

Analysis of Humira, Electro-Acupuncture, and Pulsatile Dry Cupping on Reducing Joint  
Inflammation in Patients with Rheumatoid Arthritis

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### **Abstract**

Humira, an anti-TNF drug aimed at decreasing inflammation in Rheumatoid Arthritis patients, can cause skin diseases from a rash to skin cancer. Humira works by blocking the chemical receptor RANKL, which therefore halts the production of osteoclasts, which attack and eat bone and cartilage, causing inflammation in arthritis patient's joints. By analyzing Humira's effect on the human body, it can be compared against other treatments such as electro-acupuncture and pulsatile dry cupping to see if these alternative treatments can decrease inflammation in Rheumatoid Arthritis patients through blocking RANKL, and if they are safer methods for carrying out this treatment. Under close examination of scientific journals written on studies where patients and animals were treated with Humira, acupuncture, and cupping for inflammation due to arthritis, the data collected suggests that Humira, electro-acupuncture, and pulsatile dry cupping all decrease inflammation in the joints of Rheumatoid Arthritis patients. However, acupuncture patients overall have the least harmful side-effects, with nausea and localized tingling being the most common complaints. These outcomes are less life-altering than localized bruising from cupping or the consequences of Humira which include an increased risk of cancer, and heat and liver failure. Therefore, electro-acupuncture and pulsatile dry cupping should be used as a viable safer alternative to Humira in treatment of inflammation in Rheumatoid Arthritis patients. The data collected from this review is important because patients should know about less harmful alternative treatments, such as acupuncture, because it has been proven to have the same effects as Humira, but have less harmful consequences that will benefit the patient's overall health.

## **Introduction**

With the United States becoming an international figure for politics, the world has also turned to follow its cultural and social norms. Currently, “pain is the second most common cause of loss of work in the United States, the common cold being first” (Kim, 2004, p.135).

Rheumatoid Arthritis (RA) is a form of arthritis that affects the joints, and is a common form of pain. These joints are normally paired joints that are found on both sides of the body, such as the wrists, hips, and knees. Currently, RA affects about 1% of the American population, and is more prevalent in women than in men. Inflammation in the joints is a symptom of RA, and is often associated with the pain in the joints that patients with RA feel.

In order to treat the pain and inflammation from RA, there has been an incentive to develop new drugs that can take away this pain. Western medicine, which is based on the use of drugs to treat symptoms of pain and discomfort, is highly valued by most medical doctors in the United States. This coincides with the need to cure different types of ‘pain’ because drugs can be made from new compounds that can treat different types of ‘pain’ in specific areas of the human body. With the United States being an international figure, and the ability of Western medicine to make drugs that can be applied to specific problems, the world has turned to drugs to solve all issues related to the body. However, according to Kim (2004), “with all the advances of technology and treatments, it [pain] still remains a major problem in our society and continues to worsen,” (p.135) proving that the increased use in drugs is not treating the ‘pain’ that Americans feel daily.

Thus, all treatment options must be considered when making a treatment plan for a patient. This includes using alternative medicine, as called in the United States, which is comprised of Traditional Chinese Medicine (TCM), a combination of “herbal remedies and

acupuncture are the treatments most commonly used by TCM practitioners,” (National Institute of Health, 2010, p.1) along with other forms of mind-body medicine that does not solely rely on drugs. Acupuncture, a form of TCM, has been practiced in China since before second century B.C., and has been used for centuries to cure pain. Today, “TCM is now practiced in one form or another by more than 300,000 practitioners in over 140 countries” (Scheid, 1999, p.10) and is taught in some European colleges, allowing TCM treatments to be available to many people throughout the United States , Europe, and Asia. Furthermore, new technology in combination with these TCM treatments has produced new forms of remedies that provide better results. These include electro-acupuncture, which provides an electric impulse to the needle while acupuncture is being performed, and pulsatile dry cupping, which “is a modernized technology using a mechanical device that generates a pulsatile vacuum with a pump,” (Teut et al., 2012, p.2). The ‘dry’ cupping refers to the skin not being cut where the cupping procedure is taking place.

