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# SCIENTIFIC TEST REPORT FOR ENERGY INFLUENCE ON HUMAN ORGANISM

## FOR THE PRODUCT

# Foam with Biocrystal® mixture

### with the review by Walter H. Medinger, MSc, PhD, IIREC, Austria

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# 1. INTRODUCTION

One of the scientific fields of research at Bion Institute is measuring effects of (ultra)weak radiation. This radiation cannot be measured with conventional measuring devices. Even unconventional devices are not yet capable of measuring this kind of radiation (in physical or chemical effects) reliably enough – but the technology is constantly developing also in this direction. This kind of radiation and its effects mostly cannot be explained by a commonly accepted theoretical interpretation, although some scientists have offered possible explanations.

Bion Institute is specialised for measuring biological effects of weak emission of devices made by various manufacturers. They cannot confirm their statements in a conventional way or with unconventional detection devices. In many years of research, Bion Institute developed a series of tests which enable us to use human organism to detect such weak emission and determine its general physiological effects. This is why we can give a valid assessment of the supposed activity or non-activity of weak emission devices; be it a stimulating or a protective activity against negative radiation from the environment. If we confirm that the effects of the supposed emission are statistically significant, we issue the adequate certificate.

The subscriber Biocrystal Technologies d.o.o. asked us to test their device »Foam with Biocrystal® mixture« (hereafter Biocrystal foam or BF, Figure 1 left), for which they claimed to have an energy influence of unknown nature on humans that cannot be researched and proved by standard measurements means. Using clinical way of research and testing, we explored the effects of the Biocrystal foam on people when there were no sources of electromagnetic radiation within the radius of 5 meters (i.e. when the only radiation was the background electromagnetic radiation). In the tests, we monitored various physiological parameters (skin conductance, heart rate, muscle activity, respiration rate, body temperature, and some other derivate parameters) in ten volunteers. With the help of various statistical methods, we compared and assessed the data gained by measuring the physiological parameters when the Biocrystal foam and the control one (sham exposure) was used.

# 2. MATERIALS AND METHODS

## *2.1. TEST DESIGN FOR THE BIOCRYSTAL FOAM*

The claims of the manufacturer were verified by scientific, clinical tests on volunteers (hereafter testees), meaning that the tests were:

- **prospective** (general criteria for the efficiency of the foam's activity were determined in advance);
- **with placebo effect ruled out** (none of the testees knew whether they were exposed to the foam's influence or not, and usually they did not even know what to expect);
- **double-blind** (neither the testees, nor the assistant working with the testees knew which foam was being used);
- **randomised** (the decisions about control and real tests were made randomly).

We tested the effects of Biocrystal foam on the physiological parameters of testees. The parameters were measured in two sets of tests with:

- Biocrystal foam (BF),
- control foam (no crystals; hereafter control or CF).

The tests were conducted from 18th to 27th January 2017 at the Bion Institute with 10 testees aged from 23 to 55 (seven women and three men). Prior to the tests, we instructed the testees to avoid any big meal at least one hour before the tests, and to avoid coffee, alcohol, or energy drinks at least three hours before the tests. Each person was tested twice (in two different days), each time at the same hour. This ruled out as much as possible the effects of other factors (e.g. the testee was tired after an 8-hour work shift both times). At one test the person was exposed to the Biocrystal foam, at the other to the control foam. The order of both foams was chosen in advance and randomly (randomisation).

Figure 1: Biocrystal (left) and control (right) foam placed on a wooden chair during preparations for testing.

## *2.2. TESTING PROCEDURE*

The tests took place in a separate room where there were no other activities that could interfere with the measurements. There was a table in a room on which a computer and the device for measuring physiological parameters were placed. During measurements testees sat for approximately half an hour in a comfortable chair while skin conductance, heart rate, muscle activity, respiration rate and body temperature at the tip of the finger were measured. Throughout the testing process, the Biocrystal or control foam was placed on a wooden chair and covered with cotton cloth so that nobody could know which one was being used. Testees were seated directly on the cotton cloth.

All the electrodes needed for the tests were placed on both arms. On the left arm – positive electrode and ground for heart rate, and at left hand fingertips – electrodes for skin conductance and body temperature; on the right arm – negative electrode for heart rate, and both electrodes for muscle activity (Figure 2, upper right).

