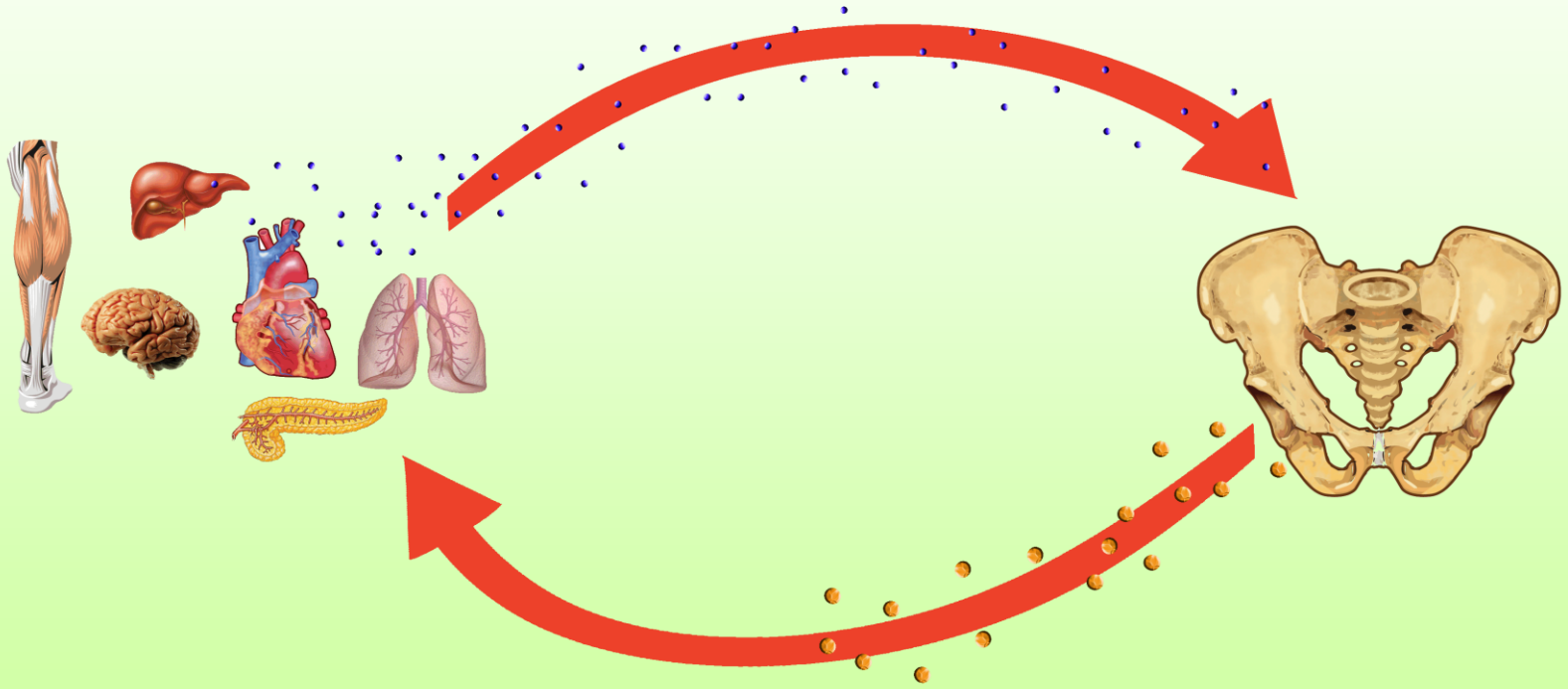
STEM CELLS ROLE IN THE BODY

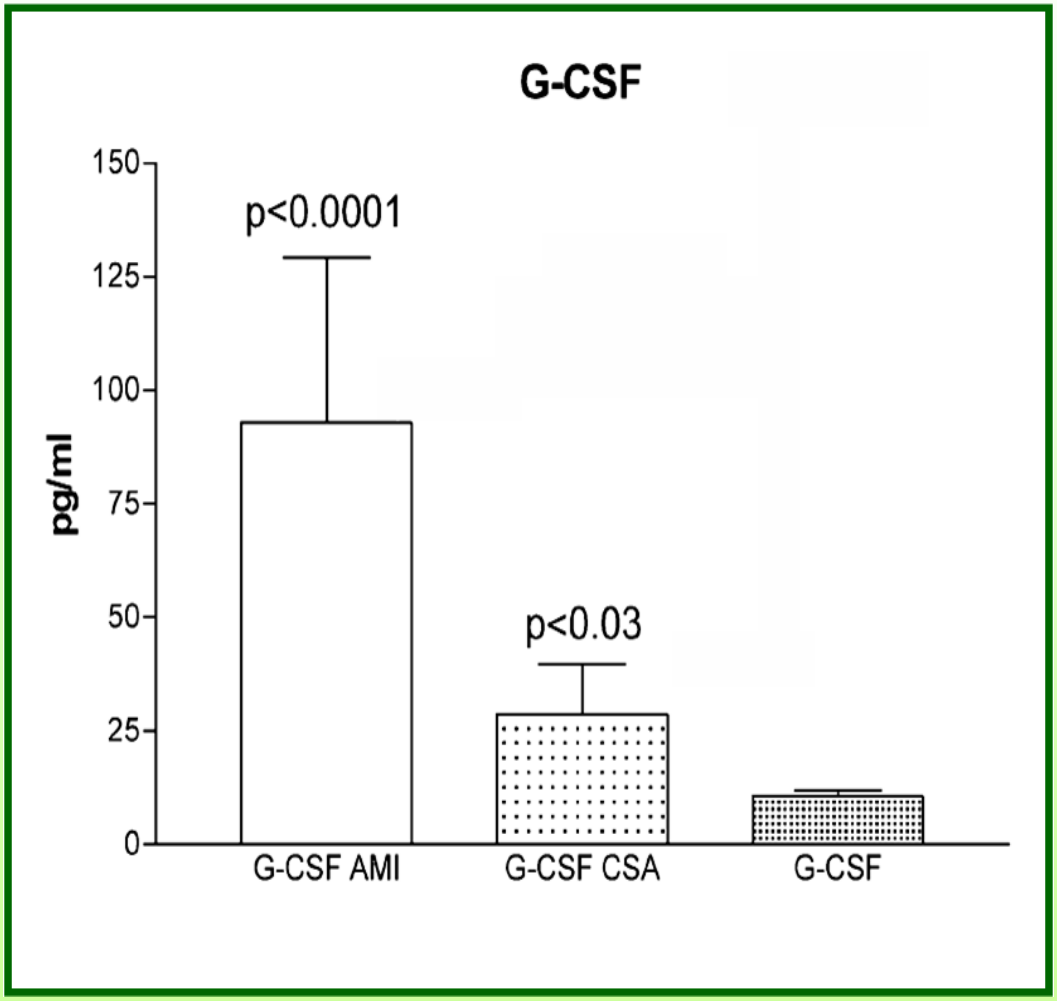
A new understanding of disease formation

