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skin innovations

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STAFF CORRESPONDENT

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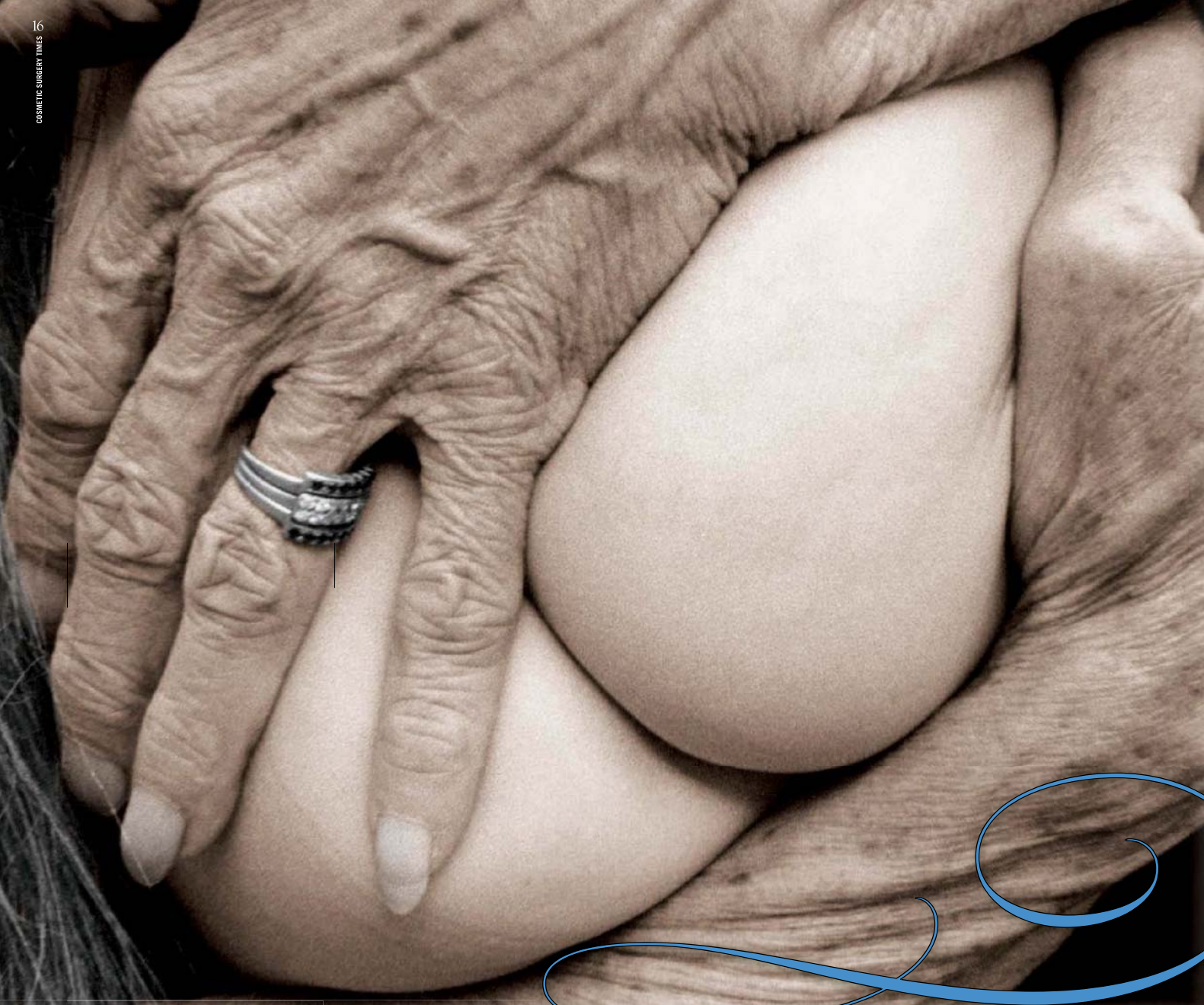
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# Coenzyme keeper

STUDY SUGGESTS  
CoQ10 OFFERS  
MEANINGFUL  
RESULTS,  
COUNTERS EFFECTS  
OF AGE ON  
THE SKIN

It's not uncommon for cosmetic surgeons to recommend that patients invest in a consistent daily skin care regimen after surgical procedures to protect their financial investment. However, with the availability of so many 'anti-aging' formulations — and with research coming out at such a rapid clip — it can be daunting to know in which direction to point your patients. ➤➤





## skin innovations

Research indicates that CoQ10, or ubiquinone, has what it takes to counter the effects of age on the skin. Findings reviewed here explain why and how this ubiquitous enzyme can offer meaningful results to patients interested not only in staving off the appearance of advancing age, but also the deleterious effects of photoaging.

**AT THE CELLULAR LEVEL** In a study funded by German skin care product manufacturer Beiersdorf AG, researchers showed that aging skin is functionally anaerobic and that CoQ10 positively influences the age-affected cellular metabolism by essentially facilitating a battle against the signs of aging that start at the cellular level. "Cutaneous aging is characterized by a decline in energy metabolism of skin cells partially caused by detrimental changes in mitochondrial respiration," explains Thomas Blatt, Ph.D., human biologist, who heads up skin aging research at Beiersdorf and is one of the study authors. "The processes involved

seem to be predominantly mediated by free radical actions known to be generated either by exogenous [influences] such as UV light, or by endogenous processes such as impaired mitochondrial respiration and generation of ROS [reactive oxygen species] by leakage of electrons from the respiratory chain."

