

Magnesium: Can this be the new SSRI?

Jeanette Tucker

Grenfell Campus, Memorial University of Newfoundland

### Abstract

Major depressive disorder is a mental health condition that has become more prevalent in the last decade. Many patients with depression are getting prescribed harmful antidepressants and in some cases are not made aware of the problems they may cause. There are a few other ways that depression can be treated without having to take these prescribed antidepressants. This paper explore the idea that Magnesium is an effective treatment for depression and can often be as effective as a prescription antidepressant. The articles reviewed in this paper are scholarly, peer-reviewed articles that for the most part offer the similar perspective towards Magnesium that I have proposed. Other articles reviewed in this paper discuss vitamins and supplements other than magnesium that are vital to our mental health. In general, there was a support for the idea that magnesium does in fact help relieve the symptoms of depression. Most of the articles that discuss magnesium and its antidepressant like effects state that research needs to be conducted further to conclude how exactly this changes the way the brain functions.

### **Magnesium: Can this be the new SSRI?**

Depression is a frequent diagnosis that is commonly seen in the medical field and is higher amongst adolescents and the elderly (the mean age of those diagnosed is 32) (DBSA, 2005). Statistically speaking, major depressive disorder is a serious psychiatric illness affecting approximately 17% of the population at some point in their lives; also depression is the leading cause of emotional disability worldwide (Sowa-Kucma et al., 2013). As defined in the DSM-V (Diagnostic and statistical manual of mental disorders [5<sup>th</sup> ed., text rev.]) major depressive disorder is a “medical illness that affects how you feel, think and behave causing persistent feelings of sadness and loss of interest in previously enjoyed activities...it is a chronic illness that usually requires long-term treatment” (American Psychiatric Association, 2013). Often depression is accompanied by feelings of anxiety and nervousness as well as weight gain or weight loss.

Depression can be treated by a wide variety of prescription drugs such as SSRIs (Selective Serotonin Reuptake Inhibitors), MAOIs (Monoamine oxidase inhibitors) or non-prescription drugs such as Vitamin D, Vitamin B12 or other vitamins. New research shows that Magnesium as a supplement can also be beneficial when looking at potential treatments for depression (Deron, 2013). I hypothesize that magnesium can be equally as effective as prescription drugs (particularly SSRIs) for treating depression. Discussed in this paper are articles that have recently presented the same idea as my hypothesis. This is a fairly new topic to the research of drugs and behaviour, however it is becoming popular very quickly. Therefore this is a great topic of interest for new researchers when looking for alternate and natural ways to treating major depressive disorder.

Peter Wehrwein at Harvard University conducted a study on the astounding increase in antidepressant use in Americans. In this study he states that the rate of antidepressant use in North America particularly amongst teens and adults has increased by over 400% since 1988. That is averaging on one in every ten Americans taking these drugs on a daily basis. In just over 20 years, antidepressants have become a popular, more prescribed and more frequently used medication. Therefore, as these medications are becoming more widely prescribed in doctor offices, more support has become available for researchers to propose and discover alternate and more natural ways to treat major depressive disorder.

### **Research and the Current Hypothesis**

Magnesium, (as defined by MedicineNet) is a “mineral involved in many processes in the body including nerve signaling, the building of healthy bones, and normal muscle contraction. About 350 enzymes are known to depend on magnesium.” It is more important than it is given credit for and plays multiple roles in the body, many of which are not widely known. Other vitamins such as vitamin B12 or vitamin D have been the area of focus when it comes to treating depression, however magnesium itself and its use for depression have increasingly become more popular.

There was a study conducted by Derom and colleagues in 2013 on the plasma levels of magnesium in depressed versus non depressed patients. They originally stated that the research on magnesium in depression is fairly new but it is a worthwhile and possibly significant study to pursue. In their cross-sectional study, they concluded that a fairly high intake of dietary magnesium seemed to be associated with lower depression symptoms (Derom, 2013). While they obtained significant positive results in their study, they noted that although magnesium seems to

be an effective treatment of depression, the data can sometimes be scarce and incongruous. The magnesium levels and level of depression often depends on the patient and the severity of their case of depression.

In this research paper I am going to look at the effects of magnesium on depression. This paper will focus on; how it chemically changes your brain and how it can have some of the same effects as that of other antidepressants; why it is a better choice than many other forms of SSRIs with regards to withdrawal symptoms and side effects. I will also take a brief look at other supplements such as calcium, vitamin D and keratin that are available to treat depression.