The testee was left alone in the room during the measurements so that external interferences were excluded to the highest degree possible. However, the testees were exposed to an average environmental electromagnetic pollution to be as close to ordinary life situations as possible. The testing assistant left the room as soon as everything had been prepared for the test and the measuring process began. Since the foam had been prepared by a third person, neither the testee, nor the testing assistant knew which one was in use.

## 2.3. MEASURING PHYSIOLOGICAL PARAMETERS

Measuring physiological parameters enables us to monitor the changes in a certain person's body in real time. We can monitor the state of a testee throughout the measuring time. We measure the following parameters:

- **Heart rate** (frequency of heart rate HR) is seen form electrocardiogram, from which we can deduct heart rate variability (HRV).
- **Muscle activity** (electromyogram, EMG) is measured on the left forearm. This shows us any artefacts that could appear on the EKG due to the testees moving arms.
- **Skin conductance** (SC) and **external body temperature** (TEMP) are measured on the fingertips of the left hand, where skin conductance varies the most. Skin conductance monitoring is used also in lie detectors, because sweating and skin conductance is regulated by parasympathetic nervous system. The latter is a part of the autonomic nervous system that is not controlled by our consciousness, so we cannot regulate it. In general terms, skin conductance is higher when a person is under stress (more sweating, higher blood flow), but responses can be much more complex.
- **Course of respiration** (RESP) is monitored with a special extendable elastic belt, measuring the expansion of thorax, which makes it possible to calculate the number of breaths per minute (BPM – respiration rate) and breathing depth (RESPV).

Figure 2: Demonstration of the testing set up. Testees were seated in a comfortable wooden chair (left) over which foam covered with cotton cloth was placed (lower right). Electrodes needed for measuring of physiological parameters were placed on both arms (upper right).

## *2.4. DATA ANALYSIS*

After the measurements, all data were exported to Excel with the sampling frequency of one second. The data was graphically represented and statistically analysed with the programmes *Gnumeric* and *RKWard*. For every testee, a thirty-second medians were calculated, after that the data were normalised to the median of the first two minutes (quotient between the median of the given time and the median of the first two minutes). On the basis of these data, we then calculated common medians for all ten testees, and used this number to draw graphs for each measured parameter.

The entire procedure was divided into two parts:

- the first half of the test: form the beginning to 12 minutes 30 seconds,
- the second half of the test: from 12 minutes 30 seconds to 25 minutes.

A statistical analysis was made for both parts of the tests separately. We used the Wilcoxon signed-rank test whereby we checked if there were any differences between median values of individual parameters between the Biocrystal and control foam. The same procedure was used for the Levene's test for equality of variances to check if BF caused any changes in data variability. We corrected the results of both statistical tests by the Holm-Bonferroni correction for multiple comparisons (Holm, 1979).

On the basis of the thirty-second medians, we calculated the percentage of BF functioning for every parameter. The percentage of BF functioning is the difference between the median values for BF and for CF, compared to the standard deviation of a chosen parameter (SD), or in mathematical terms: (BF–CF)/SD).

For better evaluation of results and where it was considered suitable we compared BF and CF with our long-term control average (hereafter LC) curve yielded from many previous tests of the same type (average taken from the control groups for 7 tests, i.e. 7 x 10 testees). According to our long experience the conditions of particular tests may be specific and different volunteers are used for tests so the comparison with long-term control has only informative value.

# 3. RESULTS WITH DISCUSSION

Overview of results showed that the influence of the Biocrystal foam was the most significant for the respiration rate and body temperature. For these two parameters the analysis showed statistically significant differences in median values between BF and CF in both halves of the test (Table 1, Wilcoxon signed-rank test). For the muscle activity, heart rate, skin conductance and course of respiration the analysis showed significant differences between BF and CF only in one of two halves of measurements, so the response for those four parameters was not as obvious as with previous two.

Certain differences between BF and CF can also be observed in data variability. Levene's test showed statistically significant differences for course of respiration in the second half of measurements (Table 1, Levene's test).