Dr. Blatt points out that it's widely accepted that alterations in mitochondrial respiration can be regarded as both a reason for, as well as an important consequence of, aging. "Any lack of mitochondrial function impairs cellular ATP synthesis, reducing the 'fuel supply' for repair mechanisms," he explains. "Furthermore, it induces the formation of ROS as by-products of an impaired mitochondrial respiration; and accumulation of ROS may, in turn, damage neighboring mitochondrial complexes, membranes and mtDNA and further accelerate the aging process in a kind of feedback loop." Once the damage of macromolecules has reached the level

of mtDNA, leading to mutations, Dr. Blatt says, "the energetic age of a mitochondrion, and thus of a cell, is carved in stone."

The skin attempts to compensate for this loss of mitochondrial energetic capacity by getting energy from other sources. "This is either through the exploitation of intracellular energy stores for high energy demands in the short term, or the switch to anaerobic pathways for energy supply, such as glycolysis, as a last resort," he notes. In this context, glycolysis, used by a cell as a last resort, is associated with the generation of reactive glycolytic intermediates. These, Dr. Blatt says, favor the formation of advanced glycation end products (AGEs) via reactive carbonyl groups.

"These AGEs may harm a cell by processes ranging from the generation of infunctional cytoskeletal proteins up to the induction of apoptosis. Thus, it's important to keep tissues from anaerobiosis by keeping mitochondrial



“CoQ10 exerts a dual function — energizer and antioxidant. Skin cells that are energetically recharged are better protected against a variety of cellular stressors, age-dependent deficiencies in cellular functions or oxidative- and free radical-induced cell damage.”

— Gesa-Meike Muhr, Ph.D.

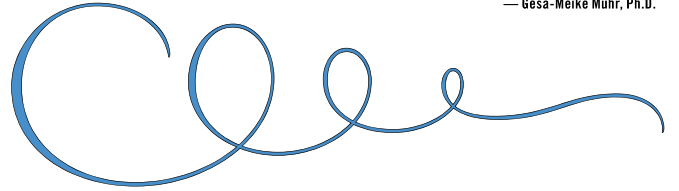


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energy generation upright. Furthermore, it's important to supply a cell with substantial energy stores — to be filled with energy in phases of baseline activity — which can be used in situations of high energy demand without the need to switch to glycolysis,” he states.

While there are several entry points to affect skin aging from an energy perspective, according to Dr. Blatt, it's important to keep in mind that active ingredients keep the respiratory chain in skin cells working in order to avoid generation of ROS. The study findings support that this can be achieved via supplementation with CoQ10, which Dr. Blatt describes as a key component of the respiratory chain.

“CoQ10 declines with age but can be effectively replenished in skin by topical formulations — as long as the appropriate formulations ensure that CoQ10 is bioavailable and fully integrates into the mitochondria,” he adds.

the topical and oral bioavailability is very low. “After numerous attempts to improve CoQ10 absorption, the latest developments suggest that encapsulation of CoQ10 in nanoemulsions results in a significantly enhanced bioavailability,” Dr. Züllig says. What's more, he explains, there are multiple nanoemulsions that allow the administration of several incompatible substances at the same time. Dr. Züllig explains that research has shown that nanoemulsions strikingly improve CoQ10's skin penetration and upgrades the bioavailability of oxidized CoQ10.

An example of this is Control Tactics (PRESCRIBEDsolutions), a product that includes CoQ10 in a nanoemulsion with Vitamin E (Tocopherol) and Vitamin C (Ascorbyl Tetraisopalmitate). In a PRESCRIBEDsolutions-sponsored, half-face study, when Control Tactics was applied topically twice daily for four days before a fractional ablative procedure, the patient experienced a significantly reduced amount of inflammation and pinpoint bleeding on the pre-treated side (see figure).

CoQ10 is also a potent radical scavenger that protects important membrane proteins of the respiratory chain, such as cardiolipin, from oxidative damage, according to Gesa-Meike Muhr, Ph.D., one of the Beiersdorf study authors and director of one of the research laboratories at the German company. “CoQ10 exerts a dual function — energizer and antioxidant. Skin cells that are energetically recharged are better protected against a variety of cellular stressors, age-dependent deficiencies in cellular functions or oxidative and free-radical-induced cell damage,” says Dr. Muhr.

“It might be a beneficial treatment for plastic surgeons and their patients, but we have not investigated this matter, so the effects remain to be seen. Nevertheless, declining energy metabolism has turned out to be a high priority field among anti-aging interventions such as CoQ10,” she says. ◀



Dr. Züllig



Photo credit: PRESCRIBEDsolutions, LLC

Female patient shown 36 hours post-treatment with Fraxel Re:pair. The left side of the face was treated with Control Tactics for four days pre-procedure.

**COQ10 BIOAVAILABILITY** In a paper sponsored by Swiss company Mibelle AG Biochemistry, Fred Züllig, Ph.D., and colleagues, explored CoQ10 bioavailability challenges and recent developments regarding encapsulation of CoQ10 in nanoemulsions. Dr. Züllig points out that, since CoQ10 is highly lipophilic,

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