Christian Drapeau
STEMTech International

Stem Cell Theory of Repair

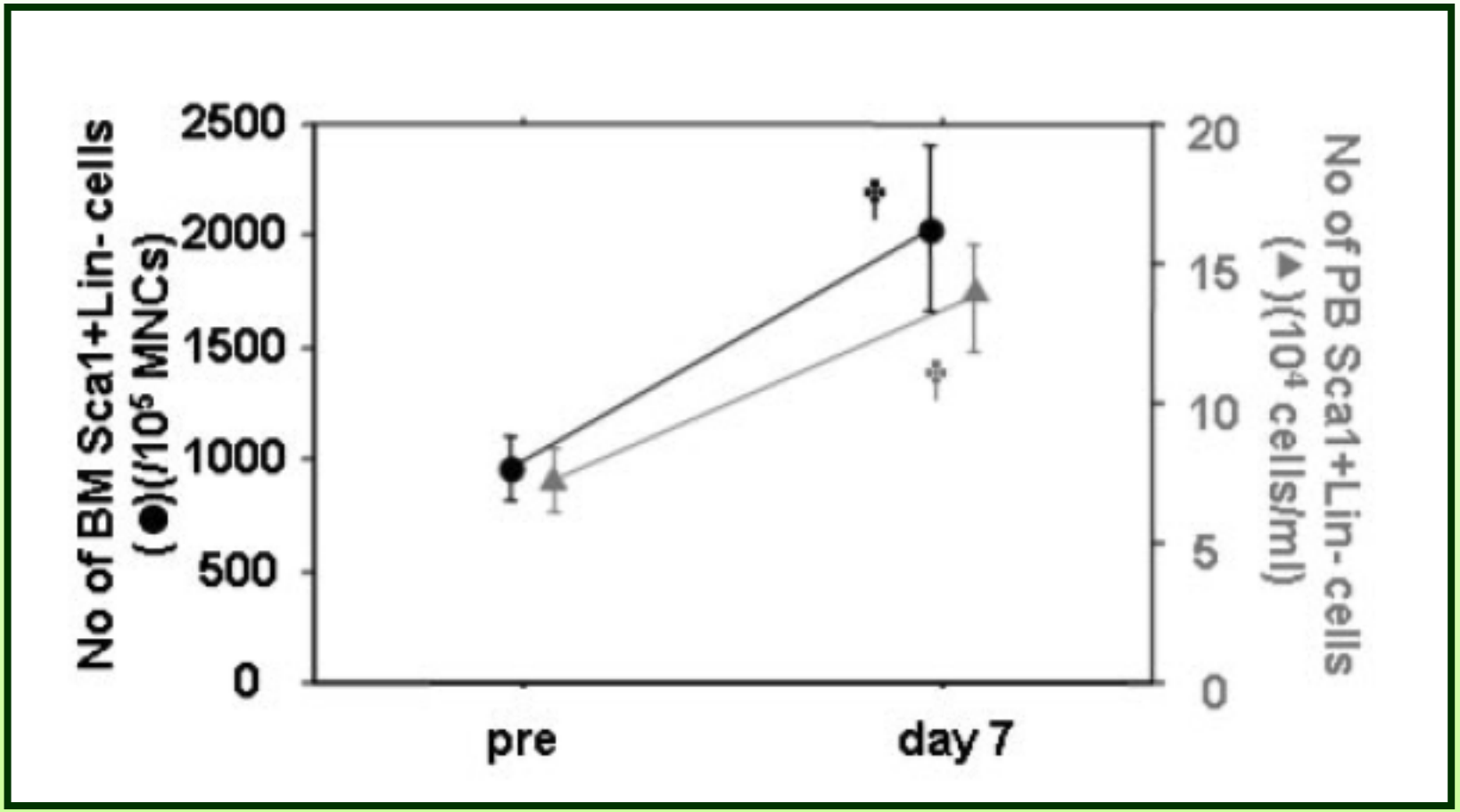


Affected tissues release G-CSF



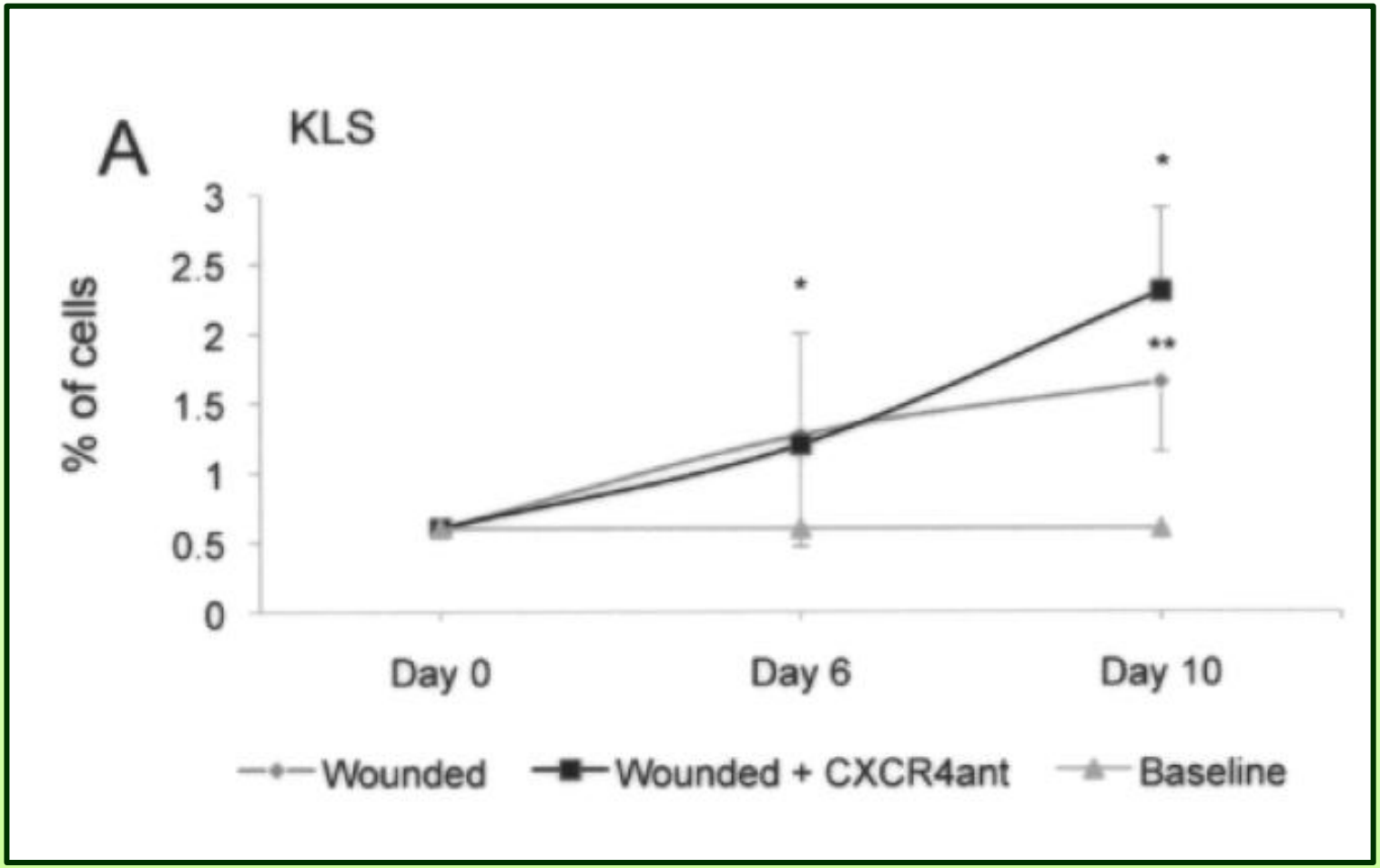
Leone et al., Int. J Cardiol. 111(2):202-8, 2006.

Injury & SC Mobilization (fracture)



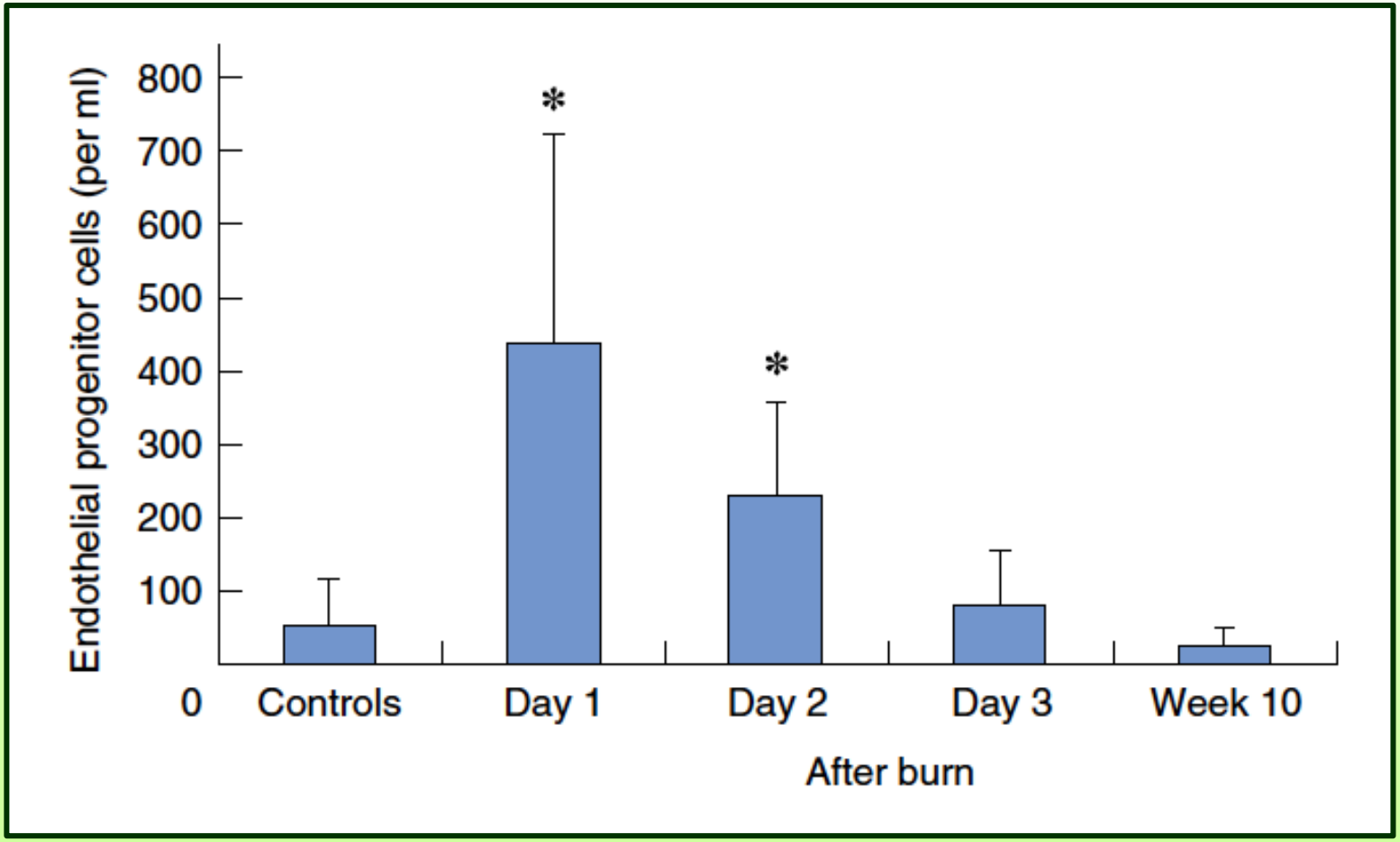
J. Cell. Physiol. 215: 234–242, 2008.

Injury & SC Mobilization (wound)



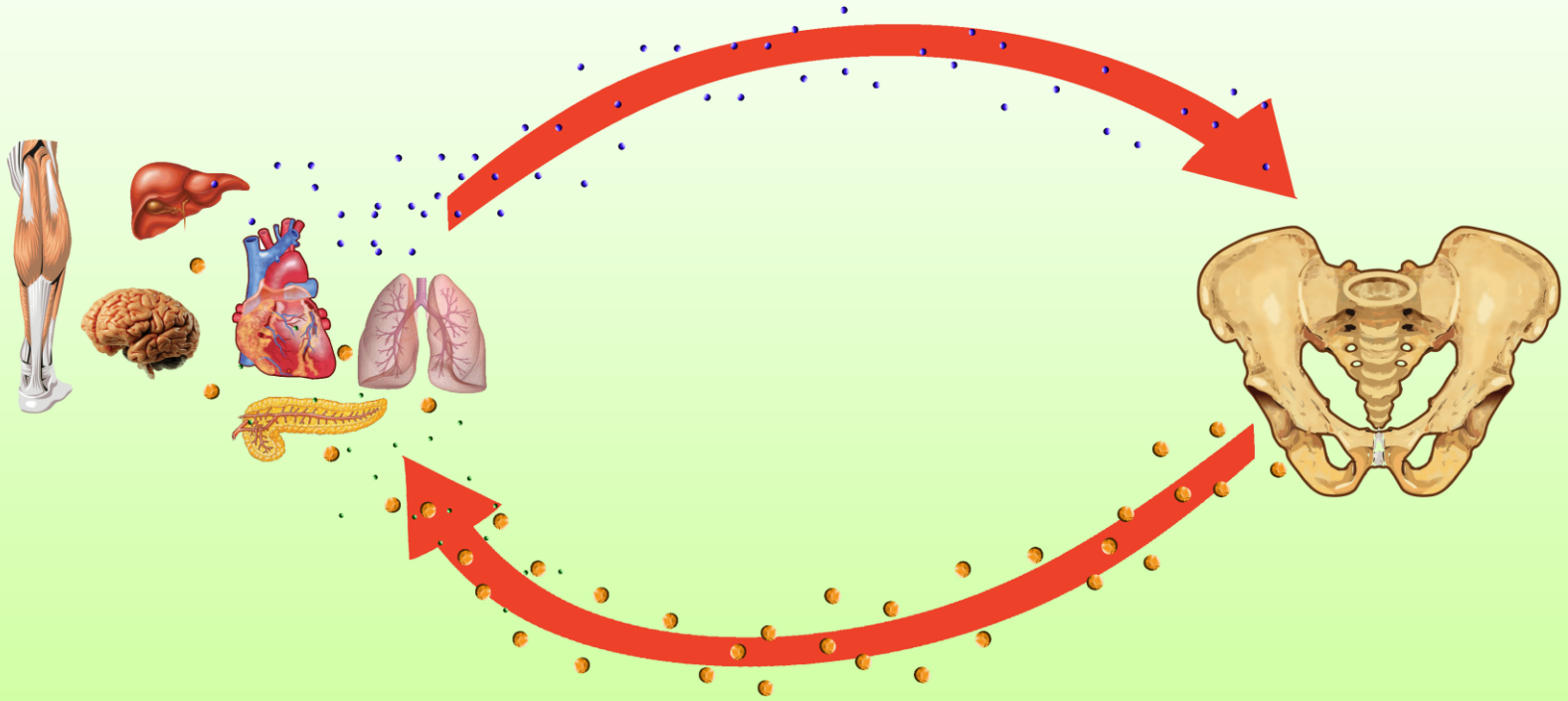
Cell Transplantation 19:1369–1381, 2010

Injury & SC Mobilization (burn)

