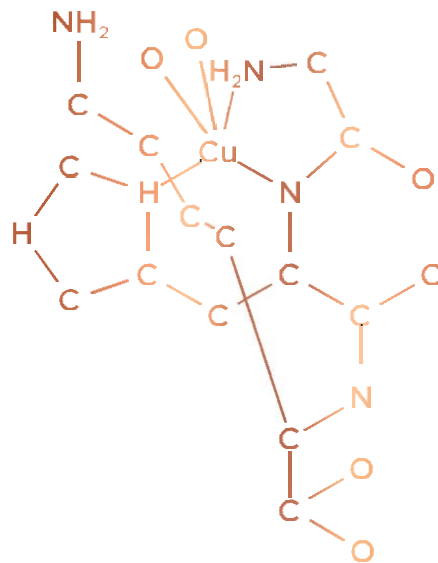


GHK-CU – WHAT THE RESEARCH SHOWS

What is GHK?

GHK is an abbreviation of glycyl-L-histidyl-L-lysine which is a human copper-binding peptide. Research has shown that GHK is both safe and non-toxic (Pickart et al., 2012b). When anyone is considering the use of any product, they have to answer three questions. 1) Is it safe? 2) Does it work? 3) Can you afford the product? As you read this booklet keep these three questions in mind.



Okay so GHK is a peptide, but what are peptides?

Peptides are chains of two or more amino acids. Peptides are not only the building blocks of proteins, but they are also bioregulators and hormones that control genetic expression and the biological activity of all the cells in the body.

Why are peptides important?

Since the 1960s an increasing amount of research has discovered that peptides play a significant role in regulating biological aging. The Russian military initiated much of the original peptide research in efforts to make their soldiers stronger and more resilient. This research was headed by Professor Vladimir Khavinson who determined that peptides are bioregulators that can slow down the aging process. While this booklet is basically about the peptide GHK-Cu and its effect on stem cells and genes, it now appears that other peptides like glutathione and carnosine are also gene regulators.

As biologically active peptides decline with age, gene expression also declines resulting in decreased protein synthesis. Reduction of proteins and enzymes in the body results in impairment in metabolism and tissue repair producing age-related decline and degeneration of the body. Methods that increase peptide availability are now known to have anti-aging effects. This booklet will explain the extensive research on the peptide GHK-Cu.

GHK-Cu levels are high in young people, but the concentration of GHK-Cu drops in humans with increased age. In a study performed at the University of California at San Francisco, young male medical students (age 20–25), were found to have about 200 nanograms/mL of GHK-Cu in their blood plasma, while the healthy, male medical school faculty (average age of 60) had a decline of 60% with a plasma levels of only 80 nanograms/mL (Pickart, 2008; Pickart et al., 2017).

Following the original discovery of GHK-Cu in 1973 by Loren Pickart, numerous articles and publications have appeared in the scientific literature discussing its beneficial and incredible properties.



GHK-Cu can:

- Increase stem cells
- Activate over 4000 genes to more youthful levels
- Reduce pain
- Reduce anxiety
- Repair DNA damage and promote DNA repair

- Produce antiaging effects at a cellular level
- Promote organ regeneration
- Suppress the production of fibrinogen which reduces the tendency of forming blood clots in the circulatory system
- Improve blood flow in tissues
- Tighten loose skin and increase the thickness of aged skin
- Improve skin hydration
- Stimulate the production of collagen
- Improve skin firmness, elasticity, and clarity
- Reduce appearance of fine lines, depth of wrinkles, and improve the structure of aged skin
- Smooth rough skin
- Reduce photodamage, mottled hyperpigmentation, and skin spots
- Improve overall skin appearance
- Stimulate wound healing
- Protect skin cells from UV radiation
- Reduce inflammation and free radical damage
- Promote hair growth and thickness, enlarge hair follicle size

GHK is an effective copper transporter

- The blood protein albumin is the main source of copper transport in the bloodstream. The peptide GHK has the ability to acquire copper ions from albumin and move copper into cells of injured tissue (Pickart et al., 1980; Lau et al., 1981).
- “Due to its small size and unique copper-binding characteristics, GHK may be able to facilitate rapid exchange of copper in the intracellular space (Pickart et al., 2018).”
- GHK plays an important role in regulating copper availability at a cellular level. The key concept is that GHK provides the body with the ability to correct copper imbalances at a cellular level (Pickart et al., 2012b).
- A deficiency of intracellular copper impairs the activity of the copper-dependent enzyme SOD (superoxide dismutase). When SOD activity is impaired, cells are subjected to oxidative stress that disrupts many cellular functions including DNA functions and energy production. When the energy production of cells is compromised to an extreme degree, the cells die. Cell death is the opposite of cellular regeneration.

- Copper delivery into cells is also essential for stem cells to start proliferating and regenerating tissues (Pickart et al., 2015a).

What role does copper have in injuries?

- Copper is an essential element in the anti-oxidant protein SOD (copper-zinc superoxide dismutase). Also, copper bound to GHK activates genes involved in antioxidant production and tissue regeneration to promote wound healing, pain control, reduce inflammation and stimulate stem cell generation (Pickart et al., 1980; Uauy et al., 1998).
- Copper is involved in multiple biochemical processes besides antioxidant production. Copper is also involved in growth and differentiation, and nervous system health (Pickart et al., 2018).
- Memory problems and cognitive decline are common problems of an aging population. Peptides like GHK that produce both antioxidant and anti-inflammatory activity are capable of restoring copper balance and youthful gene functioning. Restoring gene function in this way produces an anti-aging effect and may play a beneficial role in reducing age-associated cognitive decline (Pickart 2012b).
- For many years it was thought the effects were due to the ability of GHK to deliver small amounts of copper into cells (Pickart et al., 1980), but new research since 2010 has determined that GHK, when bound to copper, modulates the action of over 4000 genes to a healthier state (Hong et al., 2010; Campbell et al. 2012; Pickart et al., 2015a; Pickart et al., 2017).

