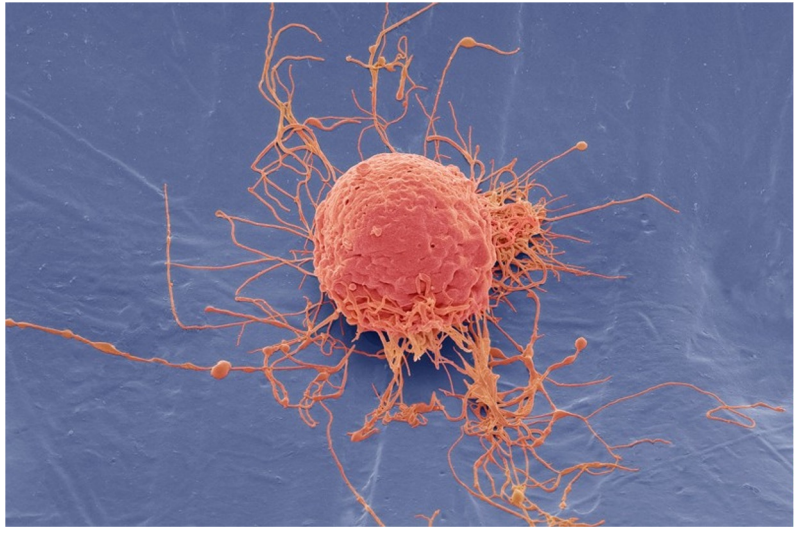
Orthobiologics:

The Good, the Bad, and the Ugly

Kurt Kowalski MD

Sept 9th, 2021



Disclosures

None

My Practice

- Clinical orthopaedic surgeon
- General orthopaedics, ABOS sports sub-certified
- PRP, have not injected “stem cells”
- Not actively involved in academic medicine/research

Orthobiologics: Formulations, Applications

- PRP, Wharten’s jelly, amniotic fluid, placental tissue, BMAC, “stem cells”
- Osteoarthritis, medial/lateral epicondylitis, achilles/patellar tendinitis, plantar fasciitis

Orthobiologics: Marketing

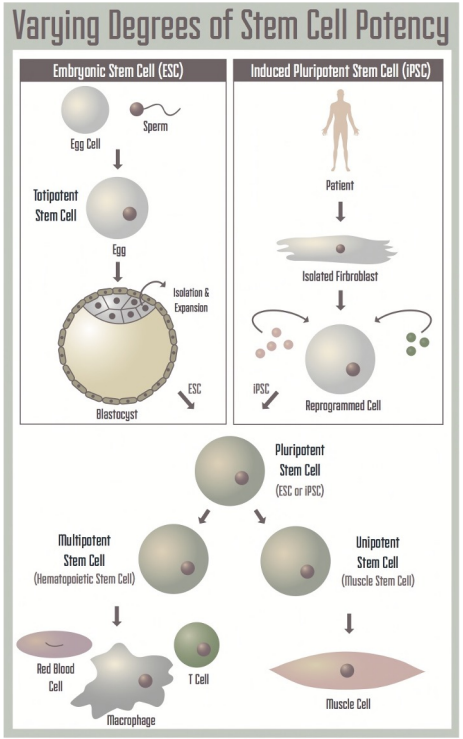
“Stem cell treatment”