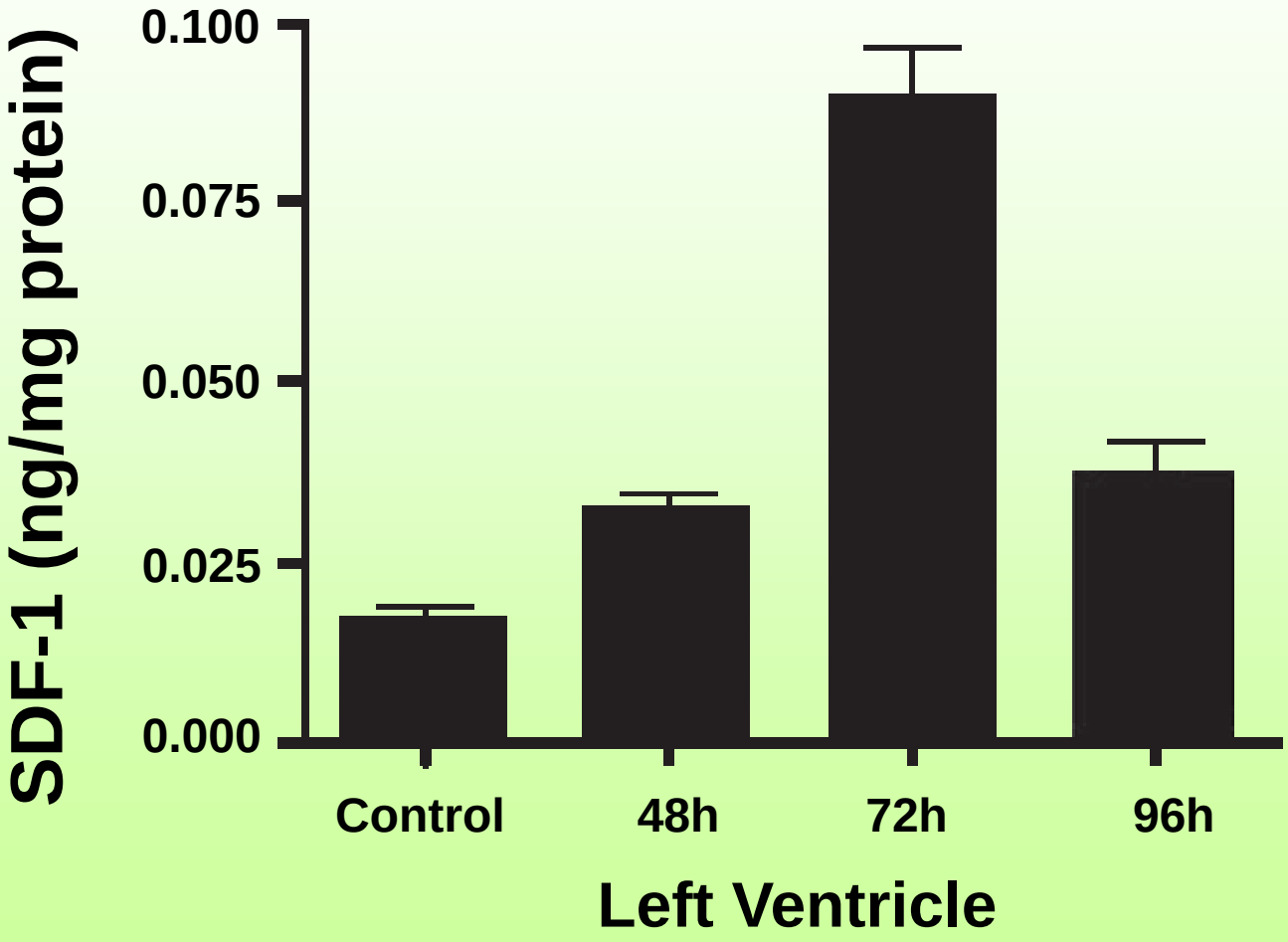


British Journal of Surgery 2008; 95: 244–251

Stem Cell Theory of Repair

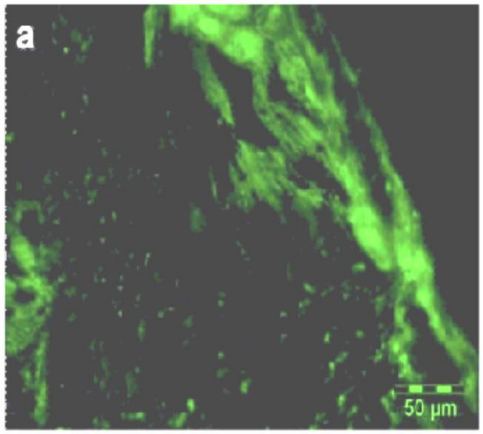


Affected tissues release SDF-1



Abbott et al., Circulation 110(21):3300-5, 2004.

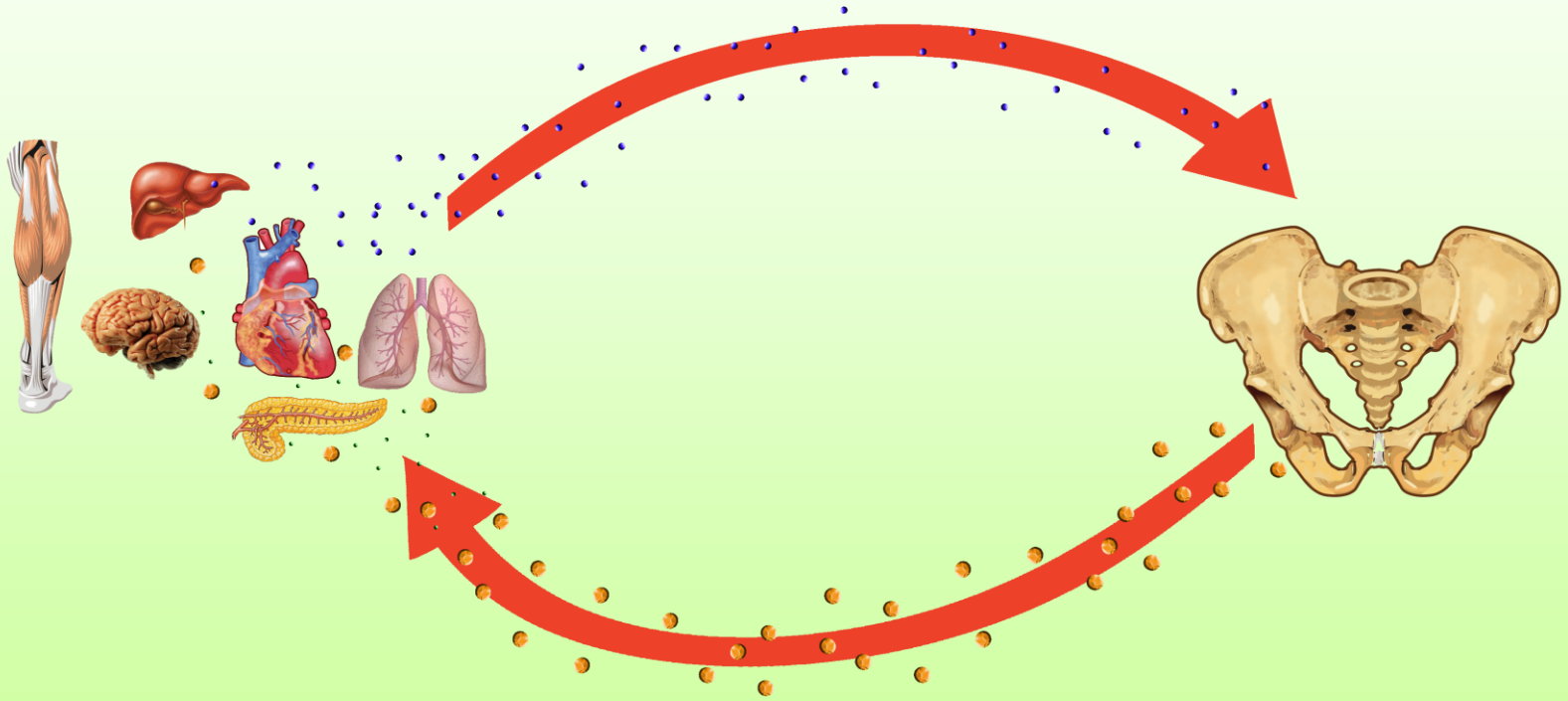
Affected tissues release SDF-1



hSDF-1α

Tang et al., Reg. Peptides 125:1-8, 2005.