### **How does Magnesium Work?**

Magnesium is considered to be one of the most important minerals in the human body. It has a variety of functions within the body, one of the main ones is having an effect on mood levels (Serefko, 2013). Magnesium has been shown to help with the functioning of the cardiovascular, alimentary, endocrine and osteoarticular systems. Simple routine blood work can measure the level of magnesium in your body, which usually translates to around 24 grams in an average human body (most of this is within your bones). New research published in the journal *BMC Bioinformatics* indicates that magnesium's role in human health and disease is far more significant and complicated than previously imagined (Piovesan, Profiti, Martelli & Casadio, 2012). Research on how magnesium works for depression is still fairly new, but half of the studies conducted have shown it to be clinically significant.

Since research is still fairly new to discussing magnesium and how it exactly affects the brain, we cannot come to any solid conclusion how it changes the chemicals we can only suspect

how it works. In this paper are multiple scholarly articles that present their proposals in how they think magnesium affects the brain. While none are specifically correct, many suggest possible ways in how it may work.

### **The effects of Magnesium in comparison to SSRIs**

Magnesium supplements are becoming more frequently bought as an over the counter drug by patients of general physicians and psychiatrists. Before the discovery of magnesium and its importance in relation to depression, other vitamins were being prescribed along with the antidepressants and most generally were working positively for depressed patients. With the new discovery of magnesium as an antidepressant, patients have to keep in mind that oral magnesium supplementation may prevent depression temporarily, but more prospective studies are needed in order to further evaluate the benefits of magnesium intake and its supplementation for depression.” (Derom, 2013)

Magnesium has some of the same effects that SSRIs have on the brain. It can change the way we feel by manipulating the chemistry in our brain and our blood-plasma levels which in return affects how we feel. As mentioned above, our magnesium blood levels should be 24 grams in our body and anything below this often triggers some depressive like symptoms (fatigue, sadness, “slow” feeling, etc.) which can interrupt a person in their daily routines. It has been suggested that in order to maintain a healthy level of magnesium in your body, you should be consuming more than 600mg of magnesium a day (Eby, 2006). Widmer et al. in their study discussed how magnesium levels in the blood of drug-free patients (with symptoms of depression) were significantly lower than those taking drugs for depression. They also concluded that the levels of magnesium depends on the sex of the patient and the intensity of the depression

they are experiencing. This was because there is a difference between someone suffering with depression and someone suffering with major depressive disorder, both of these mental illnesses affect a person in different ways. Therefore when suffering from different illnesses, the chemicals in your brain change ultimately changing how one may react to taking magnesium for their illness instead of a routine SSRI.

Pochwat et al. in 2014 did a study looking at the antidepressant like effects of magnesium in the brains of rats. They discovered that magnesium plays a fundamental role in the regulation process that is necessary for the body to function properly. It helps with the activity of approximately 300 enzymes most of which are responsible in making muscles work properly, balancing the acid-base concentration of the stomach and maintaining the structure of nucleic acids. Other than engaging in muscle function, it helps control many aspects of behaviour. Several clinical studies have shown that most depressed patients who were tested had abnormal blood serum/plasma magnesium concentrations. However, they noted that not in all the individual cases depressed patients possessed low magnesium levels but mostly in patients normal depression not major depressive disorder.

### **Important Chemicals that affect the levels of Magnesium**

Magnesium levels can also be affected by the levels of NMDA (N-methyl-d-aspartate), ketamine and zinc levels present in the blood. Three of the previous mentioned chemicals are all present in our body at some level. They may not be there in high levels, but they are naturally occurring within the body (Adams, 1998). Three of these levels fluctuate when depression symptoms are present but fundamentally depends on the type of depression and the person being observed. Murk in 2012 conducted a study looking at these chemicals and the levels that they

reached in certain patients. He first began his study looking at ketamine and its relation to depression but he did not directly test this himself, however, he did look at the previous research done on this particular drug and its effects.

NMDA (N-methyl-d-aspartate) is a chemical that excites neurotransmitters therefore causes over activity in the brain. NMDA receptors are associated with brain dysfunction and chemical imbalance, which are both associated with major depressive disorder (Sowa et al., 2013).

Ketamine is an anaesthetic (that acts as a hallucination) that is sometimes used for humans and veterinary purposes but some people chose to use it illegally for an antidepressant and to get a temporary “high.” Murk compared the effects of ketamine to the effects of magnesium from the physiological perspective. He concluded that magnesium and ketamine have similar hallucination effects but magnesium is not as intense as ketamine.

Zinc concentration in severely depressed patients was significantly lower than those without major depressive disorder (Sowa et al., 2013). The cause for this is still unknown but it has shown to be a significant predictor of major depressive disorder in a numerous amount of studies (as cited in Sowa et al., 2013).

