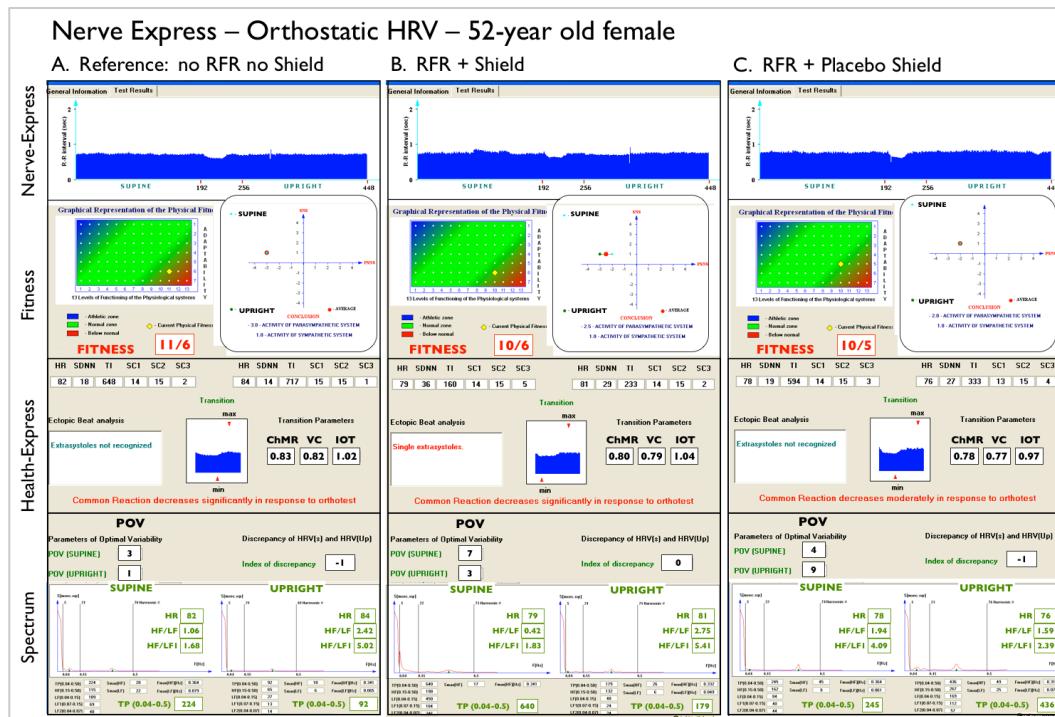


Figure 2. Nerve Express orthostatic HRV for 52-year old female exposed to three “treatments:” A. Reference with no RFR and no shield; B. RFR plus shield; and C. RFR and placebo shield.

Live blood analysis showed an improvement in rouleaux formation attributable to the shield during RF exposure. About 1 hour after the subject arrived we examined her blood under the microscope. She had serious rouleaux formation that cleared up considerably during treatment with the shield and RFR exposure and became slightly worse again with the placebo shield and RFR exposure. This indicates that the shield had some beneficial effects on blood rouleux. Rouleaux refers to the

aggregation of red blood cells that resemble a stack of coins. It may be caused by abnormal proteins or altered electrical charges on the membrane of red blood cells and can also be a microscopic artifact. In this case the artifact is unlikely.

Subject's cardiovascular response improved for several metrics as measured with MaxPulse, an FDA class II medical device. Improvements were noticed in the DPI (differential pulse wave index that represents overall cardiovascular health); EC (eccentric constriction or the constriction power of vessels from the left ventricle; AE (arterial elasticity); and RBV (remaining blood volume in vessels after systolic contraction of the heart) (Figure 3 & 4). Values below 30 are sub-optimal; between 30 and 70 are normal; and above 70 are optimal.

DPI (differential pulse wave index) represents overall health and aging of the heart and arteries. DPI increased from approximately 15.9 (sub-optimal) in the reference to 28 (almost normal) with RFR plus shield and then dropped to 16.3 when the placebo shield was used with RFR exposure.

