



Science

## THE HUMAN HAIR FOLLICLE PULSATING BIOMAGNETIC FIELD REACH AS MEASURED BY CRYSTALS ACCRETION

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### Abstract

This manuscript introduces the biomagnetic fields reach (BMFs) of the human hair follicles. The introduction of a novel table top optical microscopy technique using a special Prussian Blue Stain solution (PBS) mixed with fine iron particles has produced numerous papers confirming the inherent biomagnetism of the human hair. This technique allowed for the design of sets of incremental stacked glass slides for the purpose of measuring the human hair follicle BMFs reach out. This was demonstrated (measured) by using diamagnetic as well as paramagnetic Potassium Ferrocyanide preparations mixed with fine iron particles. Still microphotographs and video-recordings are presented.

**Keywords:** Hair Biomagnetic Field Reach; Hair Follicle Biomagnetism; Ferrocyanide Crystals Accretion; Ferricyanide Crystals Accretion; Hair Follicle.

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### 1. Introduction

Ever since the introduction of a simplified method for the detection of electromagnetic energy in plants and animal tissue (1); the intrinsic biomagnetism in humans and rodents hair follicles have been documented (2,3,4,5,6). Of relevancy to this manuscript is a published paper demonstrating the hair follicle biomagnetic fields penetrating through a 25x75x1mm glass slide (7). This finding triggered the idea of measuring the biomagnetic reach (distance) of the human hair follicle. The intrinsic unique pulsating nature of biomagnetic fields emitted by the hair follicle has been previously observed by this researcher. In several occasions, the interaction of the hair BMFs were observed slowing evaporation line progression of the PBS solutions. In addition, precedent exists as to the crystallization of potassium ferricyanide in the presence of magnetic fields (8).

## 2. Materials and Methods

Special Prussian Blue Stain solution for this study was supplied by Benjamin Scherlag PhD, Professor of Mredicine, Health Science Center, Oklahoma University, Oklahoma City, USA. The hair samples were self-plucked via tweezers from my scalp or forearms.

A fine iron particle solution was prepared as described in (1) as follows: “by mixing several grams of powdered iron filings (Edmond Scientific, Co., Tonawanda, NY) in 200 cc of deionized water (resistivity, 18.2 MΩ.cm). After standing for several hours the supernatant was carefully decanted for sizing of the very fine iron particles. The particle size and distribution of the particles from the supernatant was determined using dynamic light scattering (DLS) and the zeta potential using phase analysis light scattering by a Zeta potential analyzer (ZetaPALS, Brookhaven Instruments Corp, Holtsville, NY). For sizing, 1.5 ml of the solution in de-ionized water was scanned at 25 °C and the values obtained in nanometers (nm). A similar aliquot of the fine iron particle solution was scanned for 25 runs at 25 °C. for determining zeta potentials. Zeta potential values were displayed as millivolts (mV). A solution having diamagnetic properties was prepared by mixing aliquots of a Potassium Ferrocyanide solution as follows:

2.5% Potassium Ferrocyanide solution ( $K_4Fe_2CN_6$ ) and a 2.5% HCl. Also added were two parts of the Fe 2000 solution. The composite solution is abbreviated throughout the manuscript as “Fe2.” A solution having paramagnetic properties was also prepared by using aliquots of a Potassium Ferricyanide solution as follows:

2.5% Potassium Ferricyanide solution ( $K_4Fe_3CN_6$ ) and a 2.5% HCl, also added were two parts of the Fe 2000 solution. The composite solution is abbreviated throughout the manuscript as Fe3” (1)”.

### **The Stacked Sides Assembly or Sandwich (SDW)**

The hair was placed on a 25x75x1mm glass slide, and then covered by an equally sized slide. This preparation is referred in this manuscript as a sandwich (SDW). The Ferrocyanides solutons were used as sentinels in each incremental slide preparation. These solutions will be referred as PBS Fe2 or PBS Fe3 throughout the manuscript. Only one freshly plucked forearm human hair was sequentially used for all three experiments.

