Mesenchyme: Little Known Rejuvenating Healer

Rejuvenate: Make young or as if young again (Concise Oxford Dictionary).
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A unique and unusual substance called mesenchyme has arrived on the American market with little notice or fanfare. However, you will be hearing a lot about it in the years to come. Mesenchyme will revolutionize the way we handle health problems because of its astonishing and well-documented ability to repair and rejuvenate damaged cells and tissues.

Mesenchyme is undifferentiated embryonic connective tissue, the true mother lode of cell growth and cell regeneration. Mesenchymal cells develop during the early embryonic stages of mammalian gestation and are the source material from which most of the mammalian body's organs and tissues are made – everything from bones, muscles, and connective tissue to the central nervous system (Moore 1989). What is extraordinary about mesenchyme is that when it is ingested it migrates to the area of greatest injury in the body. Once there, it aligns itself with the damaged cells and/or tissues, becomes identical to them, and ***then starts replicating***.

Regenerates Damaged Cells

The result is regeneration or replacement of the damaged cells. The implications for speedy and full recovery from everything from broken bones to herniated discs are enormous. We now have the potential to create healing where there was previously no hope of recovery. Later in this article, you'll hear how one of the authors restored severely herniated discs that should have required surgical fusion, as well as greatly accelerated recovery from a ruptured Achilles tendon.

Interestingly, the mechanism for organ formation from mesenchymal cells is still present in some adult animal species. For example, it is the presence of mesenchymal cells that allows a salamander to regenerate its tail if cut off. In the human adult, the only mechanism where these cells normally function is in the healing of wounds (NaturPharm 1993a).

The mesenchyme available on the market in the U.S. is made from bovine embryonic mesenchymal cells. The cells are harvested from pregnant cattle destined for slaughter and subsequent human consumption. Only healthy fetuses from healthy cattle are used. Because mesenchyme is, by definition, undifferentiated fetal cellular material, it has not yet developed immune markers. It is therefore accepted by the human host without provoking an attack by the immune system and can freely work its magic on any number of physical injuries and traumas.

Mesenchyme has the ability to migrate to any tissue in need of repair and, once at the site, to take on the characteristics of the healthy cell it associates with. When mesenchyme is next to cartilage, it becomes cartilage and replaces or repairs damaged cartilage. This is true for organ tissues too: for example, when it is next to kidney mesenchyme becomes kidney. If one has damaged cells from a broken bone,

mesenchyme associates itself with the wounded tissue, assumes the specific characteristics of that type of bone, and begins to repair the damaged tissue and create new bone cells. It sounds incredible, but much research has verified this unique action. Thus, mesenchyme has great potential in regenerating diseased or injured tissues of all kinds (van den Bos 1997).

The use of mesenchyme as a therapeutic substance arises from experiments conducted early in the 20th century by Dr. Alexis Carrel, 1912 Nobel Laureate in Biology, who demonstrated that organic tissues could be regenerated in vitro by the addition of fresh younger cells to the culture medium. In the 1930s, the Swiss endocrinologist Dr. Paul Niehans developed a technique for extracting cells from animals and injecting them into his patients to compensate for their bodies' deficiencies (Niehans 1960). One of the types of cell he found most beneficial was mesenchyme.

Mesenchyme used in conjunction with other whole cells and cellular extracts was popular in Europe during the 1960s and 1970s. Many well-known celebrities and politicians visited reputable clinics and spas, including Dr. Niehans' Clinique La Prairie in Clarens, Switzerland, to receive live cell therapy. Notables such as Charles de Gaulle, Charlie Chaplin and Sir Winston Churchill were just a few of the wealthy, powerful and famous figures of the last century who went to these spas for live cell therapy, which included mesenchyme as a basic part of the rejuvenation process.

What makes mesenchyme so unique, special, and efficient is the fact that it is composed of pluripotential cells, also known as mesenchymal stem cells, which have the ability to become almost ***any*** kind of tissue or organ. Embryologically, all connective and supportive tissues arise from mesenchymal cells (Corliss 1976). The versatility of these pluripotential cells allows them to form cartilage, bone, muscle, connective tissue, and organ tissue (van den Bos 1997).