This pattern was repeated for **EC** (eccentric constriction), with a severe drop when the placebo shield was used (2.39) indicating a severe reduction in the ability of the vessels from the left ventricle to constrict.

AE (arterial elasticity) went from low normal (34.4) to high normal (65) to optimal (71). This may be a carry over effect of the shield in treatment C.

The protocol used in this study cannot differential between a carry-over effect of the shield between treatments B and C. Additional testing on different days would be required with increasing delay periods between tests to determine a carry-over effect and this would vary from person to person.

RBV (remaining blood volume) did not change with the shield but did improve with the placebo shield, which may be due to a delayed response. Additional testing is required to verify this.

The physical stress score also showed the best response with the placebo shield as did stress resistance and may also indicate a delayed response. Testing with additional subjects and/or repeated testing with the same subject are necessary to interpret these results.

Figure 3 indicates the various parameters tested using MaxPulse and how they changed during each treatment. The subject's cardiovascular parameters improved in 10 ways with the shield and with simultaneous RFR exposure (B); and continued

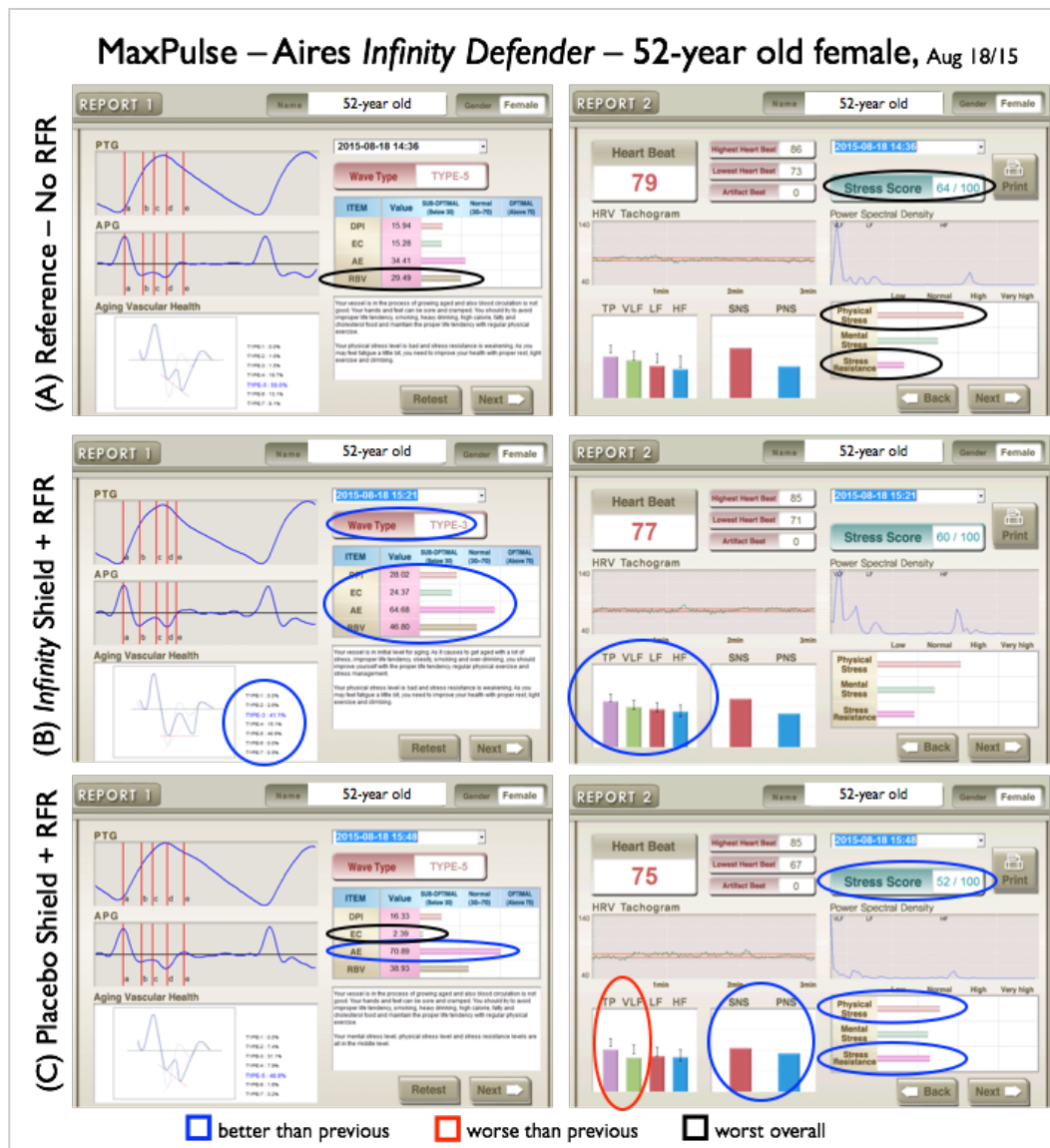


Figure 3. Metrics indicating heart and blood vessel health and stress score using the MaxPulse, a class II, FDA-approved medical device. Subject was a 52-year old female who believes she is electrically hypersensitive. Her exposures include (A) reference with no RFR and no shield; (B) Shield plus RFR; (C) placebo shield and RFR. Coloured circles represent treatments showing improvements (blue); deterioration (red); and the worst condition overall (black).

to improve in 8 categories with the placebo shield and RFR (C). In the final treatment (placebo shield and RFR), three items got worse EC (black), total power (TP) and very low frequency (VLF) in the heart rate variability (red). The subject's heart health was not very good when she began the testing. MaxPulse stated the

following after the reference exposure: Vessels are at the initial stage for aging. Physical stress level is bad and stress resistance is weakening.