Overview of the effects for BF compared to CF showed that the response of different physiological parameters was complex as for some of them activity increased while for the others it decreased (Table 2). In the first half of measurements respiration rate increased while body temperature and course of respiration decreased. In the second half of measurement there was an increase for respiration rate while muscle activity, heart rate skin conductance and body temperature decreased.

Table 1: Summary of the statistical analysis made on the basis of thirty-second medians for each individual parameter in the both halves of the test. The values are corrected by the Holm-Bonferroni correction for multiple comparisons (Holm, 1979). Green background marks the statistically significant differences between BF and CF ($p<0,05$). Marks: EMG – muscle activity, HR – heart rate, SC – skin conductance, BPM – respiration rate, RESP – course of respiration, TEMP – body temperature, HRV – heart rate variability, RESPV – relative breathing depth.

| | Wilcoxonov signed-rank test | | Levene’s test | |
|---|---|---|---|---|
| | 0-12,5 min | 12,5-25 min | 0-12,5 min | 12,5-25 min |
| EMG | 1,000 | 0,000 | 1,000 | 0,121 |
| HR | 1,000 | 0,007 | 0,696 | 1,000 |
| SC | 0,786 | 0,003 | 1,000 | 1,000 |
| BPM | 0,004 | 0,002 | 0,264 | 1,000 |
| RESP | 0,010 | 0,248 | 1,000 | 0,040 |
| TEMP | 0,000 | 0,000 | 1,000 | 1,000 |
| HRV | 0,248 | 0,677 | 1,000 | 1,000 |
| RESPV | 1,000 | 1,000 | 0,860 | 0,224 |

Table 2: Overview of effects for Biocrystal foam (BF) compared to control (CF) in both halves of the test. The percentage of functioning is calculated as a difference between the median values for BF and for CF, compared to the standard deviation of a chosen parameter (SD), or in mathematical terms: (BF–CF)/SD). Negative values (i.e. the values that are lower for BF than for control) are marked red. Marks: EMG – muscle activity, HR – heart rate, SC – skin conductance, BPM – respiration rate, RESP – course of respiration, TEMP – body temperature, HRV – heart rate variability, RESPV – relative breathing depth.

| | EMG | HR | SC | BPM | RESP | TEMP | HRV | RESPV |
|---|---|---|---|---|---|---|---|---|
| 0-12,5 min | -0,7% | -3,9% | 16,8% | 39,3% | -7,4% | -11,3% | -14,9% | 1,5% |
| 12,5-25 min | -13,1% | -21,3% | -18,2% | 41,8% | 2,9% | -22,8% | -2,4% | 0,9% |

Respiration rate is one of two parameters where response to BF was visible most clearly (Figure 3). There is a difference between BF and CF from 5:00 minutes onward when values for respiration rate increased for testees sitting on BF while values for CF remained more or less constant. Results for CF are also very similar to results for LC which means that testees sitting on a CF responded similarly to long term control average for this parameter. Difference between BF and CF was greatest in the middle of the measurements as it gradually decreased towards the end. Higher respiration rate is usually correlated with higher metabolic activity. It seems that BF induced some internal response in testees that increased oxygen consumption.