Inflammation in the joints, caused by RA, requires TNF reduction in order to treat this swelling. While the prescription drug Humira has high levels of TNF reduction, the side effects, especially “increased risk for developing serious infections that may lead to hospitalization or death” (Physician’s Desk Reference, 2012, p. 1), can lead to infections such as Tuberculosis and an increased risk for cancer. These adverse reactions make Humira less desirable than the alternative therapies of electro-acupuncture and pulsatile dry cupping whose side-effects include, “nausea or small tingling pain where the needle was injected” (Ouyang, 2011, p.508), and localized bruising. Furthermore, Humira is the most expensive treatments to have for one year, and while it is the only medicine that can be delivered to your mailbox at your house, there is a growing number of facilities that offer acupuncture and cupping. Acupuncture is more

commonly found then cupping, being offered in every state, making electro-acupuncture the best choice for a patient who is looking to reduce their inflammation and pain due to Rheumatoid Arthritis.

### **Inflammation Due To Rheumatoid Arthritis**

Rheumatoid Arthritis (RA) is a form of arthritis that affects joints that are found on both sides of the body, such as the wrists, hips, and knees. RA currently affects about 1% of the American population, and is more prevalent in women than in men. Women have a higher rate of RA due to a higher percentage of osteoporosis, which allows more bone damage to occur more quickly. Inflammation in the joints is a symptom of RA, and is often sought to be treated with drugs, acupuncture, and/or cupping. In order to treat RA, the process that causes inflammation has to first be analyzed and studied.

According to G. Jie, a doctor at Suzhou Hospital of Traditional Medicine in China, et al. in their paper, Influence of electroacupuncture on tumor necrosis factor- $\alpha$  and vascular endothelial growth factor in rats with experimental arthritis, they state that “TNF- $\alpha$  [a form of TNF] is an important physiological mediator of inflammation that mediates the host inflammatory response and leads to tissue damage, and is one of the most active inflammatory factors in RA.” (2012, p.207) This is further supported in Effect of electro-acupuncture on tumor necrosis factor- $\alpha$  and vascular endothelial growth factor in peripheral blood and joint synovia of patients with rheumatoid arthritis, by Ouyang et al.(2011) in their study when they state:

It is well-known that high levels of tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) and vascular endothelial growth factor (VEGF) could be detected in blood serum or joint synovia of patients with rheumatoid arthritis (RA). (p.505)

This supports the fact that higher TNF levels are always found when there is an increase in inflammation. These findings show that TNF and inflammation have a directly proportional relationship to each other, and that any treatment to lower inflammation should also lower the TNF levels in the patient's body.

In a study on how TNF is related to osteoclast production, Tumor necrosis factor receptor-associated factor 6 is an intranuclear transcriptional coactivator in osteoclasts, Bai et al. (2008) reports that "RANK is a member of the tumor necrosis factor (TNF) receptor superfamily, and as such, its cytoplasmic domain binds a number of TNF receptor-associated factors (TRAFs)" (p.30861), meaning that because TNF and RANK have similar enough chemical structures they both activate RANKL, the cytoplasmic receptor of RANK. This is further proven to be accurate in, Changes in bone mineral density during long-term treatment with adalimumab in patients with rheumatoid arthritis: a cohort study, by Krieckaert et al. (2012) when they state:

Generalized bone loss in osteoporosis goes beyond localized, periarticular bone loss in the affected joints. It is assumed that generalized and local bone loss share a common, inflammation-driven pathway, in which receptor activator of nuclear factor-B (RANKL) plays an important role. (p.1)

Krieckaert et al. illustrate how TNF factors bind to RANKL to actively cause inflammation in the joints. This inflammation occurs when RANKL is activated, and causes the production of osteoclasts. These osteoclasts then attack the bones and cartilage, breaking up the organic bone located there, and causing inflammation as a result. Increasing TNF- $\alpha$  would "activate and damage the local vascular endothelial cells (VECs) to increase their permeability, and aggravate the local tissue inflammatory edema and infiltration" (Ouyang et al., 2011, p.505).