### **Why is Magnesium a Better Choice than an Antidepressant?**

Magnesium is a natural occurring element in the earth that can be imitated through many manufacturing drug companies who compress the element of magnesium and put it in pill form for daily intake. It seems that taking magnesium is less harmful on the body and has less warnings and known side effects than other forms of antidepressants. Besides being a good

supplement, it is fairly new in research so studies are still ongoing and more benefits are being discovered from taking magnesium supplements.

Magnesium is also known to help people with SAD (Seasonal Affective Disorder) to alleviate their symptoms of this seasonal disorder. During the winter months it has some of the same effects on the brain as many SSRIs do. Things such as relaxing properties and slowing down the brain waves can be achieved through taking magnesium supplementation just as efficiently as taking a routine antidepressant. This is an excellent finding since it is an alternate way to treat depression instead of taking other antidepressants for a few months that may cause many side effects such as withdrawal after the winter months.

Many psychiatrists prescribe antidepressants because they are unaware of the more natural ways of treating depression, but taking an antidepressant really depends on who you are and if you really need it. If you are experiencing SAD during a few months of the year than taking Magnesium may be more beneficial since it is only for a short period of time. However, if you are experiencing extreme depression and it cannot be fixed by any “natural” method than taking antidepressants may be the best option for you.

Another thing that I have heard many psychiatrists tell their patients is that when taking antidepressants for depression you have to be aware of the 90/10 rule. This simply means that 90% dealing with depression is what you do for yourself to cope and 10% of dealing with depression is the medication that you may be taking to help give you the extra push that you may need. For example, many people often rely on antidepressants to make them happy and feel more alive, however if you do not want to feel better than you probably will not. You have to change your own brain chemistry, you cannot rely fully on a drug to do that for you. This is why I

believe that researchers in drug fields are starting to promote Magnesium because it puts more of something that you need in your body, rather than just pumping it with chemicals that you can easily overdose on.

Just to touch on the subject lightly, other than Magnesium there are a couple vitamins that can be used to alleviate the symptoms of depression. A study by Anglin, Samaan, Walter and McDonald in 2013 discusses how Vitamin D deficiency is often a sign in people suffering with depression. They hypothesized that low vitamin D concentration in the blood is associated with depression and their hypothesis was proven to be true. They also found that vitamin D deficiency was more common in middle age women than in men of any age group. Despite their hypothesis being true, they should have increased their sample size to ensure that their results they achieved were a fair representation of the entire population.

Another study conducted by George and Karen Eby in 2006, discussed how they researched the idea that after suffering a bad experience in one's life or feeling a period of acute sadness, taking Magnesium would alleviate the symptoms. In their results they stated "We have shown efficacy, as have others, in treating depression and some related mental disorders with magnesium. We suggest that magnesium treatment will be found effective in future clinical trials, at least to an extent equivalent to antidepressant drugs, and perhaps more effective (pp. 368)." I believe that this concludes my research idea that Magnesium is just as effective as an antidepressant for people suffering depression.

### **Conclusion and Future Study**

Magnesium is a natural occurring chemical that many people are lacking in their body. Most people are not reaching half of their recommended daily amount of magnesium (Eby,

2006) and this is ultimately having an effect on the chemicals in the brain. It has been shown to be essential in helping with the treatment of depression in many patients. I proposed that Magnesium has similar effects on the brain as a routinely prescribed antidepressant. After a large amount of research being conducted, I found that my hypothesis was supported. It was supported since I hypothesized that magnesium would be just as effective as a routine antidepressant, and research by George and Karen Eby and other articles presented in this paper are proposing and testing ideas that support my overall hypothesis. Studies and lab research are still ongoing with how exactly magnesium works within the body and I believe that this is a great area of research for future development. It would be beneficial for researchers to do blind drug studies on human participants rather than rats since we would then have a greater idea how it effects humans. Conducting further research in experimental studies where drug companies create synthetic drugs including mainly magnesium with other natural antidepressant supplements would open more opportunities for treatment in depressed patients.