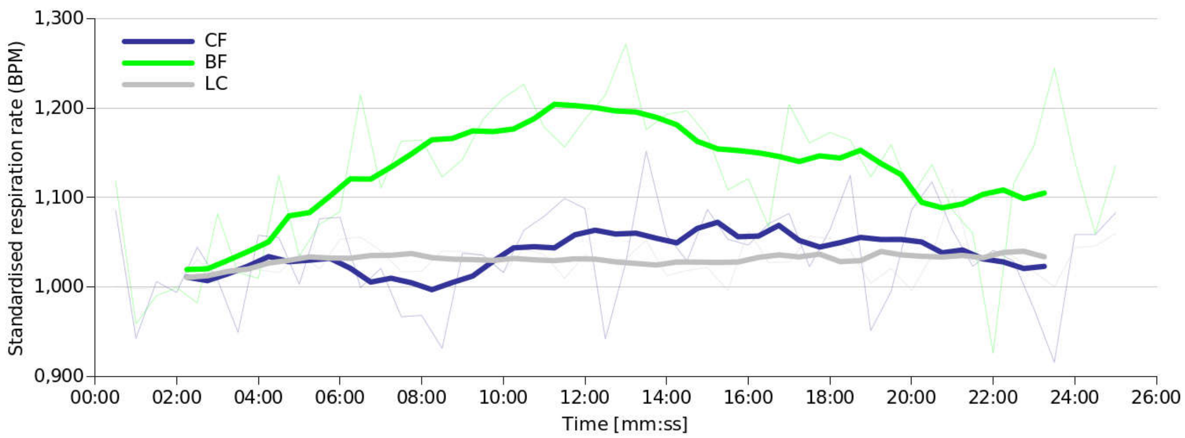


Figure 3: Standardised values for respiration rate (BPM) calculated with medians of the ten testees for Biocrystal (green line, BF) and for control foam (blue line, CF). LC represents long time average for control group of all the measurements we have done for this energy influence (gray line). The thinner lines in the back show the thirty-second medians, over which we made the moving average (more intensive lines at the front).

A clear difference between BF and CF is visible from temperature response too (Figure 4). For both BF and CF body temperature of testees increased until around 6:00 minutes, after that it remained more or less constant. However it increased much faster and achieved higher values for CF compared to BF. In comparison with long-term control it is clearly visible that values for BF are closer to LC than values for CF. It is somehow surprising as values for LC and for CF were expected to be close together. We assume that there was higher (ordinary) electromagnetic pollution than normally and that in this case the BF demonstrated strong protective effect as it is close to LC.

Difference between BF and CF for muscle activity can be seen in the second half of measurements only (Figure 5). Its values in this period were lower for BF as they were more constant than those for CF which gradually increased until 21:00 minutes when difference between them was the greatest. Lower values for muscle activity normally mean higher relaxation.

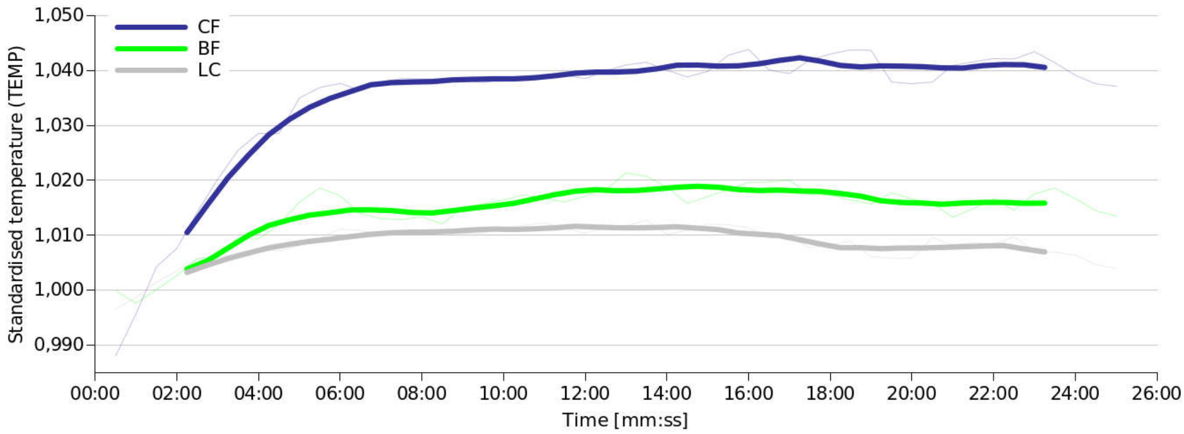


Figure 4: Standardised values for temperature (TEMP) calculated with medians of the ten testees for Biocrystal (green line, BF) and for control foam (blue line, CV). LC represents long time average for control group of all the measurements we have done for this energy influence (gray line). The thinner lines in the back show the thirty-second medians, over which we made the moving average (more intensive lines at the front).