Stem Cell Theory of Repair



Endogenous Stem cells Mobilization

A novel therapeutic approach

Animal models

Acute Myocardial Infarction

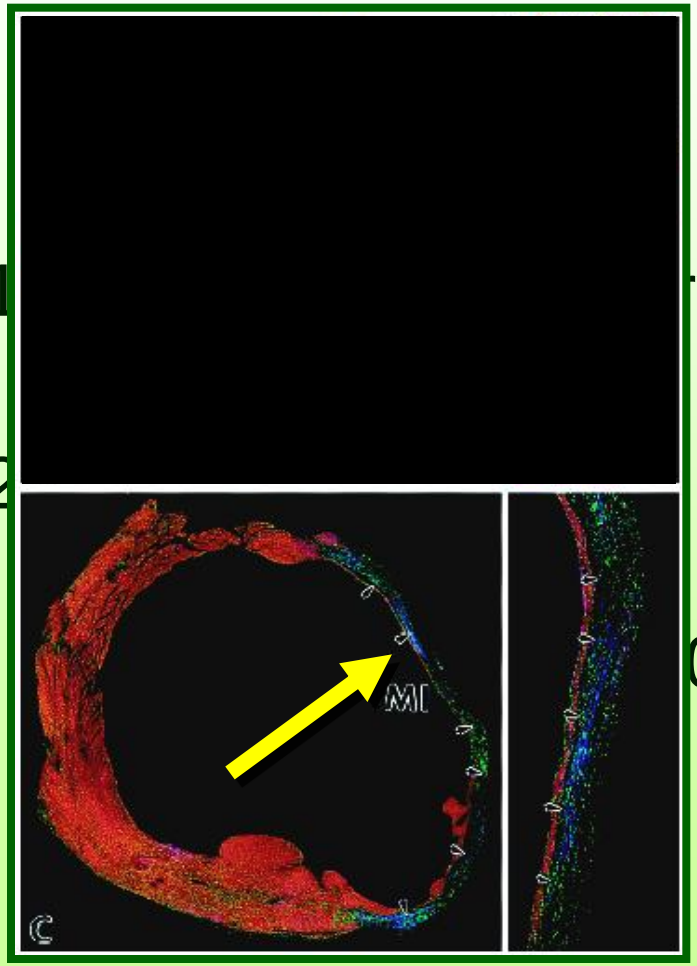
After 27 days…

In experimental animals:

- Scar tissue of ventricular wall
- Functional blood vessels

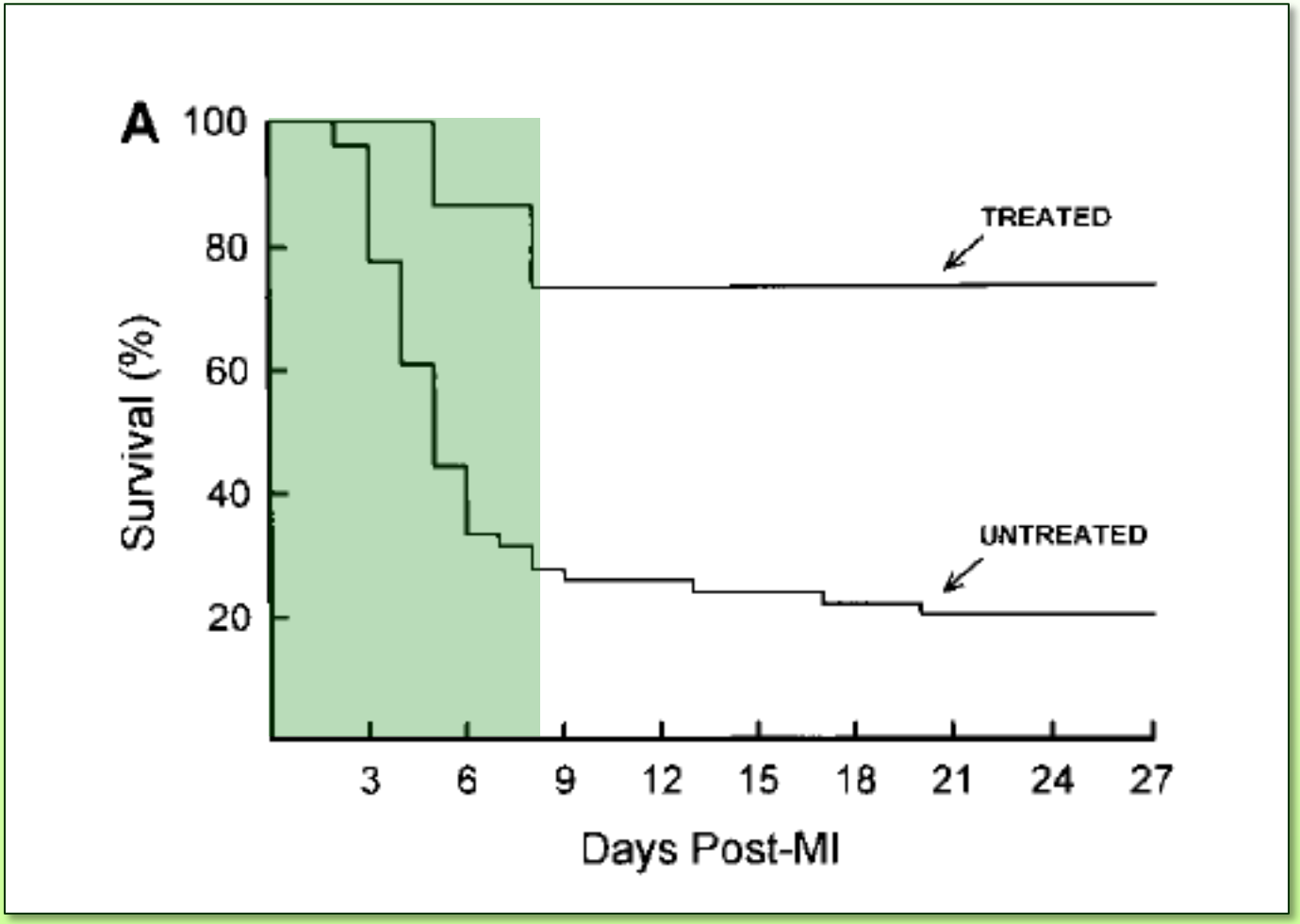
In humans:

- 13% survival (87% fatality)
- Cardiovascular health
  - poor ejection fraction
  - low systolic pressure



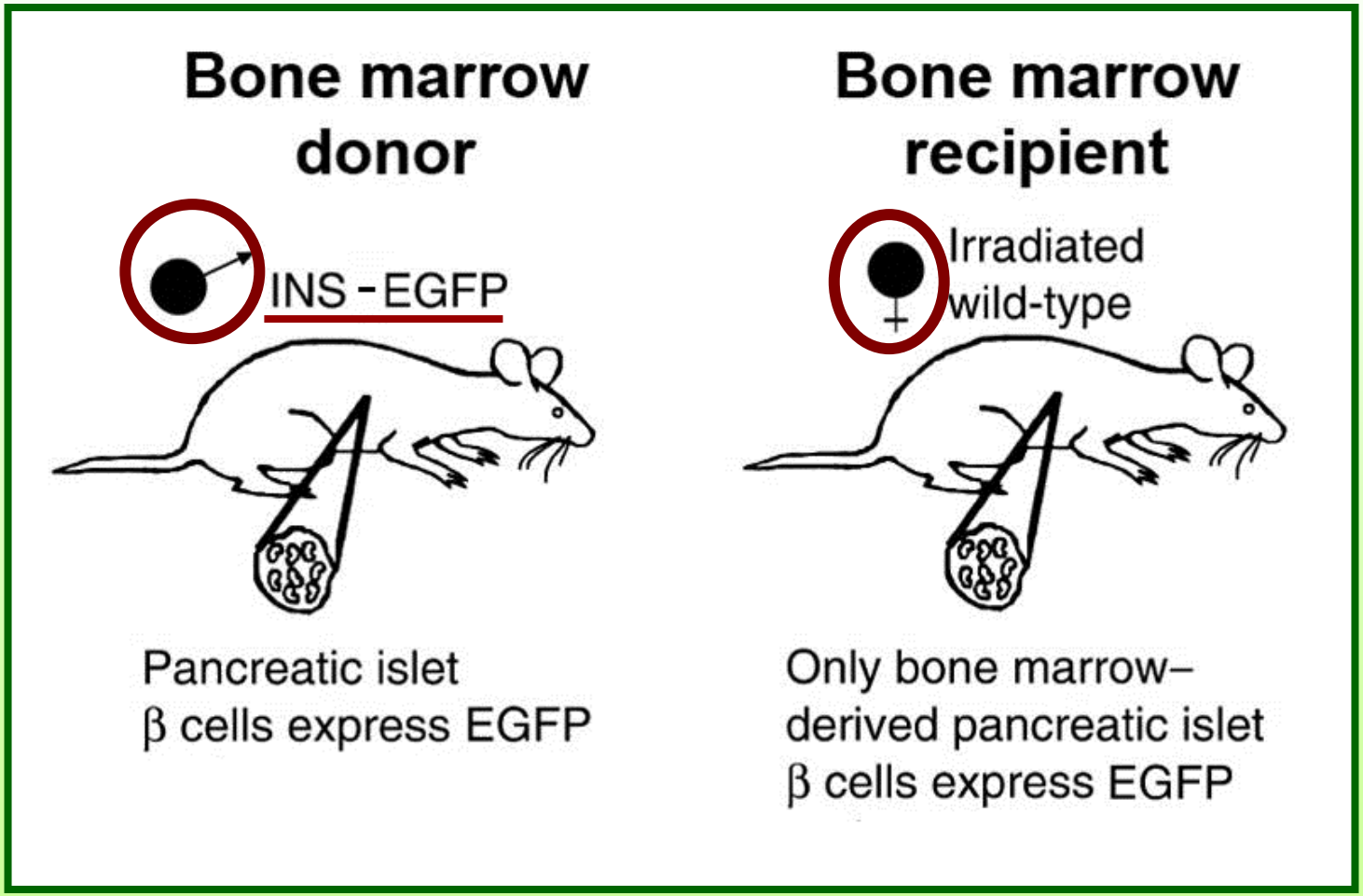
Orlic et al., PNAS 98(18):10344–10349, 2001.

Acute Myocardial Infarction

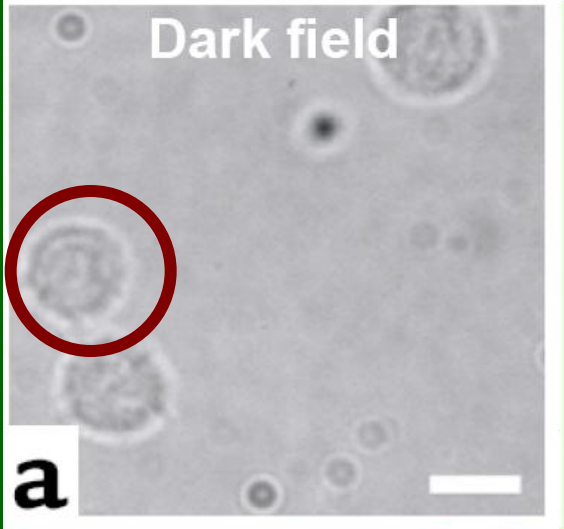


Orlic et al., PNAS 98(18):10344–10349, 2001.