This research suggests that if TNF factors were to be lowered in the body, there would therefore be a decrease in osteoclast production, since RANKL would be activated in smaller amounts.

Although the TNF pathway is focused in the research of this paper and how it lowers inflammation in RA patients, there is another chemical that produces a similar effect. Four and half LIM domain 2 (FHL2) also binds with RANKL, like TNF, except instead of activating RANKL, it inhibits it. This is explained as:

Four and half LIM domain 2 (FHL2) is a LIM domain-only protein, not present in bone marrow macrophages (BMMs) but induced by RANKL, which binds TRAF6, thereby inhibiting its interaction with RANK (6). (Bai et al., 2008, p.30861)

The inhibition of RANKL therefore stops the body's production of osteoclasts thus leading to a stoppage of osteoclasts attacking and destroying the patient's joints and a reduction in inflammation. Therefore, FHL2 and RANKL have an inverse relationship, with one increasing, while the other decreases. This means that in order to find a way to decrease inflammation through the RANKL pathway, either TNF factors must be reduced, or FHL2 factors must be increased. Either way will result in the decrease in the activation of RANKL, which will lead to a decrease in the amount of osteoclasts that are produced in the body.

### **Prescription Drug Treatment of Rheumatoid Arthritis**

When diagnosed with Rheumatoid Arthritis today, the most common form of treatment for the pain and inflammation associated with RA would be an anti-TNF drug, which would be prescribed by a doctor. Currently, one of the most common drugs on the market is Humira, whose leading ingredient is the anti-TNF drug adalimumab. However, side effects of this drug range from "headache, stuffy nose, sinus pain, [and] mild stomach pain" (Physicians' Desk

Reference, 2012, p.1), to a reduced immune system, which has caused some patients to have skin lesions, lymphoma, allergic reactions, and the inability to form blood clots. The Food and Drug Administration (FDA) warns on Humira's prescription guidelines that "liver problems can happen in people who use TNF-blocker medicines. These problems can lead to liver failure and death" (2012, p.3196923).

Currently, according to the Physician's Desk Reference (PDR) (2012), "Humira is indicated for reducing signs and symptoms, inducing major clinical response, inhibiting the progression of structural damage, and improving physical function in adult patients with moderately to severely active rheumatoid arthritis" (p.1), and is used to treat RA's inflammation and pain in the joints. It is proven in, TNF inhibiting therapy preferentially targets bone destruction but not synovial inflammation in a TNF driven model of rheumatoid arthritis, by Binder et al. (2012) that Humira works to lower the TNF that causes inflammation to occur because the inflammation is:

Retarded, by treatment with the anti-TNF antibody infliximab, even if clinical signs and symptoms of inflammation are not affected. Similar observations have been also made for two other TNF inhibitors, etanercept and adalimumab [Humira] (p.611)

Binder et al. findings are supported by their research that they conducted on the use of the anti-TNF drug Humira, and how it affected the osteoclast (OC) numbers that are found in the body. This is relevant because when TNF activates RANKL, osteoclasts are produced in the bone, therefore when OC numbers decrease, TNF levels are being lowered. Binder et al. (2012) findings were as follows:

We found that TNF inhibition dramatically reduced pre-OC numbers in a dose depended manner [figure 1, B]. Moreover, TNF inhibition was effective in reducing pre-OC

numbers not only in the absence, but even in the presence of RANKL [figure 2 D]. Taken together these data suggest that TNF inhibition mainly affects pre-OC differentiation rather than the development of mature OCs, at least under these conditions. (p.611)