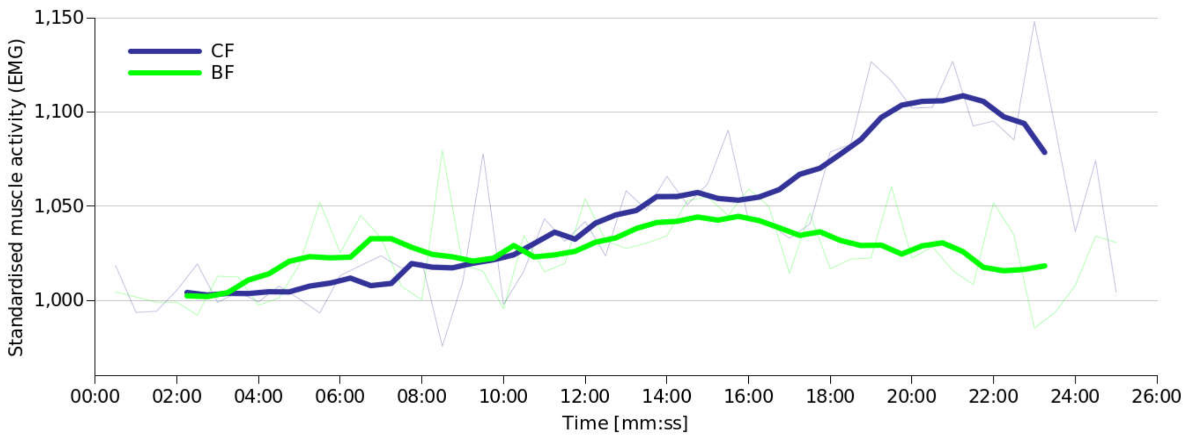


Figure 5: Standardised values for muscle activity (EMG) calculated with medians of the ten testees for Biocrystal (green line, BF) and for control foam (blue line, CF). The thinner lines in the back show the thirty-second medians, over which we made the moving average (more intensive lines at the front).

Similarly to muscle activity the values for heart rate are lower for BF compared to CF in the second half of measurements (Figure 6). Values for both foams decline gradually over time only that decrease is faster for BF. However around 23:00 minutes a fast increase is visible for BF so that there was no difference between both foams at the end of measurements. Lower values for heart rate usually correlate with higher relaxation or with lower physical activity. Therefore this goes in harmony with lower muscle activity by further indicating a higher relaxation. In comparison with LC it is evident from graph that values in the second half of measurements for BF are for most of the time the same as LC while values for CF are higher in this period. In this respect this parameter responded in a similar manner to body temperature (protective effect) since the CF curve sharply differentiates from the other and the BF curve is almost identical to the LC one.

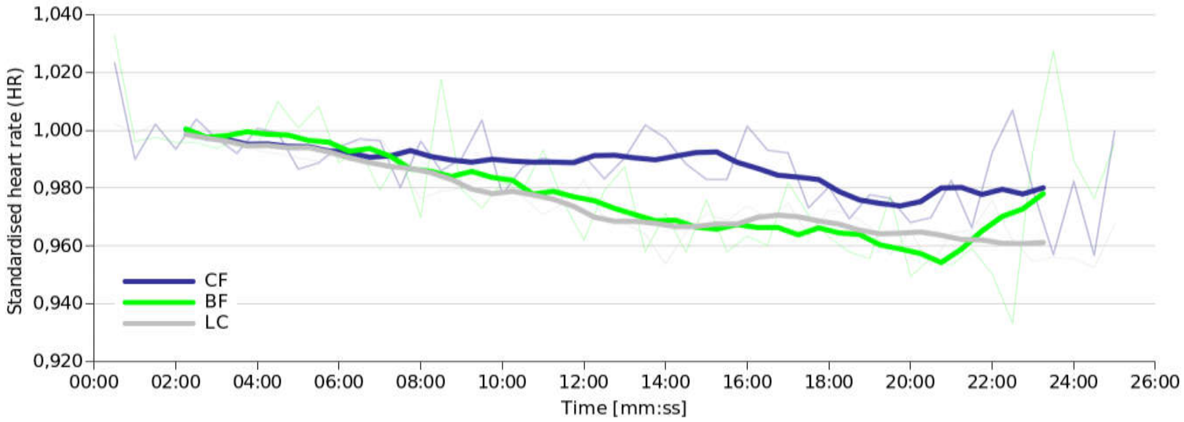


Figure 6: Standardised values for heart rate (HR) calculated with medians of the ten testees for Biocrystal (green line, BF) and for control foam (blue line, CF). LC represents long time average for control group of all the measurements we have done for this energy influence (gray line). The thinner lines in the back show the thirty-second medians, over which we made the moving average (more intensive lines at the front).

