Regenerative Medicine:

Your Body Wants to Heal Itself!!

PRESENT TECHNOLOGY AND PUBLISHED CLINICAL RESULTS

FUTURE TECHNOLOGY
KENNETH PETTINE MD

- Retired Board Certified Fellowship Trained Orthopedic Spine Surgeon
- Principal Investigator for 18 FDA clinical trials
- Four FDA Biologic studies (ISTO, Mesoblast)
- 18 STEM CELL EXOSOME PATENTS
- 16 PUBLISHED STEM CELL ARTICLES
“10,000 Americans will turn 65 everyday for the next 14 years”

-Medicare
What is a stem cell?

• Reproduce itself
• Become a different type of cell

Mesenchymal Stem Cells (MSC)
MSC Differentiation

- Osteocyte (bone cell)
- Chondrocyte (cartilage)
- Fibroblast (skin health)
Mesenchymal Stem Cells (MSC)

- Anti-inflammatory
- Modulates immune system
- Releases numerous growth factors
- Anti-apoptotic → Inhibit cell death
- > 3,000 references in peer review (2012-2015)
- Most studied stem cell in your own body
Primary Cell for Regeneration for Orthopedic and Spinal Conditions

Mesenchymal Stem Cell (MSC) = Pluripotent Adult Stem Cell

- Chondroblast
- Fibroblast
- Osteoblast
The use of Mesenchymal Stem Cells is a standard of care in veterinary medicine, aren’t you as important as a dog or horse?
Regulatory Considerations

**BONE MARROW:**
FDA COMPLIANT - CFR 1271 Section 361

**ADIPOSE AND PLACENTA TISSUE:**
NOT FDA APPROVED
REGULATORY CONSIDERATIONS

FDA is closing Adipose and Placenta tissue Clinics
Stem Cell Injection Technique

- IV Sedation
- Bone Marrow from the Iliac Wing
- Concentrated with a Centrifuge
- Stem cells injected into all abnormal areas
- 30-45 minute Procedure
- 45 minute recovery

NO FDA ISSUES WITH BONE MARROW CONCENTRATES
Bone Marrow Aspiration from the Ilium
BMC Injection Procedure

60cc BMA drawn from the posterior iliac crest

BMA centrifuged for 12 min. 6cc bone marrow concentrate (BMC) drawn

2-3cc BMC injected per disc

1cc BMC sent to lab for cell analysis
Cervical Degeneration

- Cervical Disc Patients  210
- Cervical Disc Levels  513
Neck Disability Index Improvement

63% improvement

*p-values <0.001
Neck pain improvement over time

67% improvement

*p-values <0.001
Lumbar Degeneration

- Lumbar Disc Patients: 522
- Lumbar Disc Levels: 1471
Results of One Year Lumbar Follow up

ODI-65% Decrease
VAS-69% Decrease

*p-values <0.001
Published Results of Treating Severe Back Pain with Stem Cells

Percentage Improvement in Pain/Function

<table>
<thead>
<tr>
<th></th>
<th>1 yr</th>
<th>2 yrs</th>
<th>3 yrs</th>
<th>5 yrs</th>
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<tr>
<td>PAIN</td>
<td>58%</td>
<td>71%</td>
<td>72%</td>
<td>76%</td>
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<tr>
<td>FUNCTION</td>
<td>66%</td>
<td>68%</td>
<td>69%</td>
<td>83%</td>
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Peripheral Joints Injected

- Hip
- Knee
- Ankle
- Shoulder
- Elbow
- Fingers
- Toes
-- 1.5 Million hip and knee replacements per year

-- Direct cost $30 billion

-- Numbers to double in 3 to 5 years
Treatment for Joint Arthritis

• Weight Loss
• Gentle Exercise
• NSAIDS
• Total Joint Replacement

STEM CELL THERAPY
ARTHRTIC HIPS

Patients: 286
Number of hips: 472

Average improvement: 68% in 72% at 1 year follow up
P<0.001
ARTHRITIC KNEES

Patients: 463
Number of knees: 738

Average improvement: 70% in 70% at 1 year follow up
P<0.001
Shoulder Rotator Cuff Pathology and Arthritis

Patients: 178
Total number of shoulders: 257

Average improvement: 72% in 69% at 1 year follow up
P<0.001
STEM CELLS IN FORMER NFL PLAYERS

NFL players: 51
Average age: 60
Hip: 11
Knee: 10
Shoulder: 30
Former NFL Players - 1 Year Outcome

Hips 72% Improvement

Knees 69% Improvement

Shoulders 68% Improvement

P<0.001

STEM CELL THERAPY
STEM CELLS FOR SPORTS INJURIES
What is a Platelet?

• Only in mammals
• Primary function is blood clotting
• No nucleus
• Contains growth factors
• Stimulate fibroblast → Collagen
What is PRP?

- Platelet Rich Plasma
- Concentrated platelets from blood
- Not FDA approved
Does PRP work for sports injuries?

- Reviewed 19 articles comparing PRP to control.
- Insufficient data to support PRP therapy for sports injuries.
Does PRP work for sports injuries?

- Literature Review - May 2016 Haymarket medical websites.
- No clear evidence for the benefit of PRP therapy.
Stem Cells for Treating Sports Injuries

- Anti-inflammatory.
- Stimulate new blood vessels.
- Become fibroblasts → Collagen.
- Supported with extensive animal studies.
- Standard of care in veterinary medicine.
Do stem cells help Sports Injuries

Literature Review - Archives Trauma Res. 2016

- Rotator Cuff Injuries - Human studies show better results with MSC vs. Control.