### **The Stacked Slide Preparations**

Glass slides were sequentially assembled to increase the vertical distance from the sandwiched hair follicle to the PBS Fe solutions at 1 mm stages (Figure 1)

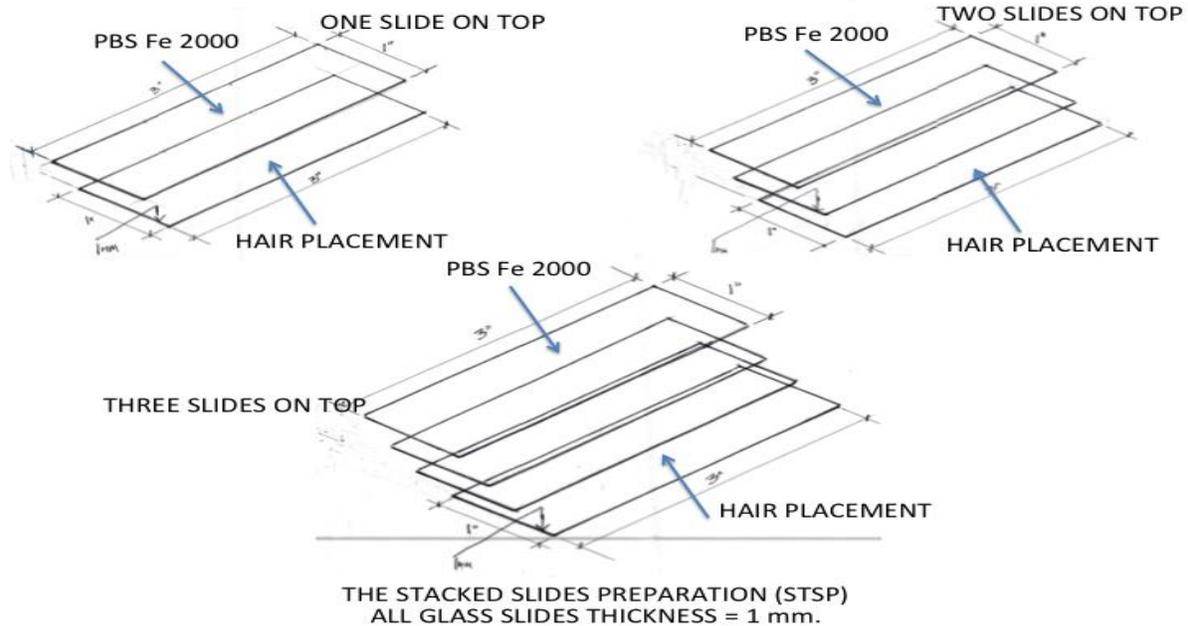


Figure 1: The stacked slide preparations. Above drawings showing the three different types of slide assemblies to measure the human hair vertical effective electromagnetic force effect on crystallization of a PBS Fe 2000 solution

### **Hair in SDW at 1 mm vertical distance from PBS Fe<sub>2</sub> drops**

A hair was placed on a single clean slide (size 25 x 75 x 1 mm), this time a second slide was placed on top. On the top slide two drops of PBS Fe were placed and allowed to evaporate. The PBS Fe<sub>2</sub> fluid is now at a vertical distance by 1 mm. Two drops of the PBS Fe<sub>2</sub> solution were then applied to the top slide (covering the hair follicle out of focus outline and allowed to evaporate.

### **Hair in SDW at 2 mm vertical distance from the PBS Fe<sub>2</sub> drops**

The same technique as above was duplicated, except that this time the SDW had two glass slides on the top surface. This made the hair follicle to PBS Fe<sub>2</sub> solution at 2 mm.

### **Hair in SDW at 3 mm vertical distance from the PBS Fe<sub>2</sub> drops**

The same technique was reproduced, except that this time the SDW had three slides on the top surface. This made the hair follicle to PBS Fe solution distance at 3 mm.

Note: In all three slides preparations the PBS Fe<sub>2</sub> were allowed to evaporate. Still images and video-recordings were made by using a Celestron II video-microscope. The images downloaded onto an Apple computer MacBook Pro Photo Application.