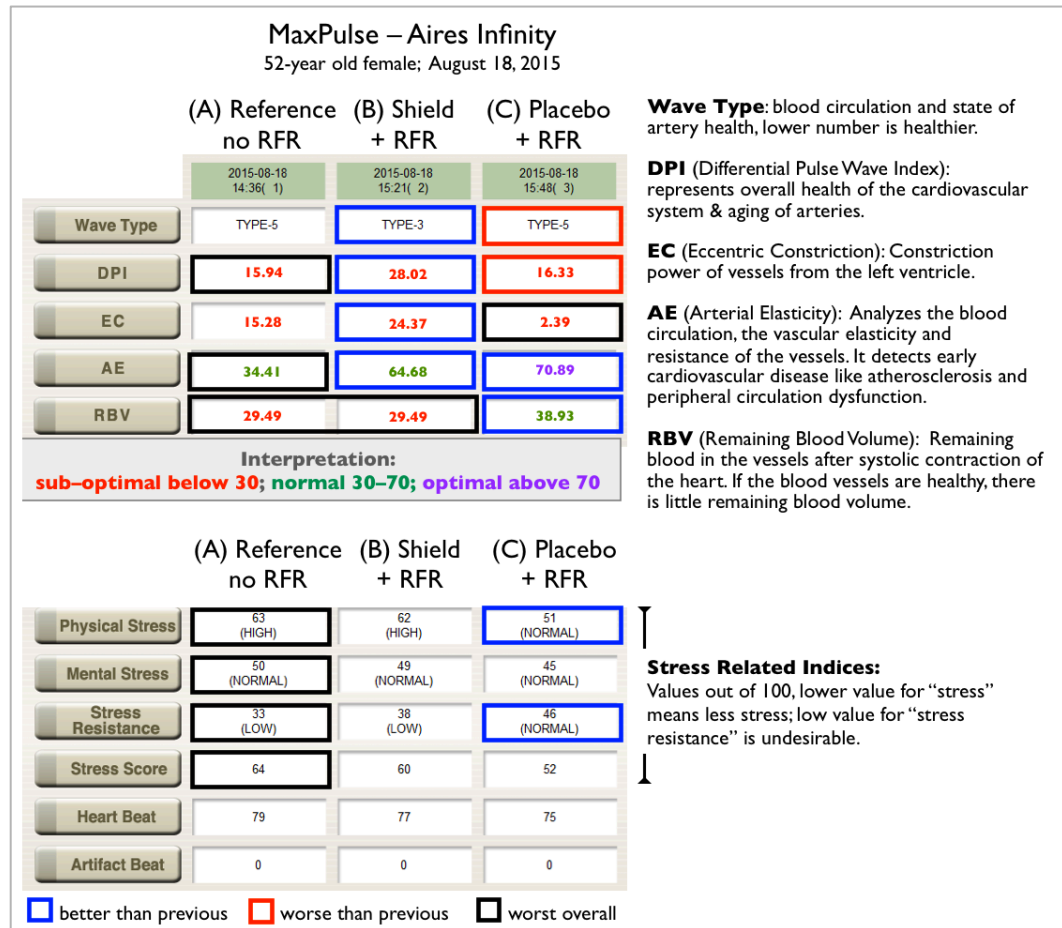


Figure 4. Summary of the trends in Figure 3. Coloured boxes represent better than previous treatment (blue); worse than previous treatment (red); and the worst condition overall (black).

This subject had some health issues that may have been triggered by electrosmog exposure making her feel as though she had EHS for the past ten years. When she tried the Aires *Defender Infinity*, her symptoms improved, as did the quality of her life. If she forgets her to wear her *Defender Infinity*, her symptoms return.

The shield does not change the electromagnetic environment in any way that we could measure with our equipment and nor does the company make claims about this. The claim that the Aires *Defender Infinity* “protects” against RFR is confirmed based on cardiovascular parameters obtained via MaxPulse, by live blood analysis for rouleaux formation, and by the subjective response of test subject.

CONCLUSIONS

In conclusion, the Aires *Defender Infinity* did not change any of the electromagnetic levels monitored in the environment including RFR, dirty electricity, and ELF EMF. This is in agreement with the claims made by the manufacturers and distributors of this technology. All of these EM parameters (except for RF during RF exposure) were low in the laboratory used for the testing. An electromagnetically clean environment is essential for this type of test. The Aires *Infinity* did not have an effect on heart rate or blood pressure. Some minor changes were detected during HRV orthostatic testing with changes in TI with shield and RFR exposure. The subject had exhausted adrenals and had a poor 'fitness' level that often fails to respond to additional stressors due to lack of energy. When the *Defender Infinity* was worn around the neck (blind placebo control study), cardiovascular response improved despite RFR exposure of a 52-year old woman who suffers from electrohypersensitivity. These improvements include DPI (differential pulse wave index indicative of overall cardiovascular health and aging of arteries); ED (eccentric constriction or the constriction power of the vessels from the left ventricle); and AE (arterial elasticity). Analysis of live blood showed an improvement in rouleaux formation with the shield that deteriorated with the placebo shield indicating that the shield was effective at reducing blood rouleaux. The objective results were supported by her subjective assessment of feeling better while the *Infinity* shield was worn. These results indicate that the Aires *Defender Infinity* may have a beneficial effect on someone who is electrically hypersensitive. Follow-up studies should be conducted with someone who is not on heart medication and has less adrenal stress to determine if there is an HRV response of the autonomic nervous system as well. Additional testing is recommended to see how consistent this response is among those who react to electromagnetic pollution.

REFERENCES

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Appendix I. International Radio Frequency (RF) Exposure Limits for 1800 MHz-Range.