Diabetes


Bone marrow donor
INS-EGFP
Pancreatic islet β cells express EGFP
Bone marrow recipient
Irradiated wild-type
Only bone marrow–derived pancreatic islet β cells express EGFP

Diabetes



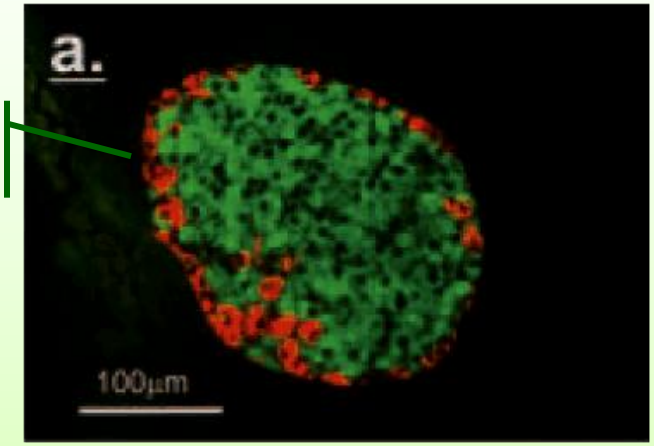
Transcribed insulin gene

Produces insulin

Originate from donor

Ianus et al., J. Clin. Invest. 111(6), March 2003

Diabetes



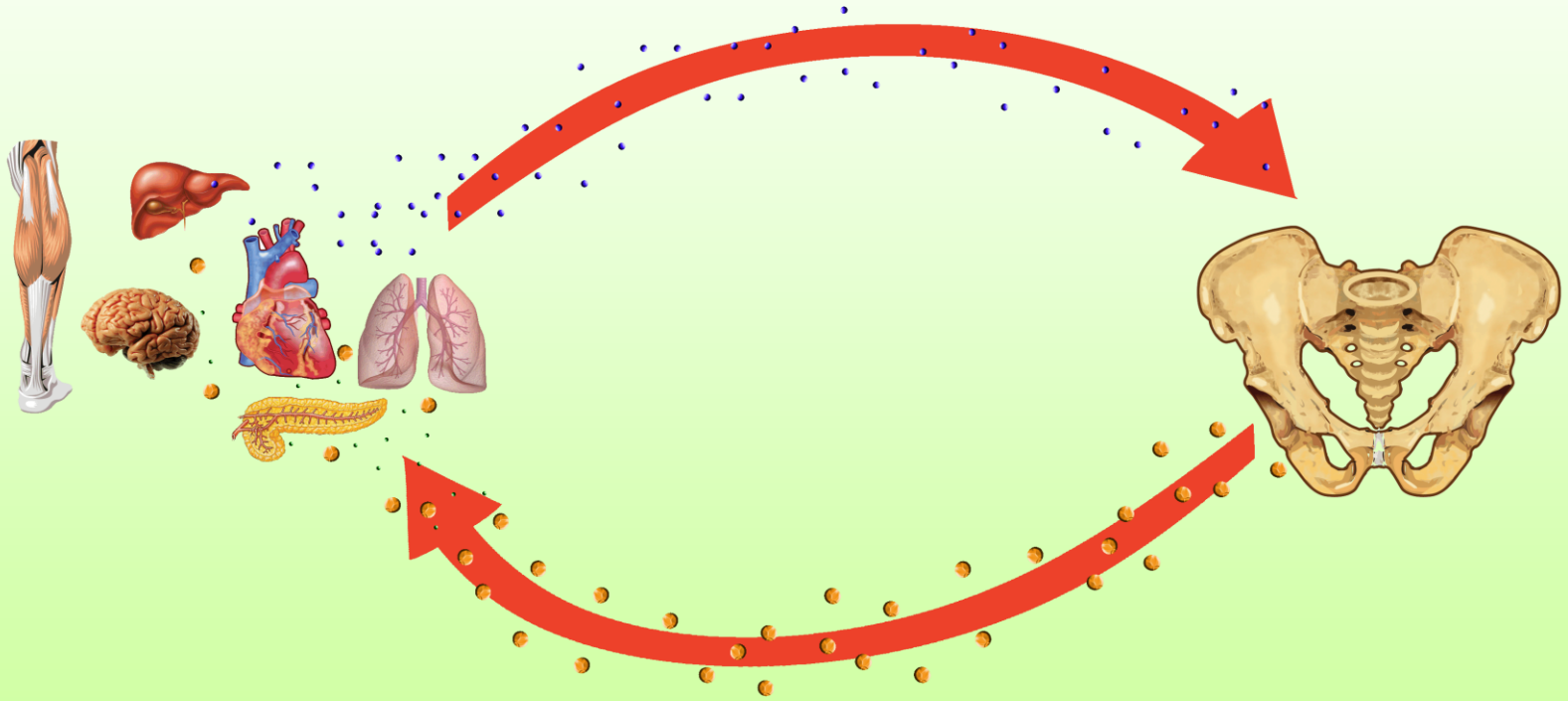
Normal

STZ

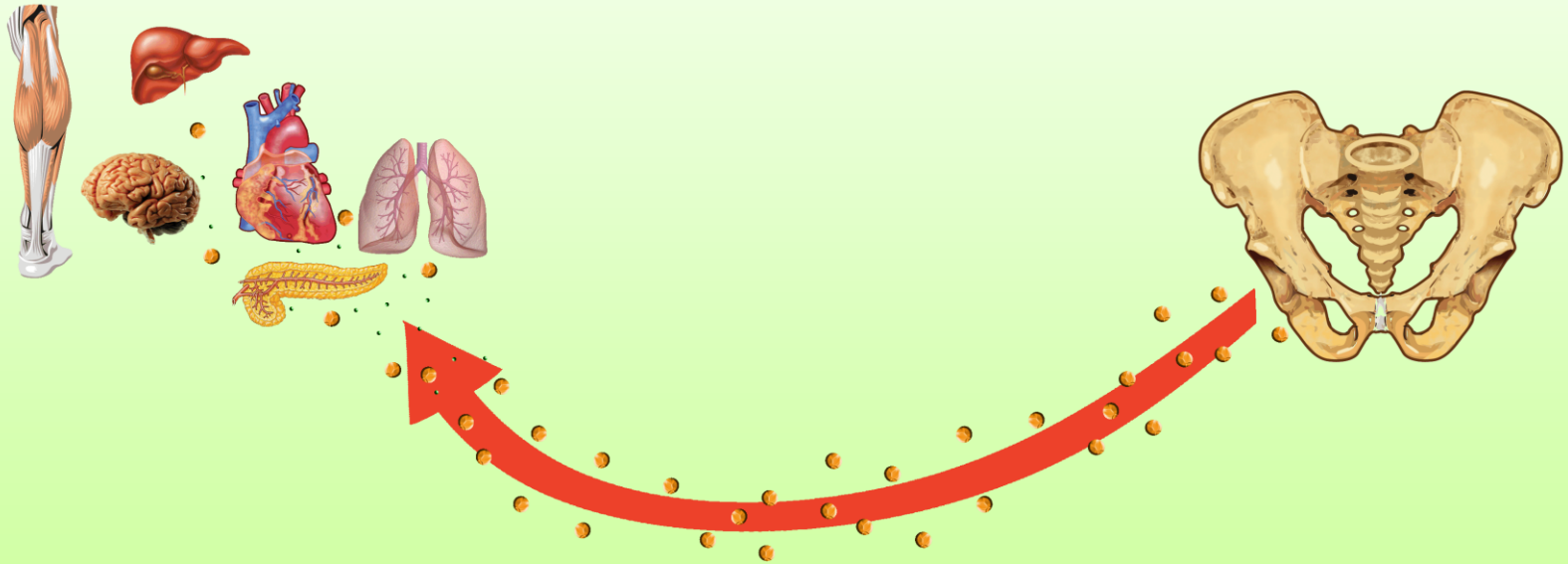
STZ + TMO

Hasegawa et al., Endocrinology 148(5), May 2007

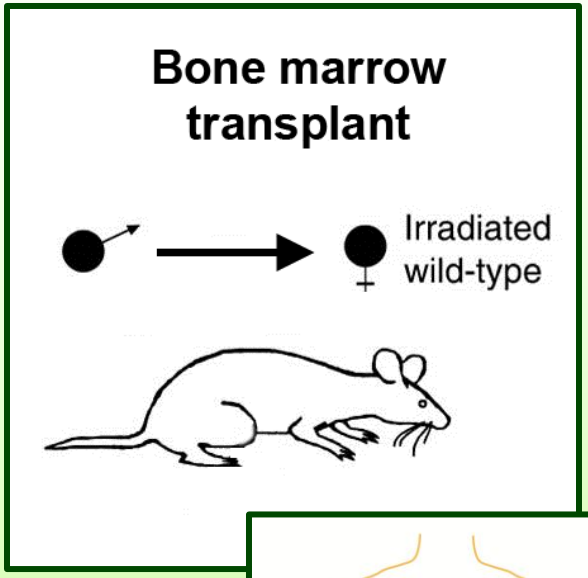