## **3. Results**

### **The hair vertical biomagnetic field range**

#### **One slide covering the hair (video-recording analysis)**

As previously described, a freshly plucked forearm hair follicle was placed onto the center of a clean slide. The sticky property of a fresh follicle made it easy for adherence to the glass slide,

care was taken to maneuver the shaft with a toothpick, and assure that it was also within the slide's boundaries.

Another clean slide was then placed on top of the first and two drops of the PBS Fe<sub>2</sub> solution was applied. The thickness of the glass slide measures 1 mm, therefore no contact with the hair below. The solution was allowed to evaporate and continuously monitored. As the evaporation line reached the latitude in front of the root, it stopped and then continues its path (Fig 2) and supplementary video:

<https://youtu.be/uddsCIeEdMc>



Figure 2: One vertically stacked slide. The hair was placed on a clean slide. Another slide covered the hair and three drops of the PBS Fe solution was allowed to evaporate. This photograph of a Video frame shows the crystallization line stopped by the biomagnetic field reach of the hair follicle

Total vertical distance from hair to top surface = 1 mm. Please visit link #0592 AVI for further details: <https://youtu.be/uddsCIeEdMc>

Large crystals were formed and fixed in place forming a structured evaporation line. Notably, this time the crystallization line also had a curved appearance. Is theorized that this was as result of the vertical biomagnetic field reach as shown by the crystals deposition emitted by the hair trapped in the bottom slide was 1 mm

### **Two Slides Covering the Hair SDW**

The top slide was removed; care was taken to assert that the hair on the bottom slide remained in position. This time two additional 1 mm slides were added to the SDW. Two drops of the PBS Fe<sub>2</sub> solution were also applied. The top slide was allowed to evaporate, this time also the evaporation line stopped in front of the root area for approximately the same time and then continue its path past the bulb and permanently stopped over the bulge area (Fig 3).



Figure 3: Two vertically stacked slides. The hair was placed on a clean slide. Two clean slides covered the hair and three drops of the PBS Fe 000 solution were placed on the uppermost slide and allowed to evaporate. This photograph of a video frame shows the crystallization line stopped by the biomagnetic field reach of the hair follicle. Since now we have two slides covering the hair, the crystallization line width is less pronounced and shifted to the right of the bulb. Total distance from hair to top slide is 2 mm

This time the evaporation showed a latitudinal shift. Now instead of stopping over the bulb area, it was seen over the bulge area. This is attributed to the “Faraday Effect” on EMF vertical propagation. The distance now for the vertical effective magnetic force effect on crystallization was 2 mm. Please note that the thickness of the crystallization line is inversely proportional to the Biomagnetical Field Reach distance

### Three Slides Covering Hair

This time the top slide was removed and two clean slides were added; thus making the hair follicle to the top slide at a vertical distance of 3 mm. The evaporation line was unaffected and continued in its path. The distance now from the hair to the top slide surface was 3 mm (Fig 4).



Figure 4: Three slides on top of hair. The hair was placed on a clean slide and seen out of focus in the background. Three clean slides covered the hair and three drops of the PBS Fe 2000 solution were placed on the uppermost slide and allowed to evaporate. This photograph of a video frame shows the absence of a crystallization pattern. The random occurrence of crystals is a demonstration that the biomagnetic field reach range of the human hair magnetism is ineffective at a distance of 3 mm from the source (hair)