International Radio Frequency "RF" Exposure Limits for 1800 MHz Range
(Cell Phone, WiFi, Smart Meters, etc)

Location	Reference	Exposure time	Limit Based On	Lower by	mW/m ²	V/m
Most of Western Europe	IEEE C95.1-1989 and ICNIRP	30 minutes	Thermal / Healing	-	10,000	61.4
USA	(FCC) IEEE C95.1-1989 and ICNIRP	30 minutes	Thermal / Healing	-	10,000	61.4
Canada	Safety Code 6, Table 5 (2015)	6 minutes	Thermal / Healing	66 x	4,394	40.7
Russia	Sanitary Norms and Regulations 2.2.4/2.1.8.055-96	3 hours +	Biological Effects	100 x	100	6.14
China	UDC 614.898.5 GB 9175-88	3 hours +	Biological Effects	100 x	100	6.14
Italy	Sanitary Norms and Regulations 2.2.4/2.1.8.055-96	3 hours +	Biological Effects	100 x	100	6.14
Most of Eastern Europe	Sanitary Norms and Regulations 2.2.4/2.1.8.055-96	3 hours +	Biological Effects	100 x	100	6.14
Switzerland	Ordinance on Protection from Non-ionising Radiation (NISV)	Long Term	Precautionary	100 x	100	6.14
Toronto Board of Health, Canada	Proposed 1999	Long Term	Precautionary	100 x	100	6.14
Bio-Initiative Report recommendation	Bio-Initiative Report 2007	Long Term	Biological / Precautionary	10,000 x	1	0.614
Salzburg Resolution on Mobile Telecommunication	Preventive public health protection, Salzburg, June 7-8, 2000	Long Term	Precautionary	10,000 x	1	0.614
European Parliament	Resolution 1815, Strasbourg, May 27, 2011	Long Term	Precautionary	10,000 x	0.106	0.2
Building Biology Guidelines Germany (Sleeping Areas)	SBM2008 - Level of No Biological Concern	Long Term	Precautionary	100,000,000 x	0.0001	0.006,14
Cell Phone Operational Requirements				10,000,000,000 x	0.000,001	0.000,061,4
Natural Cosmic Radiation	MAES 2000	Long Term	Natural Exposure	10,000,000,000,000 x	0.000,000,001	0.000,000,061,4
Average Indoor Urban Exposure Toronto, Canada	Safe Living Technologies Inc. 2011	Long Term			0.2 - 0.5	0.3 - 1.4

source: modified from Safe Living Technologies, Inc., www.slt.co

Appendix II. International EMF Exposure Limits for AC Electric and AC Magnetic Fields.

International EMF Exposure Limits for AC Electric and AC Magnetic Fields 50/60z (High Voltage Power Lines, Home Electrical Wiring, Power Cords, Appliances)

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Location	Reference	Limit Based On	AC Magnetic Field mG	AC Electric Field V/m
Canada	ICNIRP 1998	Nerve and Muscle Stimulation	833 0.833	5,000
USA	ACGHI 1998	Nerve and Muscle Stimulation	1,000 100	25,000
Germany	DIN/VDE	Nerve and Muscle Stimulation	50,000 5,000	20,000
Sweden	MRP	Biological / Precautionary	3 0.3	25
Sweden	TCO	Biological / Precautionary	2 0.2	10
Switzerland		Biological / Precautionary	10 1	
WHO "possibly carcinogenic"		Biological / Precautionary	3-4 0.3-0.4	
Bio-Initiative Report recommendation	Bio-Initiative Report 2007	Biological / Precautionary	1 0.1	
US Congress	Recommendation 1996	Biological / Precautionary	2 0.2	10
Building Biology Guidelines Germany (Sleeping Areas)	SBM2008 - Level of No Biological Concern	Biological / Precautionary	0.2 0.02	0.3
Natural Radiation	MAES 2008	Natural Exposure	0.0002 0.00002	0.0001
Average Indoor Urban Exposure Toronto, Canada	Safe Living Technologies Inc. 2011		0.4 to 2.0 0.04 to 0.2	5 to 25

source: modified from Safe Living Technologies, Inc., www.slt.co

Appendix III. Physiological States of the Autonomic Nervous System based on *Nerve Express* (Riftine, nd).