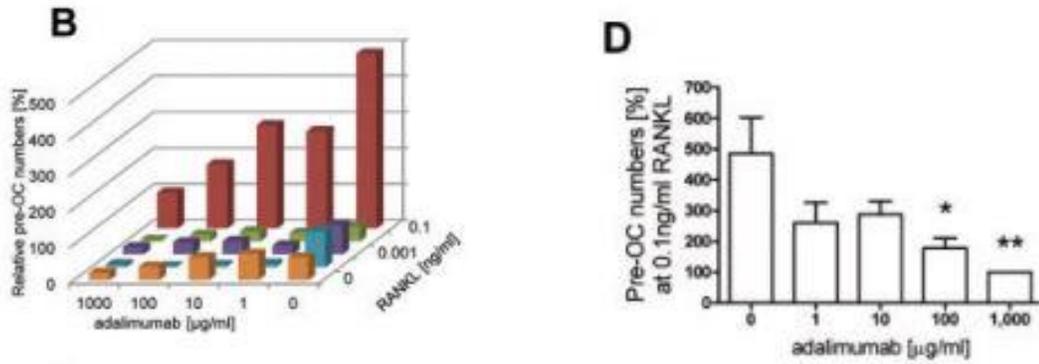


Figure 1 B: Use of different concentrations of Humira on pre-OC numbers. Figure 1 D: Effect of TNF inhibition of pre-OC numbers (Binder et al., 2012, p.611),

Because TNF inhibitions only affect pre-OCs, it means that prior OC's in the body will continue to be present and harm the joint. However, by using Humira, it will stop any new OC's from forming, therefore over time, decreasing inflammation. When OC's are formed, they attack the bone and cartilage in the joints. This leads to the bone mass density (BMD) to decrease in patients where OC's are overactive, such as in Rheumatoid Arthritis patients. Therefore, Krieckaert's et al. (2012) data that the "Mean BMD change per year was 0.58% and 0.07% for the hip and lumbar spine, respectively, during a mean follow-up period of 4 years," (p.3) illustrates how the anti-TNF drug, Humira can help decrease the OC production, and therefore retard the BMD loss in patients.

### **Side-effects of Humira**

For all of the benefits that Humira can provide, it does have side-effects such as a decrease in immune system, an increased risk of cancer, and liver and heart failure, which can make Humira dangerous to take. Although all of these side-effects are not experienced by over 50% of the patients that take Humira, the common side-effects that can effect day to day life include “headache, stuffy nose, sinus pain, mild stomach pain; or pain, redness, itching, swelling, or bleeding where you injected the medication” (Physician’s Desk Reference, 2012, p.1), and can still be crippling to the daily activities in a patient’s life. This is supported by the National Institute of Health (NIH) (2007) when they found that “common adverse reactions (incidence >10%): infections (e.g. upper respiratory, sinusitis), injection site reactions, headache and rash” (p. 1), are prevalent in patients. Although these reactions are not life threatening, they do cause the patient discomfort, and should be taken into consideration when taking Humira. The side-effects that are life-threatening however, should not be taken lightly and should be considered before taking Humira, since it is more likely to happen in patients that are older and already have a serious infection such as Crohn’s disease, or heart disease.

The most problematic of these effects are the decrease of the patient’s immune system. According to the Physician’s Desk Reference (PDR) (2012), “patients treated with Humira are at increased risk for developing serious infections that may lead to hospitalization or death” (p. 1), causing thousands of Humira patient’s to take other drugs to cure infections that they contract while on Humira. This risk of infection is supported because “serious infection...even if your TB test is negative your doctor should carefully monitor you for TB infections while you are taking HUMIRA” (Food and Drug Administration, 2012, p.3196923), illustrating how it becomes easier for a patient to contract tuberculosis while on Humira. The risk of serious infection is important