### Example of control Ferrocyanide evaporation pattern

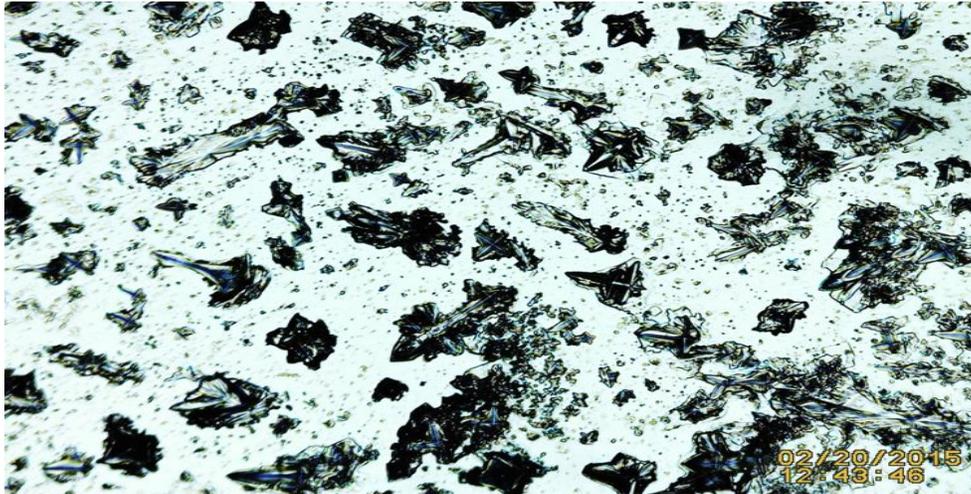


Figure 5: Example of control unimpeded evaporation of a SSP with PBS Fe 2000 solution. Notice the homogeneous appearance (no line clumping) in the crystals distribution in the absence of a biomagnetic field reach

### Experiments Demonstrating Bipmagnetic Field Slowing Evaporation Progression Diamagnetic PBS Fe<sub>2</sub>

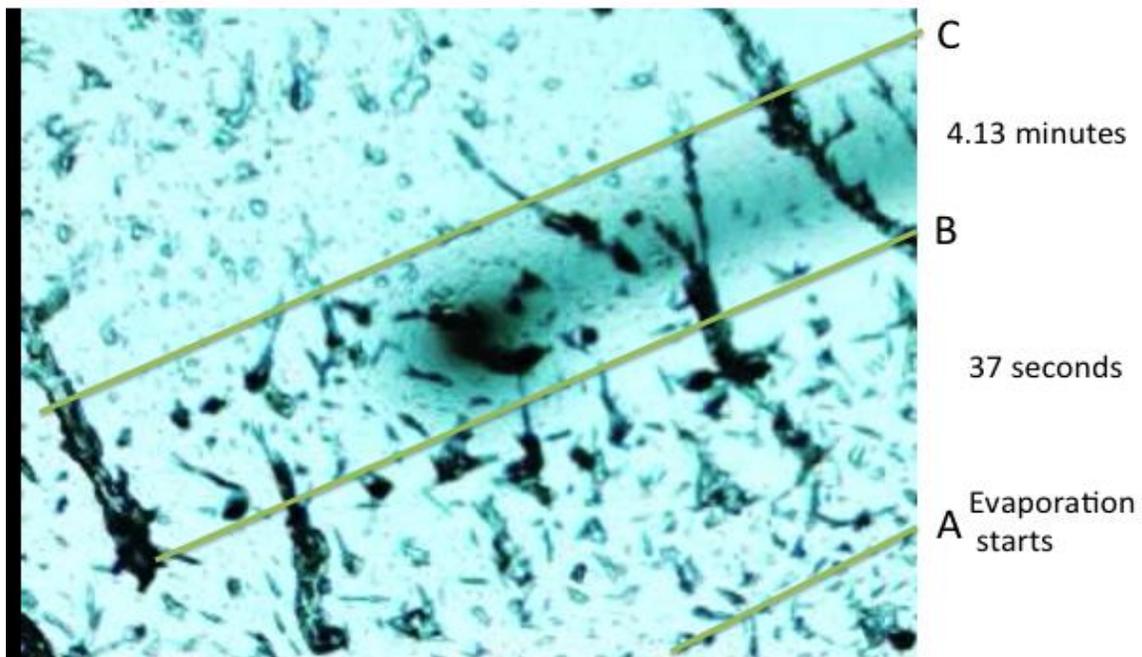


Figure 6: Hair Follicle in SDW at 1 mm vertical distance from the PBS Fe evaporated crystals. The video-recording shows timing of the evaporation process as follows: From A to B= 31 seconds From B to C= 4.13 minutes. There is a noticeable delay in the crystallization advance as the evaporation line is influenced by the biomagnetic field reach of the hair follicle. Please visit video link for details:

[https://youtu.be/6iKcEvxY\\_zE](https://youtu.be/6iKcEvxY_zE)

### Biomagnetic field reachout of the hair follicle using a paramagnetic solution as sentinel

The same procedures were conducted, this time using PBS mixed with Potassium Ferricyanide (Fe paramagnetic solution), The results were slightly different, the hair follicle biomagnetic field reachout was detected at 3 mm vertical distance (Figure 7)