Difference between BF and CF is not so clear for the skin conductance but statistical analysis nevertheless showed significant differences in the second half of the measurements (Figure 7). Values for BF are generally lower in this period of measurements than those for CF and this indicates higher relaxation for BF.

Some difference between BF and CF in the first half of measurements is visible from the course of respiration (Figure 8). Values for this parameter were around the initial level for CF for the first half of measurements while the values for BF had gradually decreased and increased afterward.

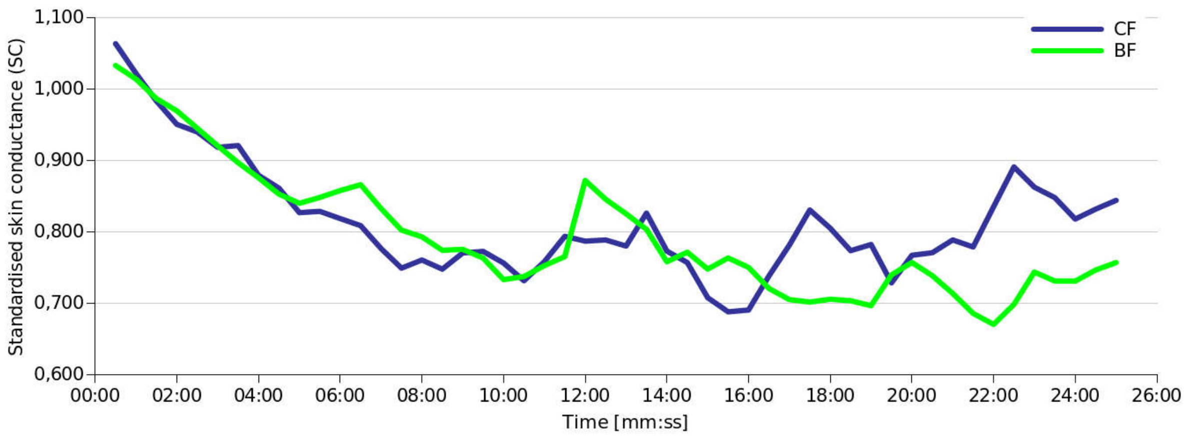


Figure 7: Standardised values for skin conductance (SC) calculated with medians of the ten testees for Biocrystal (green line, BF) and for control foam (blue line, DF).

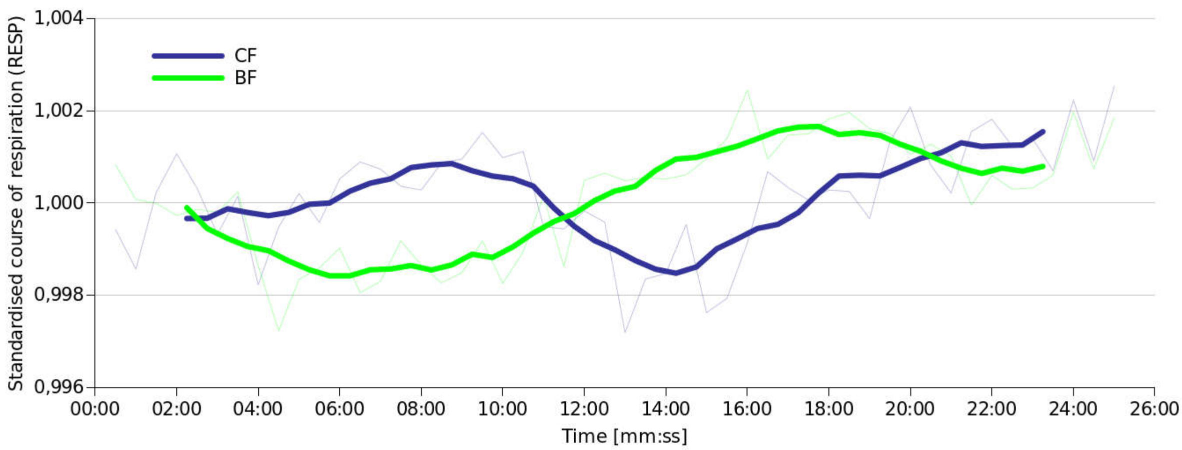


Figure 8: Standardised values for course of respiration (RESP) calculated with medians of the ten testees for Biocrystal (green line, BF) and for control foam (blue line, CF). The thinner lines in the back show the thirty-second medians, over which we made the moving average (more intensive lines at the front).