because many of the patients who are prescribed Humira are older, and already have a decreased immune system. This means that for these adults, with an even more compromised immune system, they can contract such diseases as “Tuberculosis (TB), invasive fungal, and other opportunistic infections, some fatal” (2007, p. 1), according to the National Institute of Health’s highlights of prescribing Humira information. These risks for infection for people who are taking Humira are also supported by the PDR (2012) and “active tuberculosis (TB), including reactivation of latent TB... Invasive fungal infections, including histoplasmosis, coccidioidomycosis, candidiasis, aspergillosis, blastomycosis, and pneumocystosis... [and] bacterial, viral and other infections due to opportunistic pathogens, including Legionella and Listeria,” (p. 1) are repeatedly found in patients who are taking Humira.

For the above mentioned diseases such as TB and fungal infections, these diseases present fairly quickly after taking Humira. However, Humira can cause cancer that may not become present until after the patient has stopped taking Humira. This is proven in a study, Lymphomatoid papulosis in a patient treated with adalimumab for juvenile rheumatoid arthritis, by Park (2012) that “TNF- blockers [including adalimumab/ Humira] used to treat inflammatory disorders are also believed to reduce host immune responses to malignancy, thereby indirectly increasing the risk of secondary cancers” (p.261). In Park’s study (2012), he found that “to date, data from several studies and case reports have shown an increased incidence of lymphoma in patients treated with anti-TNF agents” (p.259). These cases of lymphoma are supported by the NIH (2007) in their prescription data when they state, “Malignancies are seen more often than in controls, and lymphoma is seen more often than in the general population” (p. 1), and further supported by the FDA (2012) who found that besides lymphoma, other cancer such as “basal cell cancer and squamous cell cancer of the skin [occur in the patient]. These types of cancer are

generally not life-threatening if treated” (p. 3196923) but “people with RA, especially more serious RA, may have a higher chance for getting a kind of cancer called lymphoma” (p. 3196923).



Figure 2: Erythematous to brown nodules on the elbow and upper arm. (Park, 2012, 260)

This is important because according to the PDR (2012) “Humira is indicated for reducing signs and symptoms, inducing major clinical response, inhibiting the progression of structural damage, and improving physical function in adult patients with moderately to severely active rheumatoid arthritis,” (p.1) and is therefore commonly prescribed to people with Rheumatoid Arthritis. This is important to note because having serious RA while on Humira directly “increases your change of having a higher chance for getting a kind of cancer called lymphoma” (Physician’s Desk Reference, 2012, p. 3196923). Furthermore:

“Post-marketing cases of hepatosplenic T-cell lymphoma (HSTCL), a rare type of T-cell lymphoma, have been reported in patients treated with TNF blockers including Humira. These cases have had a very aggressive disease course and have been fatal” (Physician’s Desk Reference, 2012, p. 1)

This means that by taking Humira, it is possible to contract strains of rare forms of lymphoma which can cause death because little knowledge is known about the cancer’s treatment and its inability to cure it.

Besides cancer, there are other side-effects that are prevalent with the use of Humira. The liver is an important organ in the body for its ability to clean the blood, regulate blood clots, and production of bile, and humans are unable to live without one. Therefore, it is a problem when the FDA (2012) finds that “liver problems can happen in people who use TNF-blocker medicines [Humira]. These problems can lead to liver failure and death” (p. 3196923), because by taking Humira, the patient is taking a drug that can harm the liver to a point where it can no longer function properly. Other problems that may occur include “heart failure, worsening or new onset, may occur” (National Institute of Health, 2007, p. 1), causing this drug to not be a choice option for those people who already have heart disease or who are at risk for heart attacks or heart disease.

Furthermore, Humira is expensive to buy, costing a patient with no insurance coverage around \$4,507.36 a month because Humira is usually proscribed, “usually every other week” (Food and Drug Administration, 2012, p.1). However, after receiving a prescription from your doctor, Humira can be mailed to your home, or picked up at any local pharmacy, making it easily accessible to almost any person in the United States as long as they can pay for the dosages. This means that Humira should be used as a first choice of treatment only for patients who are house-bound who cannot receive treatments, such as cupping or acupuncture, outside of their homes. Otherwise, the side-effects that can be caused by Humira should encourage the patient to first seek other options of treatment before taking Humira.