Stem Cell Theory of Repair

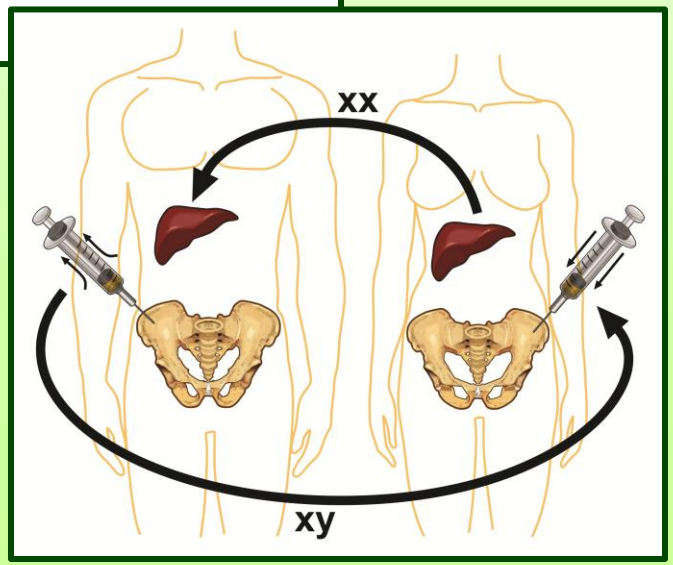


Stem Cell Theory of Repair & Renewal



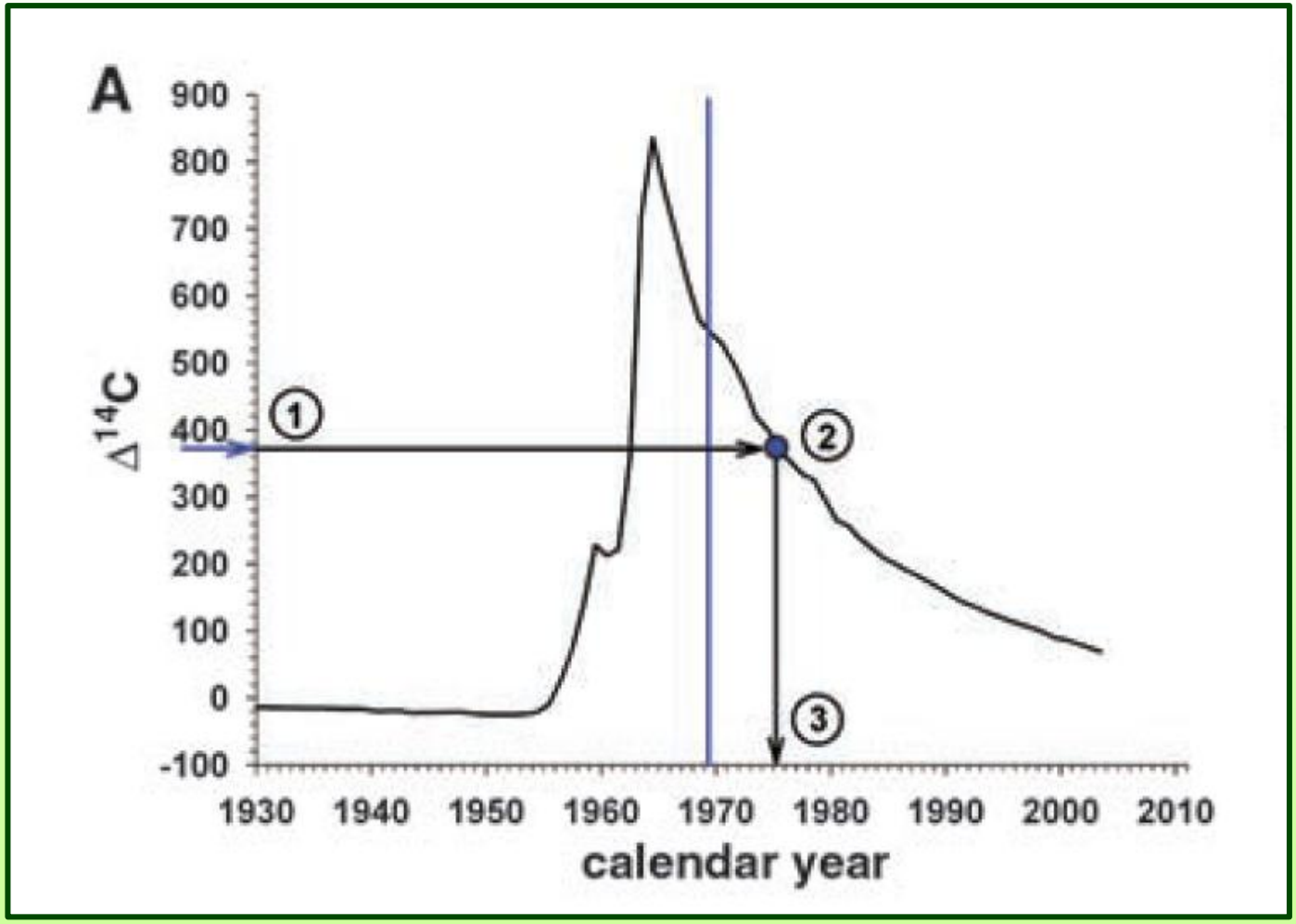
Stem Cell Theory of Renewal & Repair





- Brain
- Heart
- Liver
- Skin
- Gut
- Intestine
- Lung
- Pancreas
- Muscles
- Kidneys
- Blood vessels

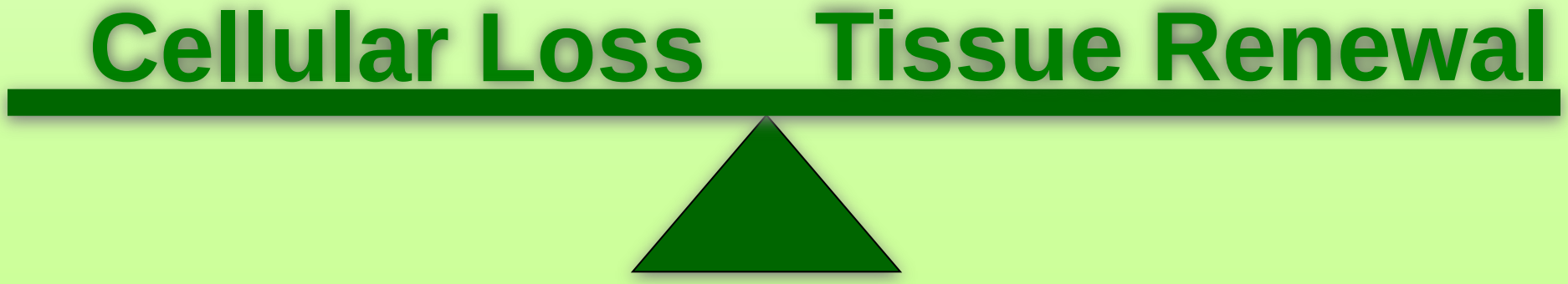
Renewal in the Heart



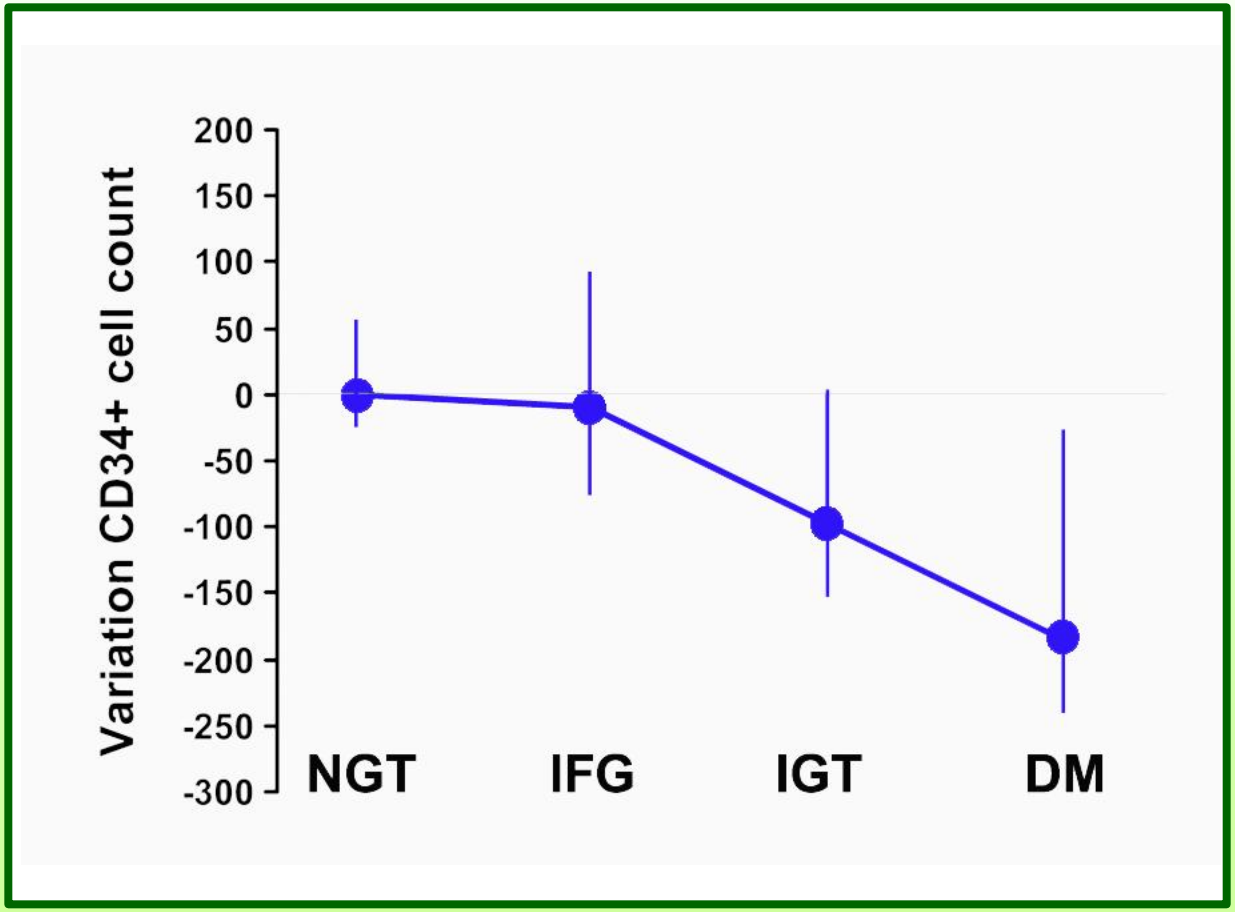
Olaf Bergmann, et al., Science 324, 98 (2009)

Stem Cell Theory of Renewal

Genetics
Past injuries
Environmental toxins
Lifestyle
Diet
Ability to rest
Physical Stress
Emotional Stress