### References

- Adams, V. (1998). The mechanisms of action of ketamine. *Anaesthes Reanim*, 23(3), 60-3.
- Alliance, Depression and Bipolar Support. (2015). Who is Affected by Depression? *Depression Statistics*. Chicago: Illinois. Retrieved from:  
[http://www.dbsalliance.org/site/PageServer?pagename=education\\_statistics\\_depression](http://www.dbsalliance.org/site/PageServer?pagename=education_statistics_depression)  
03.29.15
- American Psychiatric Association. (2013). Major Depressive Disorder. *Diagnostic and statistical manual of mental disorders* (5<sup>th</sup> ed.). Pages 160-168. Washington, DC
- Anglin, R.E.S., Samaan, Z., Walter, S.D. & McDonald, S.D. (2013). Vitamin D deficiency and depression in adults: systematic review and meta-analysis. *The British Journal of Psychiatry*. Doi:10.1192/bjp.202.2.A7
- Armstrong, D.J., Meenagh, G.K., Bickle, I., Lee, A., Curran, E. & Finch, M. (2006). Vitamin D deficiency is associate with anxiety and depression in fibromyalgia. *Clinical Rheumatology*, 26(4), 551-554. DOI: 10.1007/s10067-006-0348-5
- Camardese, G., De Risio, L., Pizi, G., Mattioli, B., Buccelletti, F., Serrani, R., & Janiri, L. (2012). Plasma magnesium levels and treatment outcome in depressed patients. *Nutritional Neuroscience*, 15(2), 78-84. doi:10.1179/1476830512Y.0000000002
- Derom, M., Sayón-Orea, C., Martínez-Ortega, J. M., & Martínez-González, M. A. (2013). Magnesium and depression: A systematic review. *Nutritional Neuroscience*, 16(5), 191-206
- Eby, George A. & Eby, Karen L. (2006). Rapid recovery from major depression using magnesium treatment. *Medical Hypotheses*, 67(2), 362-370. Doi: 10.1016/j.mehy.2006.01.047.
- Jacka, F. N., Maes, M., Pasco, J. A., Williams, L. J., & Berk, M. (2012). Nutrient intakes and the common mental disorders in women. *Journal of Affective Disorders*, 141(1), 79-85. doi:10.1016/j.jad.2012.02.018
- Jacka, F., Mykletun, A., & Berk, M. (2009). Examining the role of nutrition in mental health: Issues and rationale. *Australian and New Zealand Journal Of Psychiatry*, 43(10), 976-977. doi:10.1080/00048670903179202
- Murck, H. (2013). Ketamine, magnesium and major depression—From pharmacology to pathophysiology and back. *Journal of Psychiatric Research*, 47(7), 955-965. doi:10.1016/j.jpsychires.2013.02.015

- Piovesan, D., Profiti, G., Martelli, P.L. & Casadia, R. (2012). The Human “magnesome”: detecting magnesium binding site on human proteins. *BMC Bioinformatics*. doi:10.1186/1471-2105-13-S14-S10
- Pochwat, B., Szewczyk, B., Sowa-Kucma, M., Siwek, A., Doboszewska, U., Piekoszewski, W., & Nowak, G. (2014). Antidepressant-like activity of magnesium in the chronic mild stress model in rats: Alterations in the NMDA receptor subunits. *International Journal of Neuropsychopharmacology*, 17(3), 393-405. Doi:10.1017/S1461145713001089
- Poleszak, E., Szewczyk, B., Kędzierska, E., Właż, P., Pilc, A., & Nowak, G. (2004). Antidepressant- and anxiolytic-like activity of magnesium in mice. *Pharmacology, Biochemistry and Behavior*, 78(1), 7-12. doi:10.1016/j.pbb.2004.01.006
- Serefko, A., Szopa, A., Właż, P., Nowak, G., Radziwoń-Zaleska, M., Skalski, M. & Poleszak, E. (2013). Magnesium in depression. *Pharmacological Reports*, 65(3), doi:/10.1016/S1734-1140(13)71032-6.
- Sowa-Kućma, M., Szewczyk, B., Sadlik, K., Piekoszewski, W., Trela, F., Opoka, W., & Nowak, G. (2013). Zinc, magnesium and NMDA receptor alterations in the hippocampus of suicide victims. *Journal of Affective Disorders*, 151(3), 924-931. doi:10.1016/j.jad.2013.08.009
- Tiemeier, H., Ruud van Tuijl, H., Hofman, A., Meijer, J., Kiliaan, A.J. & Breteler, M. (2002). Vitamin B12, Folate, and Homocysteine in Depression: The Rotterdam Study. *The American Journal of Psychiatry*, 159(12). DOI:10.1176/appi.ajp.159.12.2099
- Wehrwein, Peter. (2011). Astounding increase in antidepressant use by Americans. *Harvard Health Publications—Harvard Medical School*. Retrieved from: <http://www.health.harvard.edu/blog/astounding-increase-in-antidepressant-use-by-americans-201110203624> March 1st, 2015.
- Widmer J, Bovier P, Karege F, Raffin Y, Hilleret H, Gaillard J,M & Tissot R. (1992). Evolution of Blood Magnesium, Sodium and Potassium in Depressed Patients Followed for Three Months. *Neuropsychobiology*.. Doi: 10.1159/000118914
- Wilson, K., & Brakoulias, V. (2009). Magnesium intake and depression. *Australian and New Zealand Journal of Psychiatry*, 43(6), 580.