In all mammals mesenchyme eventually differentiates into three embryonic tissues – the endoderm, the mesoderm, and the ectoderm (Moore 1989). During embryonic development, these three primitive cell types differentiate into all the body's organs and tissues. The endoderm forms the linings of the digestive and respiratory tracts. The mesoderm develops into muscle, connective tissues, bone, and blood vessels. The ectoderm differentiates into the epidermis and the nervous system. A portion of the mesenchyme remains in the placenta and the yolk sac surrounding the embryo in the fetus. It is this mesenchyme that is carefully separated to become the commercially available product.

Versatile Differentiation

Mesenchymal cells migrate and differentiate in many different ways: they may become fibroblasts (connective tissue cells that manufacture collagen), chondroblasts (a type of differentiated fibroblast that becomes cartilage), or osteoblasts (bone forming cells). It is most versatile and effective as a therapeutic agent when it contains cells as undifferentiated as possible and is derived from all the mesenchymal layers (endoderm, ectoderm, and mesoderm). Most mesenchyme used for commercial purposes is harvested from the tissue surrounding the placenta between the 50th and the 150th day of fetal development.

Mesenchyme's uncanny capacity for seeking out and restoring damaged tissues and cells of any kind makes it invaluable in illnesses where there is significant cell damage and a need for repair. Mesenchyme speeds healing, decreases scar tissue formation, decreases complications of healing, and heals beyond what medical professionals typically think is possible.

Severely Herniated Discs

A case in point: six years ago, writer McLuskie was involved in a car accident which left her with three severely herniated discs in her neck, C5-6, C6-7, and C7-8. Within a year of the accident, the pain was so severe that her employer allowed her to work from home three days a week. She was unable to sit upright for more than ½ hour at a time due to the excruciating pain. She consulted three orthopedic surgeons, all of whom delivered the same chilling prognosis: the discs were deteriorating; there was no recourse but spinal fusion surgery; and after that the degeneration would continue. At least they were honest!

Soon after this news, Ms. Mcluskie interviewed Dr. James Wilson on the subject of live cell therapy. Coincidentally, the FDA had just approved mesenchyme as a dietary supplement. On hearing how a woman scheduled for hip surgery had successfully used live cell therapy to restore the destroyed cartilage, avoid surgery, and walk again, Ms. McLuskie was galvanized. Under Dr. Wilson's supervision, she began using the same protocol, a combination of shark cartilage and mesenchyme, taken sublingually.

Pain-free with Increased Disc Height

Part of her therapy involved neck traction for 20 minutes twice daily, to provide room for the new disc tissue to grow. And grow it did. After four months, Ms. McLuskie was pain-free, and has been pain-free ever since. A recent x-ray of her neck, when compared to one taken after the accident, showed graphic proof that there was indeed increased disc height between her formerly herniated cervical vertebrae. To regain disc height of a herniated disc lies outside the realm of possibility of a typical medical protocol.

In August 1999, Ms. McLuskie ruptured her left Achilles tendon during a tennis match. The full rupture was surgically reattached and she was in a knee-high cast for eight weeks. During this time, she took mesenchyme twice daily to restore the torn tendon. After finding out that mesenchyme is 10 times more potent when injected, Ms. McLuskie overcame her fear of needles and self-administered the twice-daily subcutaneous injections.

It paid off. When the cast was removed, Ms. McLuskie's orthopedic surgeon was visibly shocked at the extent of her healing, as she was able to fully flex her foot. Normally an ankle or foot immobilized for eight weeks has a very limited range of motion and is very stiff, weak, and inflexible when the cast is removed. It typically takes several weeks to several months for the ankle to regain its full range of motion, flexibility and strength. The physician was so taken aback by the flexibility of the ankle that he checked her non-injured foot to be sure that she had normal flexion, and not hyperflexion.

Unique Healing Modality

As this unique healing modality becomes better known, and more clinical research on mesenchyme is completed, it is inevitable that more and more doctors will familiarize themselves with its use. Then we will see mesenchyme being used by physicians who have the best interests of their patients at heart.