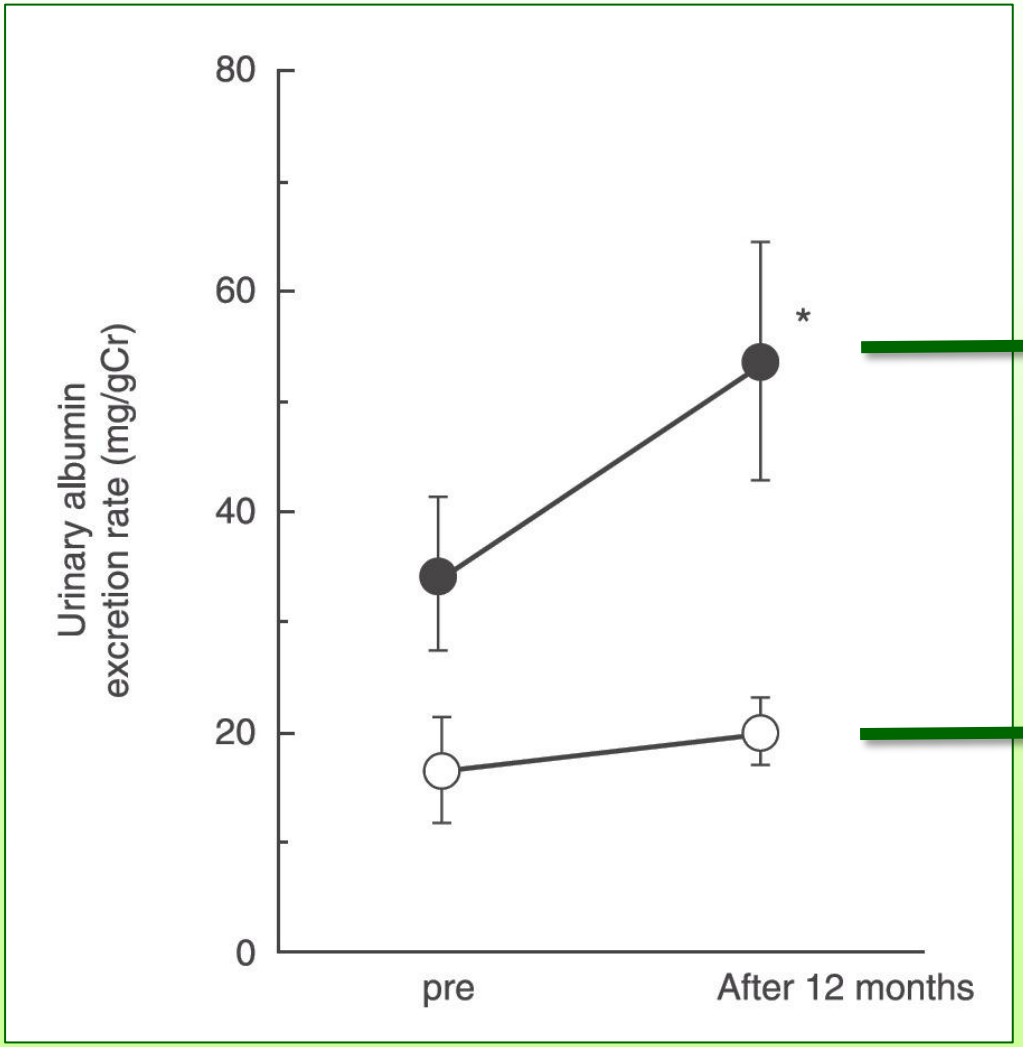


Number of PBSC - *Diabetes*



Diabetes Care, May 2010 33 (5): 1097-1102

Diabetic nephropathy

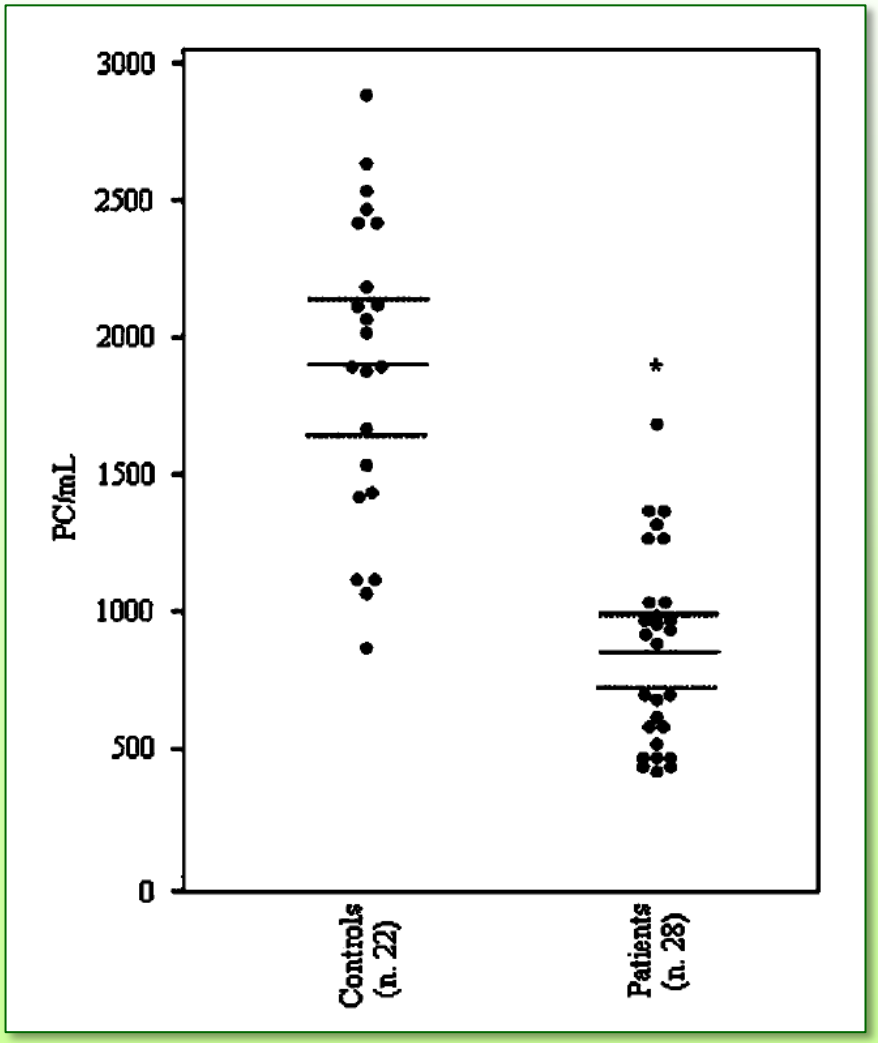


Lowest quartile of CD34+ cell number

Highest quartile of CD34+ cell number

Diabetic Medicine 2009, 26: 171–1733

Erectile dysfunction



The number of PCs in peripheral blood of patients affected by ED were significantly reduced with respected to controls (862.47 ± 345.1 vs 1903.57 ± 558.6, P< 0.001). Mean PC values were not different between ED patients with (793.47 ± 310.1) and without (922.37 ± 372.8) cardiovascular risk factors.

International Journal of Impotence Research (2005), 1–3

Erectile dysfunction

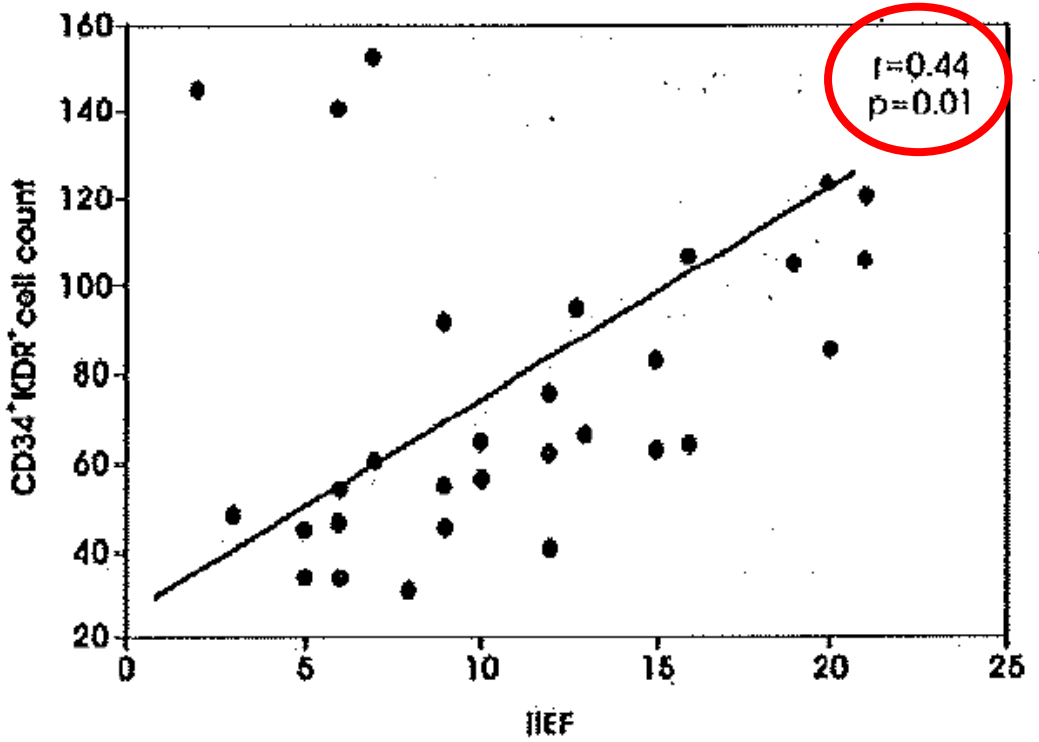
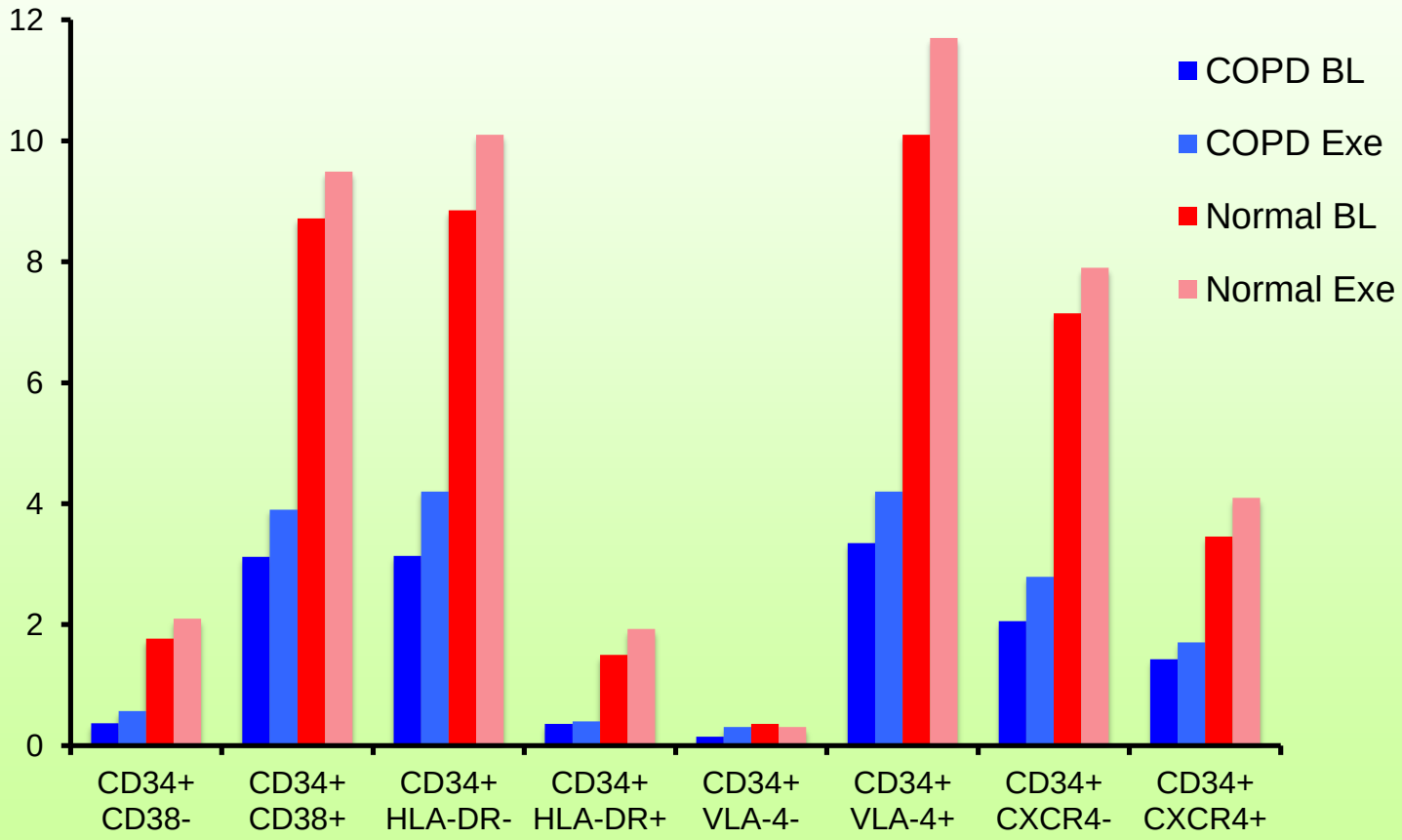


Figure 2 Correlation between $CD34^+KDR^+$ cell count and the International Index of Erectile Function score in overweight men with erectile dysfunction.