# 4. CONCLUSION

The measurements of “Foam with Biocrystal® mixture” demonstrated that it influenced the testees, and we could observe statistically significant differences between Biocrystal® foam and control foam by monitoring different physiological parameters.

The device’s energy influence was observed in both halves of measurements for respiration rate and temperature, in the first half for course of respiration and in the second half for muscle activity, heart rate and skin conductance (Table 1).

Response of testees to exposure to Biocrystal® foam was complex as it was not unified for different physiological parameters. Values for most of the parameters were lower for Biocrystal® foam compared to control foam with the exception of respiration rate where the opposite is true. Decreased values for temperature, muscle activity, heart rate, skin conductance and course of respiration indicate that testees were more relaxed when exposed to Biocrystal® foam compared to control foam. At the same time Biocrystal® foam induced higher metabolic activity as it was indicated by higher respiration rate compared to control.

When the results of these measurements were compared to long-term control average two response patterns were discovered. Respiration rate showed a pattern that is usual for energy influence tests because both controls were very similar while Biocrystal® foam differentiated from both of them. This is a pattern that we expected to be seen for Biocrystal® foam measurements. However another response pattern is visible for temperature and heart rate which is usual for protection devices. We assume that there was higher (ordinary) electromagnetic pollution than normally and that in this case the Biocrystal® foam demonstrated strong protective effect as it is close to the long term control. From those three parameters it is indicated that Biocrystal® foam have a relaxing effect and that it may have also a protective influence on the human organism.

The product »Foam with Biocrystal® mixture« met all the criteria required to obtain the Certificate of Energy Influence on Human Organism.

# 5. TEST REVIEW FROM WALTER H. MEDINGER, MSc, PhD

IIREC
International Institute for Research on Electromagnetic Compatibility

No. 21/2017 — Krems an der Donau, February 24th, 2017

**Review of:** Test report for energy influence on human organism for the product **Foam with Biocrystal® mixture**

*Manufacturer:*
Biocrystal Technologies d.o.o., Školjić 10, 51000 Rijeka, Croatia

*Research institution:*
Bion, Institute for Bioelectromagnetics and New Biology Ltd., Stegne 21, SI 1000 Ljubljana, Slovenia (Report no. 6/17 of Feb. 10th, 2017)

Having reviewed the report by Bion institute on the product »Foam with Biocrystal® mixture« I have come to the following **opinion**:

The tests were conducted with 10 volunteers after a *well-designed test plan* and *fulfilled the scientific standards* of a prospective, double-blind, and randomised study, ruling out placebo effect. Two tests series were run (i) with Biocrystal foam (BF), and (ii) with control foam (CF, without Biocrystals). The *physiological parameters* measured during the tests, namely: heart rate and its variability (HRV), muscle activity (EMG), skin conductance, external body temperature, respiration rate, and breathing depth, are *well defined and established*.

A specific trait of the report by Bion is the *careful statistical analysis* that was applied to the first and to the second half of the tests separately. It comprised the Wilcoxon signed-rank test for differences between median values of the parameters between the BF and the CF, as well as Levene's test for equality of variances. The Holm-Bonferroni correction for multiple comparisons was applied to both kinds of statistical tests. The difference of medians was compared to the standard deviation of each parameter in both half-times of the test. What I consider extremely valuable is the *long-term control (LC) based on a rich experience of Bion in the average course of test parameters* taken from previous tests of the same type within a control group of 7 x 10 volunteers. The standardised evaluation of the BF and CF curves compared to the LC curve *clearly reveals the specific effectiveness of BF* which is explained by two response patterns, namely (i) a bioenergetic influence and (ii) a bioprotective influence.

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