### **How Electro-Acupuncture Works**

Electro-acupuncture is effective at reducing inflammation caused by Rheumatoid Arthritis because electro-acupuncture targets the TNF levels in the peripheral blood as well as

the TNF in the joint fluid. This results in electro-acupuncture successfully lowering TNF levels in the body, and causing the decrease of inflammation in the patient’s joints. The side-effects of electro-acupuncture are minimal, and include nausea, and mild swelling, bruising, and bleeding at the site of needle insertion.

Acupuncture has been used to treat pain and inflammation in people since second century B.C.E. In, Influence of electroacupuncture on tumor necrosis factor- $\alpha$  and vascular endothelial growth factor in rats with experimental arthritis, Jie et al. (2012) found that:

Due to the universality and network profile of the cytokines in the pathological process of RA, the pathway for EA [electro-acupuncture] effect on TNF- $\alpha$  and VEGF reduction might be as the following four: the first is a direct inhibitory effect; the second is indirect inhibition, i.e., through the cytokines mutual coupling effect; the third is the role of chemokine generation; the last is the regulatory function of nerve-immune-endocrine system. (p.208)

Jie et al. suggest that EA has a direct effect on the amount of TNF in the body. Jie et al.(2012) claim is supported by his results in his trial which showed that “synovial content were insignificantly different after treatment ( $P>0.05$ ), suggesting the equivalent effects of EA and SN in lowering TNF- $\alpha$  contents” (p.3).

Group	Case	Time	TNF- $\alpha$	
			Blood	Synovia
EA	32	Pre-treatment	146.32 $\pm$ 10.19	149.76 $\pm$ 14.12
		Post-treatment	139.25 $\pm$ 9.85*	142.75 $\pm$ 13.67
		Lowering value	7.53 $\pm$ 1.43 <sup>A</sup>	6.87 $\pm$ 1.65
SN	31	Pre-treatment	147.02 $\pm$ 10.33	148.81 $\pm$ 14.06
		Post-treatment	141.26 $\pm$ 10.46*	142.19 $\pm$ 13.59*
		Lowering value	5.89 $\pm$ 1.21	6.39 $\pm$ 1.46

Table 1: Comparison of TNF- $\alpha$  Contents in Blood and Synovia. (Ouyang, 2011, p.507)

Because TNF factors were lowered due to EA, it means that less RANKL was activated, and caused a decrease in osteoclast production. This would lead to a decrease in inflammation, which was proven

by a “reduction of stimulation caused by antigen in the whole body and local inflammation” (Jie et al., 2012, p. 207).

Furthermore, in Effect of electro-acupuncture on tumor necrosis factor- $\alpha$  and vascular endothelial growth factor in peripheral blood and joint synovia of patients with rheumatoid arthritis, Ouyang et al. (2011) described their patients as having “high acceptance” (p.508) referring to the fact that their patients had no or minimal discomfort with electro-acupuncture, and therefore did not stop treatment. “High acceptance” is important because as a viable treatment for inflammation, EA must be used on as many different types of people with different diseases and pain tolerance levels. This discomfort consisted of nausea or small tingling pain where the needle was injected. They also observed that there were not any “adverse reaction related with the treatment [that] occurred during the observation period” (Ouyang et al., 2011, p.508), concluding that no allergic reactions or major health issues occurred. The one caveat to electro-acupuncture is that blood diseases could be passed between people who shared needles. Therefore, when receiving electro-acupuncture, it should be done in a medical facility that uses safe disposal and cleaning methods for objects that have body fluids on them.