Meanwhile, mesenchyme continues to restore lives. In another case, Dr. Wilson recommended mesenchyme therapy in conjunction with liquid shark cartilage to a professional snowboarder who had gone over a 60-foot cliff and crushed two vertebrae in his lower back – T11-12 and T12-L1. The presiding physician had told him it was doubtful he would ever walk again. After eight weeks of taking mesenchyme and shark cartilage, the young man was not only walking, he was actively working at light physical labor, lifting crates.

The research on mesenchyme provides an interesting look at the broad-based medical applications in store for this incredible substance. Scientists have been closely examining mesenchyme's intriguing qualities for some time. Mesenchyme's potential to literally become any type of tissue (that pluripotentiality again) has been described and elucidated in several research studies (Caplan 1991, Caplan 1994, Pittenger 1999).

A large part of the reason mesenchyme is commercially available is that it can be successfully harvested and cryopreserved (flash-frozen), then thawed with no loss of cellular action. Researchers at Osiris Therapeutics in Baltimore, Maryland extracted mesenchymal stem cells from normal human bone marrow, and subjected them to cryopreservation. They found that fast freezing and subsequent thawing of mesenchyme had no effect on its ability to regenerate damaged tissue (Bruder 1997).

Researchers may have discovered one of the keys to mesenchyme's ability to regenerate damaged tissue. It appears that mesenchymal stem cells produce the receptor sites for two potent growth factors known as fibroblastic growth factors 1 and 2, or FG1 and FG2. When the FG1 or FG2 comes along, it locks on to these receptor sites, and "lights it up for action." When it does, the mesenchyme proliferates at an increased rate. Since part of mesenchyme's action is to become like the healthy cells it is aligned with, there is accelerated regeneration of healthy cells. The study authors concluded that "human mesenchymal stem cells have great potential in regenerating diseased or injured tissues" (van den Bos 1997). This increased growth rate, combined with the knowledge that mesenchyme seeks out damaged and diseased cells, and that it takes on the characteristics of the cells it is near, now explains why healing and regeneration can occur more rapidly with an abundance of mesenchyme present in the body.

'Regenerates Functional Tissue'

Another research group observed that mesenchyme has "been shown to regenerate functional tissue when delivered to the site of musculoskeletal defects in experimental animals" (Bruder 1998a). This research group tested human mesenchyme's ability to heal a clinically significant bone defect. They implanted human mesenchyme into critical-sized segmental defects in the femurs of adult rats. Evidence of new bone was apparent by eight weeks, with increasing bone formation through 12 weeks. "These studies demonstrate that human mesenchymal stem cells can regenerate bone in a clinically significant osseous defect and may therefore provide an alternative to autogenous bone grafts," the researchers reported at the conclusion of the study.

Another study reviewed the effects of mesenchyme on bone development, bone repair, and skeletal regeneration (Bruder 1994). It concluded that understanding how mesenchyme performs these phenomenal regenerative feats "provides the foundation for the emergence of a new therapeutic technology for cell therapy." The researchers in this same study predicted that mesenchyme "will support the development of novel protocols for the treatment of many clinically challenging conditions," including osteoporosis "We can begin to explore therapeutic options that have never before been available."

Researchers at Veterans Affairs Medical Center in Miami, Florida further developed the concept that mesenchyme may provide a therapeutic advantage in dealing with osteoporosis (D'Ippolito 1999). In this study, researchers wanted to test the hypothesis that age-related decreases in bone mass result from decreased osteoblasts (the cells that create bone) secondary to an age-related loss of osteoprogenitors, the cellular catalysts that spur osteoblast growth and bone formation.

They extracted bone marrow from the vertebrae of 41 donors of various ages (3-70 years old) who had died of traumatic injury. Extensive testing revealed that the number of mesenchymic stem cells with bone-building potential decreases early in the aging of humans, and may be responsible for the age-related reduction in osteoblasts.