Gene effects of GHK:

- Since Loren Pickart discovered GHK-Cu in 1973 many research studies have been initiated. As these studies were reported in the scientific literature, numerous effects were identified as being caused by GHK. Over time the question arose of how such a simple peptide could cause such a wide range of effects (Pickart et al., 2018b). The answer came when gene expression studies were done on over 13,400 human genes. These gene expression studies found that GHK affected nearly 1/3 of human genes, moving their gene activity to a more youthful state.
- "GHK's copper activates regenerative and protective genes (Pickart et al., 2017)."
- GHK activates antioxidant genes (Pickart et al., 2015). GHK has been found to elevate levels of antioxidant enzymes and increase glutathione levels.

- GHK activates gene expression involved in wound healing. So far it has been established that GHK accelerates wound-healing of the skin, hair follicles, liver, gastrointestinal tract, brain, and bone tissue (Pickart et al., 2014). However further research may find that GHK has broader effects on multiple other organs.
- GHK-Cu stimulates gene expression of DNA Repair genes (Pickart et al., 2017). DNA damage in young people is usually quickly repaired, but as aging progresses DNA repair slows down. Promotion of GHK to youthful levels can help reestablish the activity of DNA repair genes and can diminish the deteriorating effects of aging (Pickart et al., 2014).
- GHK stimulates genes that remove damaged proteins (Pickart et al., 2017).



- GHK stimulates expression of nerve-related genes involved in brain repair (Pickart et al., 2017).
- GHK-Cu can directly modulate over 4000 human genes and more importantly can reverse gene expression to a more youthful healthier state producing an anti-aging effect (Lamb, 2007; Iorio et al., 2010; Campbell et al., 2012)!
- GHK-Cu is present in large amounts when people are young, but the levels decline with age. GHK is typically released when tissues are injured which helps explain why people heal much faster when they are young than when they are of advanced age. Numerous clinical studies have now shown that methods that increase GHK-Cu cause injuries to heal faster (Pickart, 2008).

Skin

- Clinical studies have shown that GHK-Cu can tighten and firm loose skin, and improve skin thickness and elasticity. GHK-Cu can also reduce fine lines and wrinkles, reduce hyperpigmentation, and reduce sun damage (Finkley et al., 2005; Pickart et al., 2015a).
- GHK-Cu is proving to be one of the most effective molecules that promote skin repair and regeneration (Gorouhi et al., 2009). GHK stimulates the synthesis of collagen and elastin; both proteins are necessary components of youthful skin (Pickart et al., 2018b). With age, the skin loses collagen and elasticity and begins to sag and wrinkle. GHK-Cu has been found to improve the appearance of skin, sometimes in a dramatic fashion.



- “Krüger et al. confirmed an increase in skin thickness in the range of the epidermis and dermis, improved skin hydration, a significant smoothing of the skin by stimulating collagen synthesis, increased skin elasticity, a significant improvement in skin contrast and an increased production of collagen (Pickart et al., 2018b).”
- Skin regeneration depends on maintaining the viability and proliferative potential of stem cells. Unfortunately, skin stem cell proliferative potential declines with age. Promoting GHK-Cu to more youthful levels is capable of restoring the gene activity of healthy stem cells (Pickart et al., 2015a).

Wound healing

- Deficiencies in GHK-Cu associated with aging can result in less optimal wound healing.
- It is clear from multiple clinical studies that GHK-Cu can speed wound healing through a variety of mechanisms including increasing stem cells in the skin, producing growth factors, activating youthful genes, increasing the production of collagen and elastin, increasing antioxidant levels, reducing inflammation, and increasing blood flow into wounds (Pickart et al., 2008; 2012b; 2018b; Gul, 2008; Gruchlik et al., 2012).



- By controlling oxidative stress and inflammation and by providing copper delivery to injured tissues, several factors that impede wound healing can be addressed by GHK-Cu (Pickart, 2008).
- "In 2003 Canapp et al. demonstrated that GHK-Cu improved healing of ischemic wounds and suppresses inflammation by lowering the level of acute-phase inflammatory cytokines such as TGF-beta and TNF-alpha (Pickart et al., 2012b)."
- By helping to reestablish blood flow into injured tissues GHK provides essential nutrients and oxygen necessary for wound repair.

Pain and anxiety effects

- Pain studies so far have been limited to animal studies since most humans will not willingly participate in scientific research where they have pain inflicted upon themselves.
- Both mice and rat studies have shown that GHK improves pain control and reduces anxiety (Bobyntsev et al., 2015; Sever'yanova et al., 2017).
- Gene studies have also found the seven anti-pain genes increased with GHK-Cu (Pickard et al., 2018B).



- Since LifeWave has introduced the new GHK-Cu patches, numerous unsolicited testimonials have been received from distributors who have remarked how the patches have improved their pain control along with improved energy and sleep.
- Dr. Steve Haltiwanger, the Health and Science Director, has also observed rapid resolution of pain in numerous individuals upon whom he has applied the patches.
- Perhaps the most remarkable discovery regarding the X39 patches is that they are an effective pain management system that works for many types of chronic pain.