- ACL Injuries - MSC improved healing.

- Achilles Tendon - Human studies showed better healing with MSCs on histology and mechanical testing.
Do stem cells help sports injuries

- MCL Injuries - Animal studies show better healing MSCs vs. control.

- Meniscal Injuries - Human and animal studies show MSCs can regenerate meniscus.

- No large long term human studies on stem cells for sports injuries.
Placenta, Amniotic, Umbilical products

- No Stem Cells - All killed in processing
- Not FDA Approved
- No Published Animal or Human Studies
- Often Misleading Sales Pitches
Conclusions for Sports injuries

• Sports Injuries are Common
• PRP: Little Evidence to Support
• Stem Cells: Extensive Supportive Literature
• IV Stem Cells: May Prevent Injury
Intravenous Stem Cell Infusion

- Anti-inflammatory
- Release growth factors
- Modulate Immune System
- Inhibit cell death
Intravenous Stem Cell Infusion

- Immunity Boost
- Systemic Anti-Inflammatory Effect
- Proactive approach to possibly reduce injuries and speed recovery
IV Infusion

220 patients treated for:

» Liver Pathology
» Parkinson’s Disease
» Multiple Sclerosis
» Ulcerative Colitis
» Fibromyalgia
» Skin Health
» Energy Boost
IV Stem Cell Therapy in the NFL

Starting Defensive Players before the Superbowl.

STEM CELL THERAPY
Stem Cell Therapy in Aesthetics

Skin aging and Cellulite is caused by decreases in Fibroblasts.

Mesenchymal Stem Cells

\[ \downarrow \]

Fibroblasts

\[ \leftarrow \]
\[ \downarrow \]
\[ \rightarrow \]

Collagen

Elastin

GAG

(Firmness)

(Elasticity)

(Hydration)

Stem cells may reverse skin aging and cellulite
Conclusions

• Your body wants to heal itself

• Use of Bone Marrow Stem Cells have no reported complications

• Bone Marrow stem cells - FDA Compliant

• Adipose and Placenta – Non- FDA Compliant

• Research strongly supports that your stem cells can help avoid Orthopedic and Spine Surgery
Overall Results

70% of patients are at least 70% better
Introduction to CUTTING EDGE Regenerative Medicine

THE FUTURE IS NOW
REGENERATIVE MEDICINE

Using science to unleash the power within our bodies to maintain and restore health and healing
The Two Main Characters of Regenerative Medicine:

- **Mesenchymal Stem Cell (Batman)**
  - The most important cell for regenerative medicine
  - Most studied cell in science

- **Exosome (Robin)**
  - The primary weapon for Batman to direct healing and health
  - Key to curing cancer
Adult Mesenchymal Stem Cell (MSC)

- Batman (MSC) creates and releases Robins (Exosomes) filled with specific growth factors and RNA to heal a specific area of damage in your body.

- MSCs release these Exosomes into the Extra Cellular Matrix (ECM) to be absorbed by specific receptor cells.
What is an Exosome (Robin)

- Tiny (30-130 nanometers) membrane bound vesicle
- Hair shaft diameter is 80,000 nanometers
- Created by a MSC (Batman)
- Filled with specific Growth Factors and RNA
- Released to communicate directions to receptor cells
HISTORY OF EXOSOMES

► Discovered in 1983
  • “platelet dust”

► Thought to be cellular garbage bags

► In 2007, EXOSOMES were discovered to contain RNA

► 28 citations in 2008

► 29,000 citations in 2018

► Key to curing cancer and heart disease
THE VILLAINS

“The Joker”
InterLeukin-1 (IL-1)

► Two of numerous proteins that create inflammation and tissue breakdown
► Results in auto-immune diseases, arthritis, pain and aging

“The Riddler”
Tumor Necrosis Factor Alpha

Only Batman and Robin can defeat these villains.
The Exosome releases its growth factors and RNA into the receptor cell to eliminate inflammation and restore healing.

“How Batman uses Robin to fight villains”
EXOSOMES– SCIENCE BASED

► Donated adult bone marrow Mesenchymal Stem Cells (MSCs)
► Expand in cGMP laboratory
► Stress cells
► Collect EXOSOMES and GROWTH FACTORS via Ultrafiltration
Conditions able to treat – Based on Science

► Joint Arthritis
► Spinal Disc Degeneration
► Skin Aging
► Baldness
► Grey Hair

Possible Conditions – Based on Science

► Auto-Immune Diseases
► Neurologic Disorders
► CANCER
OLD SCHOOL / Obsolete

Cellular products

• Autogenous Bone Marrow or Adipose

• Peri-natal products – amniotic, placenta, umbilical cord

• PRP
NEW SCHOOL – SCIENCE BASED

• Acellular products =
  NO CELLS
• EXOSOMES
• GROWTH FACTORS
ACELLMULAR PRODUCTS

► All of the GOOD
  • Exosomes and Growth Factors

► None of the Bad
  • DNA, Mitochondria, Membrane, Cytoplasm, Ribosomes, Golgi Bodies, Cellular debris
CONCLUSIONS:

- Your body wants to heal itself
- Inflammation can overwhelm your healing capacity
- MSCs, by creating EXOSOMES, fight your inflammation
- MSC EXOSOMES restore your body’s power for healing and health
- Current cellular based stem cell products are obsolete.
- ACELLULAR products will replace all current CELLULAR products
- SCIENCE, SCIENCE, SCIENCE!!!
Any Questions?