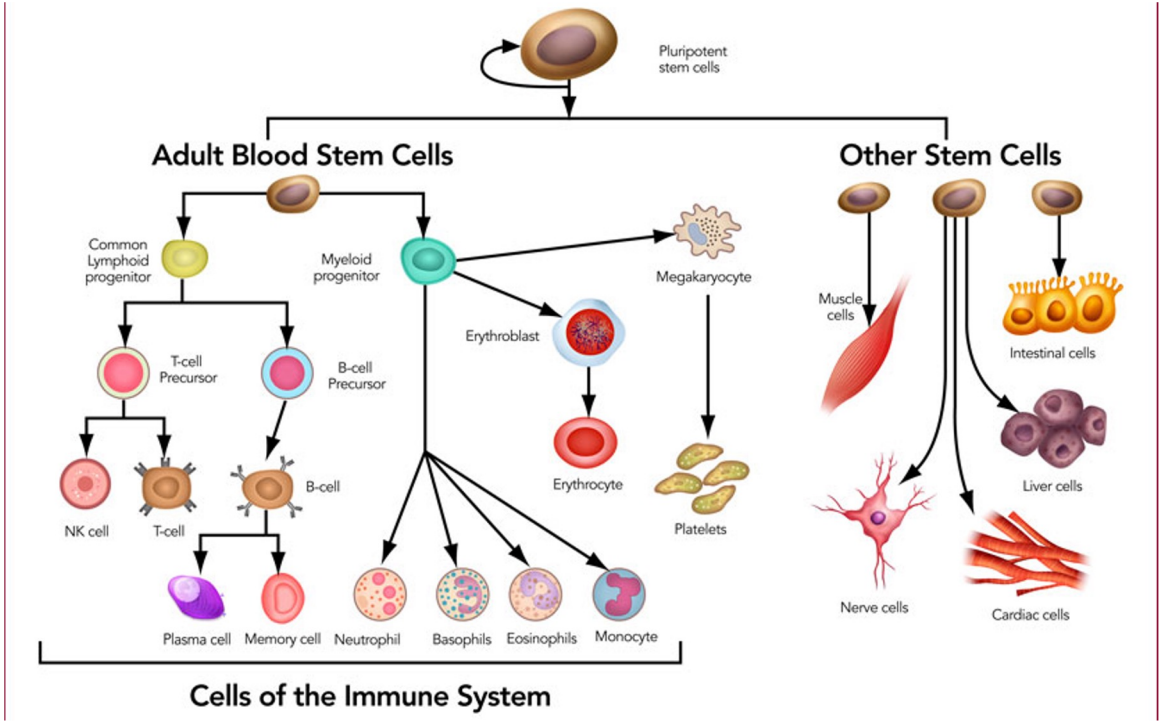
“Rejenerative Medicine”

“Rejuvenation Medicine”

The Good: Stem Cells History

- 1960's: Multipotent (HSC) stem cells discovered/isolated by McCulloch/Till
- 1981: Embryonic stem cells discovered Evans/Kauffman
- 2006: induced pluripotent stem cell created Yamanaka





Stem Cells: Sources

- Adipose Tissue
- Bone Marrow Aspirate
- Placental tissue
- Amniotic fluid
- Umbilical cord (Wharton’s Jelly)

Stem Cells: How do they work?

- Paracrine: recruit cells to regenerate tissue: angiogenesis, tendon, ligaments, cartilage
- Differentiation: Directly differentiate into target tissue phenotype, local signals needed for phenotype

Stem cells: lab purified vs minimally manipulated auto vs allogenic

Lab purified: cell sorting, culture expansion under defined conditions

- Results in measurable, pure stem cells
- Ex-vivo manipulation illegal in US and many other countries

Minimally manipulated:

- 1/10,000--1/20,000 bone marrow aspirate
- 1/2000 adipose tissue
- Heterogeneous stromal cells, poor yield, variability

Allogenic: viability, biologic concerns(harvest,processing,storage), immune response