### Experiments demonstrating bipmagnetic field slowing evaporation progression of paramagnetic potassium ferricyanide solution Fe<sub>3</sub>

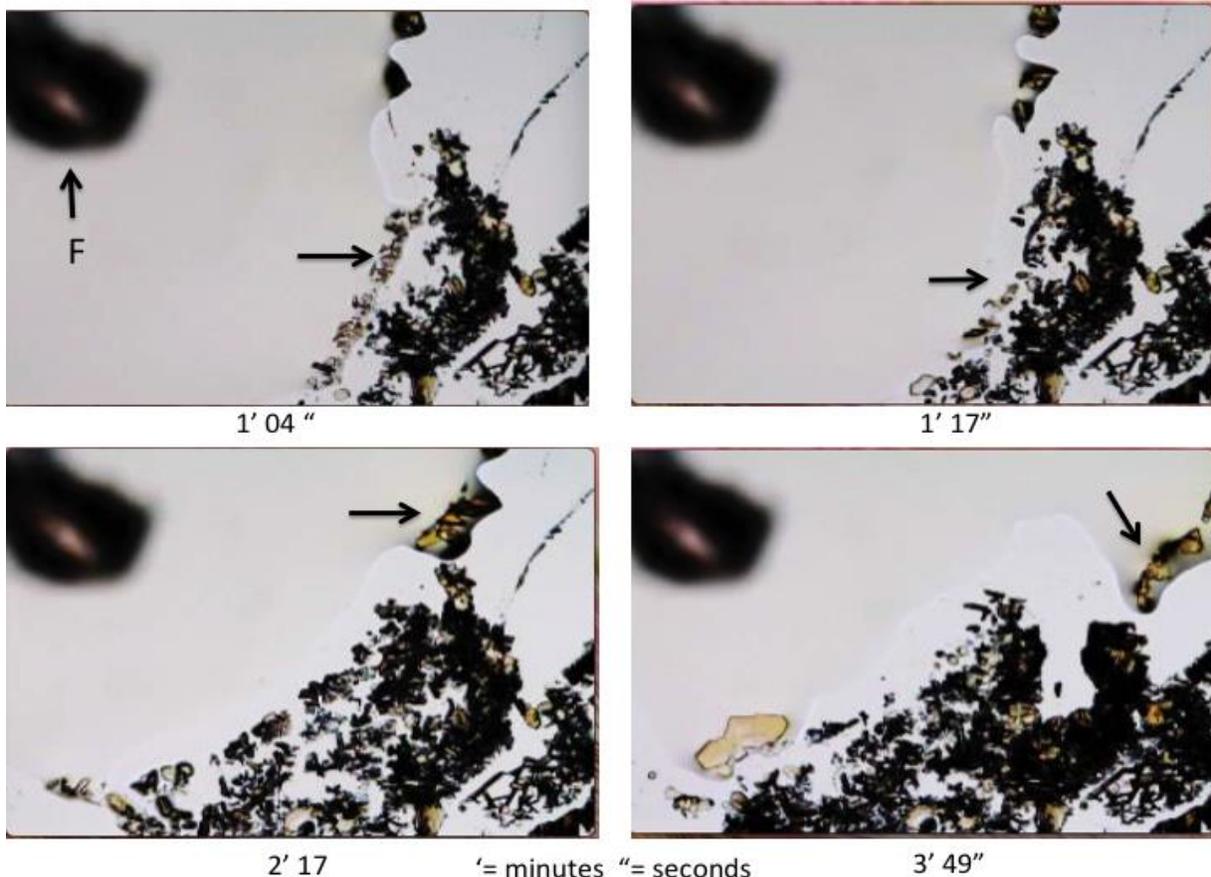


Figure 7: Demonstration of biomagnetic field fluctuation. Panel showing time lapse still frames from video-recording of effect of F= Hair Follicle biomagnetism. Hair (out of focus) mounted in glass slide and vertically separated by a similar 1 mm slide. The top slide has drops of Prussian Blue Stain + iron sized nanoparticles; the sequence shows energy from follicle non-linearity rejection of the crystallization advance (black arrows) of a Ferricyanide (paramagnetic solution). Please, refer to complimentary video: <https://youtu.be/8pipWJVytrk>.