In terms of cost, the amount of money per week for acupuncture is drastically lower than paying for Humira, with “sessions with an acupuncturist running about \$65 to \$120, depending on where you live” (Alderman, 2010, p.B5). With even the most expensive treatments costing \$300 a session cost only \$3600 a year; it is still about \$1,000 less than Humira treatment. However, many “acupuncture schools have clinics where you can be treated by supervised students at discounted rates of \$40 or so for one to two hours” (Alderman, 2010, p.B5), which would decrease the costs of having acupuncture performed. These schools are located within every state of the United States, including some territories, and most offer reduced prices when

students are performing the acupuncture. Therefore, if the patient has a car, or has access to public transportation, it is more likely that he or she can find a school that is sponsored by the American Association of Acupuncture and Oriental Medicine. There, they can receive cheaper acupuncture treatment, and therefore acupuncture should be considered as a treatment when compared to the prescription drug Humira.

### **How pulsatile dry cupping works**

Pulsatile dry cupping is one way to treat Rheumatoid Arthritis patients because it can stimulate deep into the skin, and affect the acupuncture points, that will lead to a release of chemicals in the body which will decrease the levels of TNF. This will result in a decrease of inflammation in the joints with bruising and swelling around the site where cupping has occurred.

Cupping can come in two different forms, dry and wet cupping, according to M. Teut et al. in, Pulsatile dry cupping in patients with osteoarthritis of the knee – a randomized controlled exploratory trial. Today, the most common form, and the one that Teut et al. used in their studies, is pulsatile dry cupping. Pulsatile dry cupping “is a modernized technology using a mechanical device that generates a pulsatile vacuum with a pump,” (Teut et al., 2012, p.2) when the vacuum is applied to the area that has pain with a cup.



Figure 3: Application of adaptable silicone cup at the knee. (Teut et al., 2012, p.4)

By using modeling in, Cupping: From a biomechanical perspective, Tham et al. (2005) found that the stresses on the skin are caused by the pulsatile dry cupping was found at the:

The center of the cup ( $r = 0$  mm) and the compressive stresses just beyond the rim of the cup ( $r = 25$  mm) are increased for increasing vacuum pressure loads. For the vacuum pressures applied, the results also show that the effect of cupping does not extend beyond the area enclosed by the cup; at twice the cup diameter ( $r = 50$  mm), the stresses at the fat-muscle interface are negligible. (p.2188)

This pressure is what will ultimately cause the decrease in inflammation in their affected joints that the cupping is being applied to. Teut et al. (2012) postulates that “the level of the spinal cord may also be involved [in reduction of pain]: Manipulations may stimulate inhibitory receptive fields of the multi-receptive dorsal horn neurons” (p.8). This theory is further supported by Tham (2005), because according to his theory:

AA (Acupuncture analgesia) is initiated by the stimulation of the small diameter nerves in muscles which then send impulses to the spinal cord. The three neural centers, namely, the spinal cord, the mid-brain, and the pituitary are subsequently activated and release transmitter chemicals, such as endorphins and monoamines, which block the pain messages.” (p.2184)

With the spinal cord actively engaged by cupping, this could account for natural chemicals being released by the brain which act like anesthesia to stop pain being felt in the area that the cupping is being done. These chemicals could also act like FHL2, and act as a blockage to the stimulation of RANKL. This would stop the formation of osteocytes, which would then lead to the decrease in inflammation in the patient’s body.

While cupping does decrease pain and inflammation overall in the area that the cup is being applied to, cupping of all types causes some damage to skin. Cupping “may firstly influence chronic

pain locally by deforming or even injuring the skin which stimulates A $\beta$  fibers in painful but also distal skin regions,” (Teut et al., 2012, p.8). This damage to the skin is primarily seen and characterized by Tham (2205) as:

Ecchymosis, a discolouration of the skin caused by the escape of blood into the tissue from ruptured blood vessels. This is a characteristic feature of the cupping treatment and takes the form of a circular lesion” (p.2192).