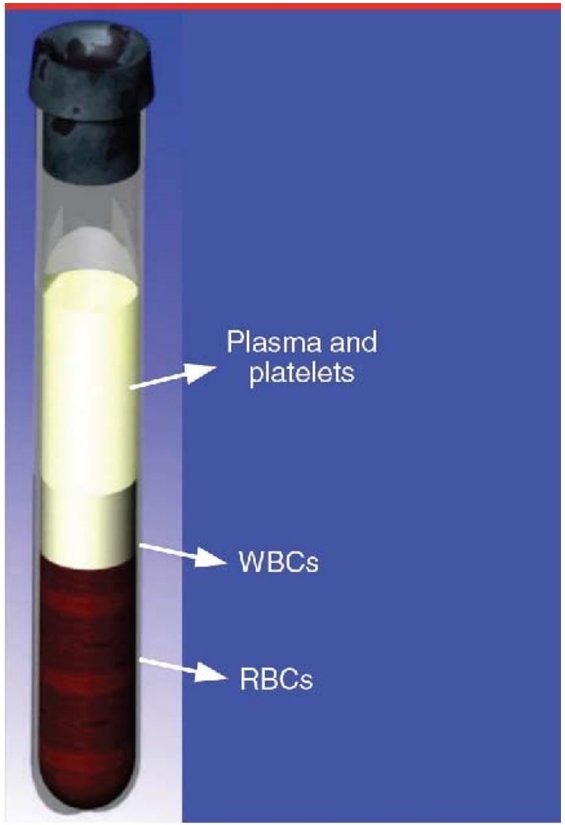
Orthobiologics: The UGLY

- Politics: Bush vs Obama
- Policy
  - Right to Try Act 2018
  - Compassionate Freedom of Choice Act 2014
- Regulation: The FDA wants to regulate your cells”
- Economics: Direct to consumer marketing
- Science? Who needs it?

In short, proposals for deregulation come shrouded in appealing messages that shift adroitly in response to critiques: freedom of choice, giving hope to dying patients, fighting bureaucratic obstructionism and, of course, innovating medicine. But it is a business model that removes the incentives to make drugs and treatments ever better. It offloads financial risk from investors and companies to patients, and requires the very ill to pay for interventions that are unlikely to work.

Nature 2014

Platelet Rich Plasma



Platelet Rich Plasma

- Platelets, PDGF, EGF, FGF
- Leukocyte rich vs leukocyte poor
- Variability:
  - amount of blood
  - Centrifugation
  - patient age
  - time of day
  - Pathology treated
  - Timeline of the pathology

Platelet Rich Plasma: Applications

- Osteoarthritis, tendinopathies (achilles, lateral/medial epicondylitis), intra-operative (rotator cuff repair, meniscus repair, acl reconstruction)
- Ostearthritis: effective in reproducible level 1 and level 2 studies
- Lateral/medial epicondylitis: effective in level 1 and level 2 studies
- Achilles/plantar fasciitis: mixed results
- Intra-operative use: mixed results

Platelet Rich Plasma: The Good

- Least expensive of orthobiologics ($897)
- Most studied
- Autogenous: no storage, preservation, infectious concerns

PRP: The Bad

- Not covered by insurance
- Variability: patient age, tissue targeted, timeline of disease, time of day, leukocyte poor vs rich, amount of blood obtained

Bone Marrow Aspirate Concentrate (BMAC)

BMAC: The Good

- Less expensive than “Stem Cells”
- Another way to get PRP--no stem cells of significance (1:10,000 at best)
- Office procedure vs surgery center

BMAC: The Bad

- Painful, invasive
- Cost
- No stem cells

Orthobiologics: Cost

- Cash payment:
  - PRP $897 ($350--$1,700)
  - Stem Cells” $3,100 ($2,100--$6,000)

What do I do?

- Offer other more generally accepted treatment options first:
  - PT, OT, NSAIDs, weight loss counseling,brace/orthotics, immobilization, RICE, activity modification
  - Steroid injections, viscosupplementation
- If above fails, then discuss surgical option as well as orthobiologics

My Utilization of Orthobiologics

- PRP exclusively
  - Least expensive
  - I know what's in it--autologous blood
  - Minimally invasive, office procedure
  - Minimal harm--good for younger athletes
- My most common uses: Achilles, patellar tendon, lateral epicondylitis, plantar fasciitis, osteoarthritis, patellofemoral syndrome
- Ultrasound guided injection

Summary

- Orthobiolobics have a promising future but good scientific studies are lacking
- Politics, policy, and economics outpace the science in current usage.
- More reproducible, unbiased studies needed

Questions?