The above slide and video clearly depicts the pulsating property of the bioelectromagnetic fields reach fluctuating forces of the hair follicle penetrating a 1 mm glass barrier and repelling the advance of a paramagnetic (Fe<sub>3</sub>) solution

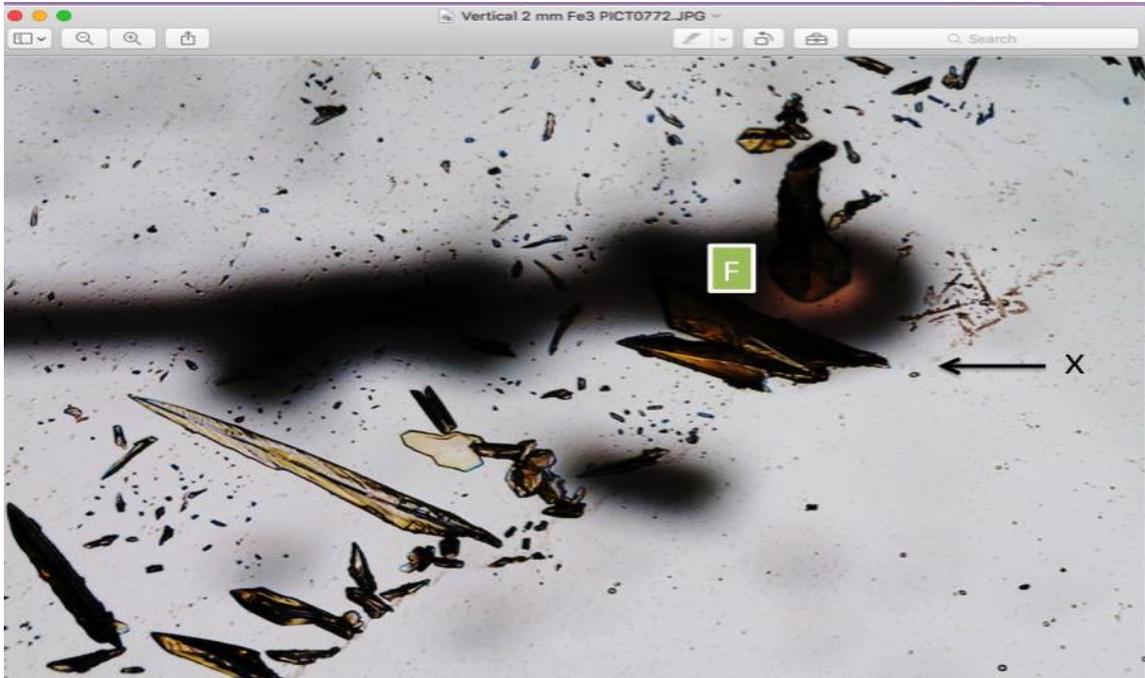


Figure 8: Microphotograph of still frame from video-recording of effect hair follicle biomagnetic field reach at 2 mm vertical distance. Hair (out of focus) is 2 mm away from crystals. X= Fe3 crystals