Figure 4: Results of Cupping (Tham et al., 2005, p.2191)

However, while pulsatile dry cupping can cause some skin discomfort through bruising, cupping has one major advantage in that “transmission of blood-borne diseases can be avoided since skin is not penetrated” (Tham et al, 2005, p.2191). This makes cupping superior to acupuncture and Humira, because in both of these alternatives, a needle must puncture the skin, in order to stimulate the acupuncture point, and in Humira’s case, inject the medicine into the patient. Pulsatile dry cupping though can stimulate these acupuncture points without puncturing the skin.

Cupping, like acupuncture, is less expensive than the cost of prescription Humira.

Cupping tends to run between “£40[\$52.40] to £50 [\$65.50] a session—lasting from half an hour

to 40 minutes. The number of sessions needed is determined by the therapist” (British Acupuncture Council, 200, p.1), which would equate to around \$786 per year, making cupping the cheapest of the three treatments. However, cupping is the hardest of the three options to obtain because it is not wide spread across the United States, with only one location in some states. However, due to its low cost and only side effect of bruising, pulsatile dry cupping should be seen as an alternative to Humira.

### **Conclusion**

From the evidence that is gathered, it is illustrated that Humira, electro-acupuncture, and pulsatile dry cupping all decrease the levels of TNF in the human body. This reduction in TNF leads to a less osteoclast formation, and therefore a minimization of swelling in patient with Rheumatoid Arthritis. However, due to the side-effects of these drugs, they should not all be considered equal relative to patient health.

When looking at the costs and location of these three treatments, Humira and acupuncture are the most expensive and therefore pulsatile dry cupping should be the patient’s first option. The only caveat to this is that cupping is the hardest form of treatment to find in the United States. If the patient is house bound, Humira should be used. Otherwise, acupuncture would be the easiest to find, and is the second cheapest option of treatment.

When looking solely at the patient’s health, Humira should be the last remedy to be used to try and treat the symptoms of RA. While Humira has been proven to lower TNF factors and help many people with inflammation associated to their Rheumatoid Arthritis, the side-effects can be life-threatening and definitely life-altering. Any drug that is “believed to reduce host immune responses to malignancy, thereby indirectly increasing the risk of secondary cancers”

(Park, 2012, p.261), should not be used for the general public. One might argue that this is considered an ‘uncommon’ side-effect, and therefore Humira should still be taken. However, “headache, stuffy nose, sinus pain, mild stomach pain” (Physician’s Desk Reference, 2012, p.1), are common in patients who take Humira, and can affect the patient’s happiness, and day to day life routines. Furthermore, any drug that ‘reduces host immune responses’ and will give RA patients a “higher chance for getting a kind of cancer called lymphoma” (Food and Drug Administration, 2012, p. 3196923) can cause side-effects that may not appear until after the patient has stopped taking Humira and many years have passed.

Therefore the two best options in term of health for the patient are pulsatile dry cupping and electro-acupuncture. This is because while pulsatile dry cupping my cause, “ecchymosis, a discolouration of the skin caused by the escape of blood into the tissue from ruptured blood vessels” (Tham, 2005, p.2192), and electro-acupuncture can cause “discomfort consisted of nausea or small tingling pain where the needle was injected” (Ouyang, 2011, p.508), these are byproduct that will last only a few weeks at the most. Pulsatile dry cupping may be better than electro-acupuncture because there is a small chance of contracting a blood disease from electro-acupuncture because the doctor that administers the treatment must pierce the skin in order to perform the treatment, where in pulsatile dry cupping, the skin in never broken.

In conclusion, Humira has the worst side-effects, and also costs the most per month, therefore making it the least desirable option of treatment. The safer alternatives would be to use electro-acupuncture or cupping. Both of these drugs cost less than Humira per month, and are safer because they do not cause any long term side-effects. However, of the two, cupping is harder to find in the United States, making acupuncture the finest option of treatment.

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