

# HEALTH EFFECTS OF MAGNAPOOL™ MINERALS THROUGH TRANSDERMAL ABSORPTION

*LITERATURE REVIEW by*

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## EXECUTIVE SUMMARY

The project is an initiative of Poolrite Equipment Pty Ltd., supplier of mineral systems to the pool industry (Magnapool™ brand), for the purpose of understanding the scientific basis of their Magnapool™ mineral system. Anecdotal evidence of the beneficial health effects of Magnapool™ mineral to skin and other conditions prompted the company to conduct research on finding out the effect of Magnapool™ mineral with the human biological system.

Chapter 1 introduces the Magnapool™ mineral system and describes the anecdotal evidence gained so far from pool users. Magnesium and potassium chlorides are the primary constituents of Magnapool™ mineral, which are believed to interact with the human biological systems to bring about therapeutic effects. In the literature review conducted, the role of magnesium ions at molecular level and the way clinical effects are induced have been investigated. Since Magnapool™ mineral is a product used in the swimming pool, the primary route of administration of Magnapool™ mineral is through transdermal absorption. In order to understand the level of penetration, human skin structure and organization has been investigated and described in this review.

Chapter 2 researches the structure and physiology of the human skin. It has been understood that the outermost layer of skin known as stratum corneum protects the inner layers of skin and internal organs from dehydration and acts as a selectively permeable layer. This layer of skin regulates the incoming particles by selectively absorbing substances that are administered through external sources. Skin absorbs substances through the hair follicles, pores created by solubilized lipid molecules, through bulk, shunt and intercellular diffusion pathways.

Chapter 3 focuses on the role of magnesium on the living system, *via* its chemical and biological interactions. Magnesium ions are known to interact with nucleic acids to stabilize their negative charge with the positive charge on them, which in turn regulates proper transcription and translation and other cellular interactions. Also, SLC41A2 (solute carrier family 41) and TRPM7 (transient receptor potential melastatin 7) are known to be the active cell membrane proteins involved in transporting magnesium ions between cells and tissues.

Potassium ions are indispensable components in the sodium potassium pump that are responsible for creating the action potential required to cause response to stimulus. The sodium-potassium gradient across the cell membrane needs to be maintained at all times for effective cellular functioning. Magnesium ions are required as a cofactor for ATP which brings about the conformational changes for sodium potassium exchange protein for maintaining this gradient. Potassium ions also have known effects in vital cellular functions.

Chapter 4 investigates the clinical effects of magnesium deficiency, and associated disorders. Magnesium deficiency causes an inflammatory response which is linked to oxidative stress and immune stress. These collective stresses influence several clinical disorders including anemia, heart diseases, and renal dysfunction. Studies on rodents under magnesium deficient conditions have revealed the extent and molecular mechanisms of inflammation.

Chapter 5 refers to case studies related to the rate of absorption of magnesium salts (sulphates) and to a case study on the Dead Sea salt experiment. Experiments have been conducted to understand the effect of Dead Sea salt on human skin to understand the healing effect on skin disorders. They show reduced skin roughness, reduced skin redness and overall healthier skin after treatment with the salts, which are chlorides of magnesium and calcium. Another experiment conducted at the University of Birmingham demonstrated the transdermal absorption of magnesium ions from magnesium sulfate salts. The experiments analyzed magnesium levels in blood and urine before and after treatment, which allowed measurement of the level of absorption of magnesium ions.

A detailed discussion is presented in Chapter 6, where established results of transdermal absorption of magnesium salts are discussed and prospective research directions are identified. Further research needs to be done to understand the clinical effects of magnesium in the human biological system and the rate of absorption – the latter can be partly achieved by using computational methods. There is good evidence for a range beneficial effects of magnesium ions in biological systems, including respiratory and skin disorders. To demonstrate reproducibility of the clinical effects, however, further research is desired. The experimental design for this research is proposed in Chapter 7.