The researchers commented that these results are particularly important because the vertebrae are a site of rapidly developing osteoporosis, and possibly the earliest site of bone loss in age-related osteoporosis. This further indicates a possible role for mesenchyme in establishing new protocols for dealing with the crippling effects of osteoporosis.

Alternative to Bone Grafts

An alternative to painful and costly bone grafts would be an extremely welcome and useful addition to the limited therapeutic choices currently available. Another research study used human mesenchyme to repair an osseous defect in a dog (Bruder 1998b). (Remember, mesenchyme is undifferentiated fetal tissue without immune factors, so it can be received and used by other mammals without being rejected.) Commenting on their results, the researchers said: "It was established that human MSCs [mesenchyme] form bone of considerable mechanical integrity when implanted in an osseous defect in an immunocompromised animal. Furthermore, bone repair studies in dogs verify that the technology is transferable to large animals, and that the application of this technology to patients at geographically remote sites is feasible. …These studies suggest that by combining MSCs with an appropriate delivery vehicle, it may be possible to offer patients new therapeutic options."

A research group at the University of Cincinnati's Noyes-Giannestras Biomechanics Laboratories studied mesenchyme's ability to restore a surgically created defect in a rabbit tendon (Awad 1999). Mesenchymal cells were implanted into a clinically created defect in the right tendon, and a cell-free collagen gel was implanted into an identical control defect in the left tendon. Repair tissues were evaluated at four weeks after surgery and compared to their matched controls.

The tendon tissue repaired with mesenchyme demonstrated significant increases in three areas used to measure the strength of a material. When compared with control results, there was a 26% gain in maximum stress, the amount of force required to cause a material to fail. There was an 18% gain in modulus, the ability of a material to resist being stretched when a force is applied to it. Researchers also noted a 33% gain in strain energy density, the amount of energy that a material (such as a compressed spring) can store before its internal bonds are disrupted and it changes shape.

The researchers also observed minor improvements in the tissue structure of some of the mesenchyme-mediated repairs, including increased number of tenocytes (tendon forming cells) and larger and more mature-looking collagen fiber bundles. They concluded: "…Delivering a large number of mesenchymal stem cells to a wound site can significantly improve its biomechanical properties." Ms. McLuskie can personally attest to this, as can the surgeon who reattached her torn Achilles tendon and was so surprised by her rapid recovery.

Resurrects Aging Cells

Mesenchyme restores bones and tendons, and opens a world of possibilities for new therapeutic options that actually heal by regenerating damaged, diseased or destroyed tissue. The research really starts to get exciting when we look at mesenchyme's regenerative abilities. A significant study on its ability to resurrect aging cells was published in 1990. This study was a collaborative effort by researchers from the German Cancer Research Center in Heidelberg, the Clinique La Prairie in Clarens, Switzerland, and the Max-Planck Institute for Immunbiology in Freiburg, Germany. The researchers examined how mesenchymal cells affected old or senescent cells that had lost their ability to divide and could no longer exhibit mitotic activity (Amtmann 1990). Researchers introduced mesenchyme from embryonic sheep tissue into these aged cell cultures. The mesenchyme restored the aged cells' responsiveness to growth factors

and the cells resumed their ability to undergo mitotic divisions. They became like young cells again.

"Aging cells are known to lose responsiveness to growth factors *despite the presence of respective receptors*," the researchers commented in their discussion of the study results. "Thus, restoring the responsiveness to growth factors that are contained in serum is likely not to be due to a reacquisition or an unmasking of receptors. Rather, one could envisage that transacting factors might be either induced or activated by the embryonic tissue extract in the senescent cells, thus augmenting transcriptional activities that may be prerequisites for the activation of cellular DNA synthesis. Mesenchyme seems to reawaken the aging cell's ability to respond to the directive of growth factors to divide and grow.

Limited Availability

We can expect a plethora of research examining mesenchyme's rejuvenating effects on a wide range of ailments, defects and disabilities that were formerly thought incurable. But, despite its amazing properties, don't expect mesenchyme to appear on drugstore shelves and become part of mainstream medicine, at least in the near future. Available mesenchymes are injectables customized together with organ cells of various body systems to achieve optimum results.

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