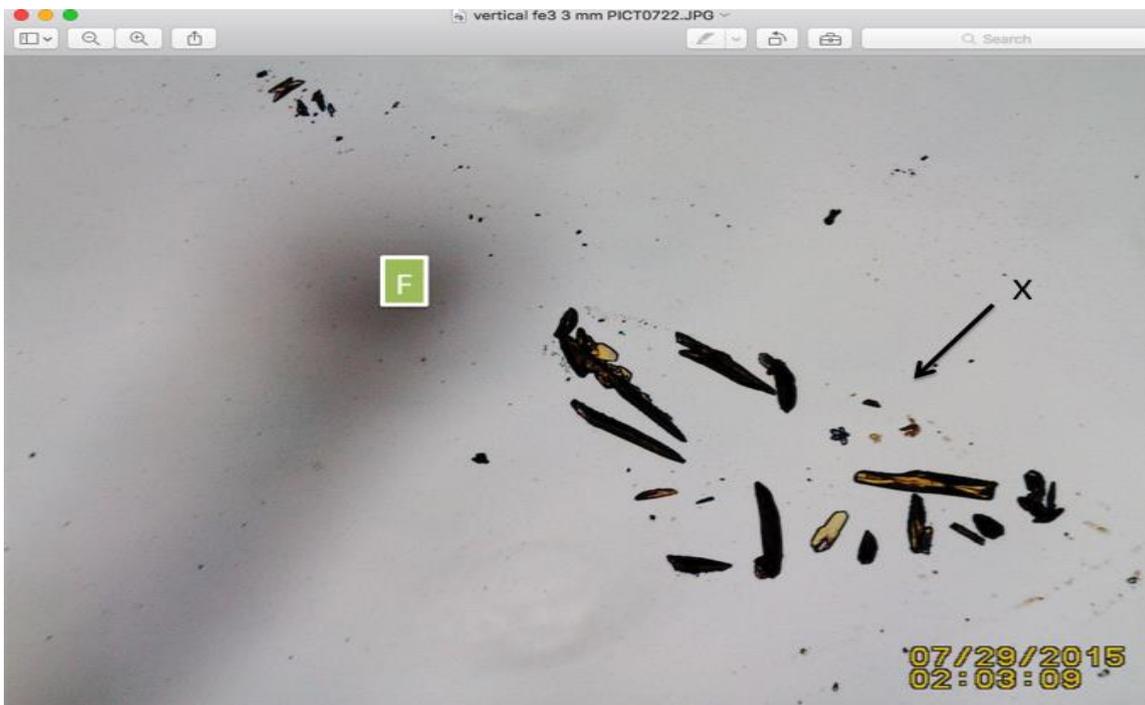


Figure 9: Microphotograph of still frame from video-recording of effect hair follicle biomagnetic field at 3 mm vertical distance. Hair (out of focus) is 3 mm vertically away from crystals. X= Fe3 crystals. This figure demonstrates the hair follicle biomagnetic field reach (at 3 mm) inducing crystals formation of a paramagnetic solution

## Results

### **Biomagnetic Field Reach of the Hair Follicle Using a Diamagnetic Solution as Sentinel**

Using a tabletop optical microscopy technique; and a Prussian Blue solution tailored to detect biomagnetic fields in plants and animal tissues, the human hair biomagnetical field reach distance was measured. A fresh tweezers plucked *in toto* (root and shaft) forearm hair was sandwiched (SDW) between two 1 mm thick glass slides. The PBS Fe<sub>2</sub> solution was placed on the top slide and allowed to evaporate. Video-recordings of the event were recorded and analyzed. The same procedure was done by preserving the original hair in the SDW and increasing the hair to PBS distance by 1 mm increments.

All recordings showed an effect on the crystallization advance by the biomagnetic field reach of the hair. The effect was not detected at a maximum vertical distance of 3 mm. After analyzing the data, it was concluded that the vertical hair follicle biomagnetic reach using a diamagnetic solution is  $\geq 2 \leq 3$  mm.

## 4. Conclusions

The hair follicle has been described as a dynamic mini-organ with a variety of different cells interactions and fluctuating metabolic processes (9). Due to the hair follicle intrinsic electron transport based metabolism these biologic entities emit variables or “pulsating” electromagnetic fields. This pulsation is observed when using a paramagnetic solution (Ferricyanide).

The experiments demonstrate (when using the slide technique) that the human hair follicle biomagnetic fields reach measure  $\geq 2 \leq 3$  mm when detecting a diamagnetic (repulsing a magnetic field) solution. When a paramagnetic solution (attracted to a magnetic field) is used the hair follicle vertical biomagnetic field reach out was approximated at 3 mm. Both solutions caused delays in translation and intensities in crystals formation in the evaporation line. Visually, it appears to be greater fluctuations in the evaporation linear movement when a paramagnetic substance is used. Demonstrated is the human hair pulsed biomagnetic field reach when using two magnetically divergent solutions.

Also demonstrated is the hair follicle Low Level Biomagnetic effect on crystals accretion of Potassium Ferrocyanide solutions.

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