J Sex Med 2009, 6:107-114

COPD



Eur Respir J 2006; 27: 529–541

Idiopathic PAH

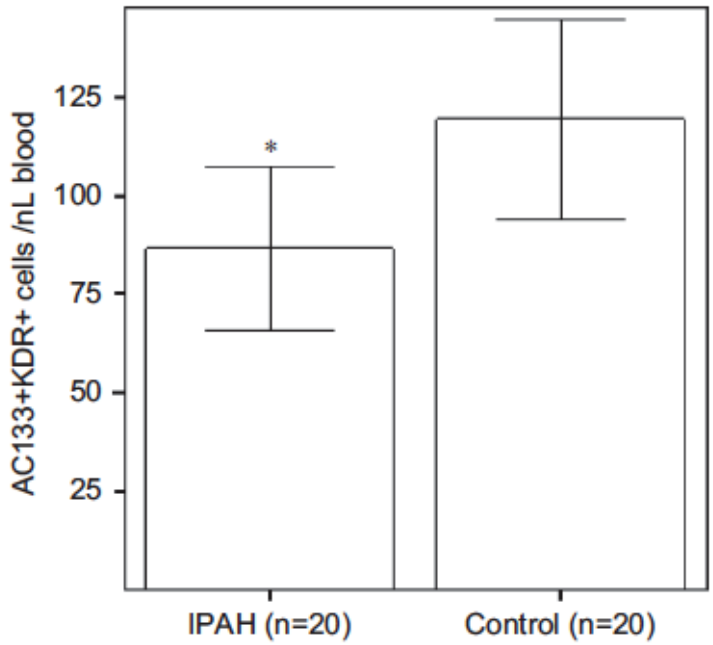


Figure 1 Circulating EPC levels in patients with IPAH. Circulating EPCs were enumerated as $AC133^{+}KDR^{+}$ cells by flow cytometry in the lymphocyte gate. Circulating EPCs number significantly decreased in subjects with IPAH compared with matched control subjects. $^{*}P<0.001$ vs. control.

Respiratory Medicine (2008) 102, 1073–1079

Idiopathic PAH

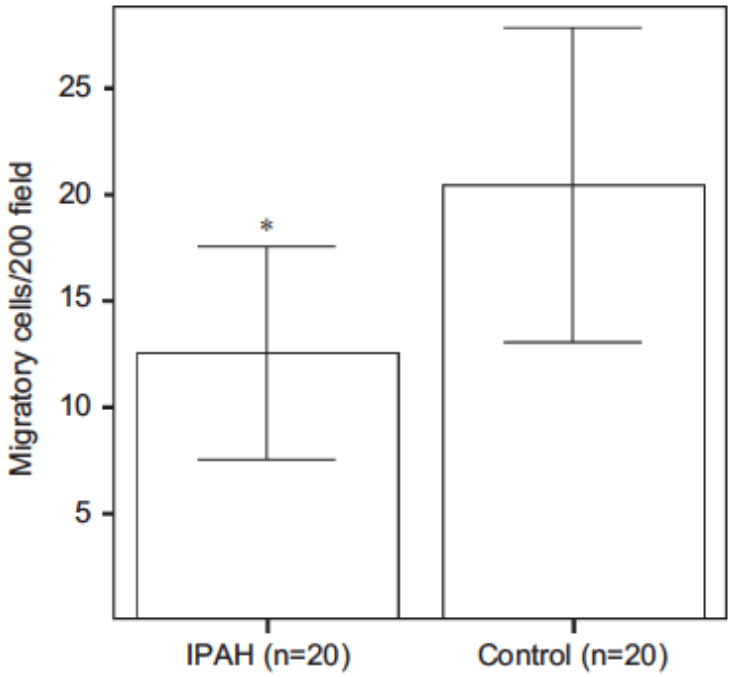


Figure 3 Migratory capacity of endothelial progenitor cells was significantly impaired in patients with IPAH. *$P<0.001$ vs. control.

Respiratory Medicine (2008) 102, 1073–1079

Idiopathic PAH

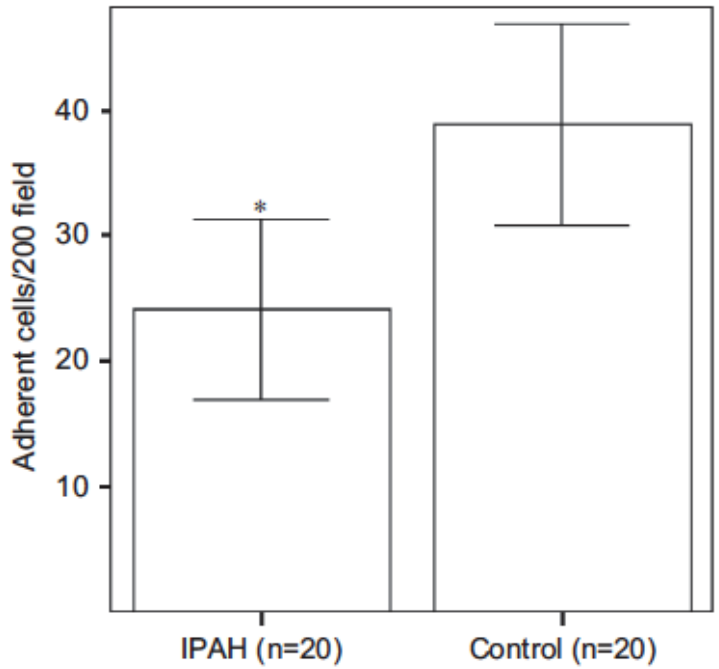


Figure 4 Endothelial progenitor cells from patients with IPAH exhibited a significant decrease in the number of adhesiveness cells. *$P < 0.001$ vs. control.

Respiratory Medicine (2008) 102, 1073–1079

Renal failure

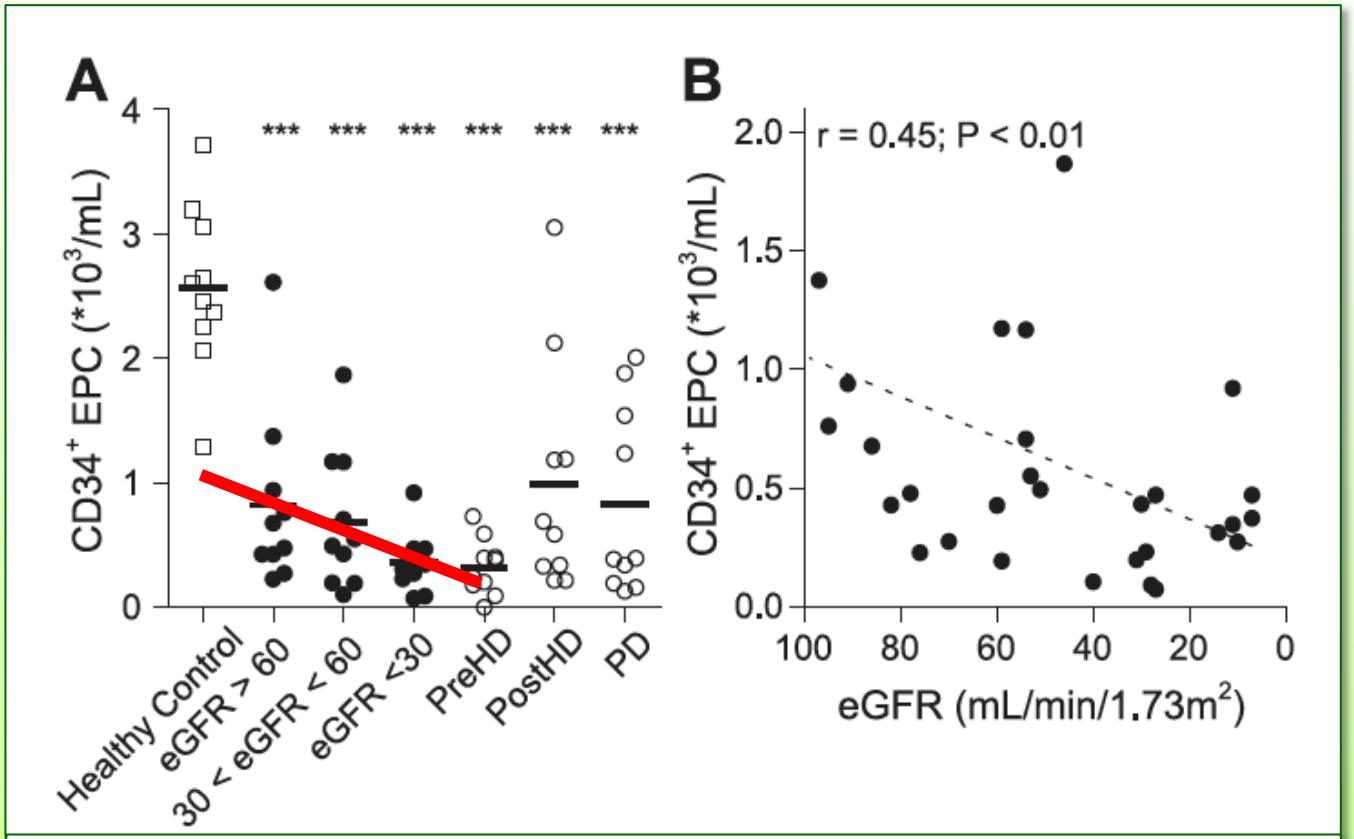
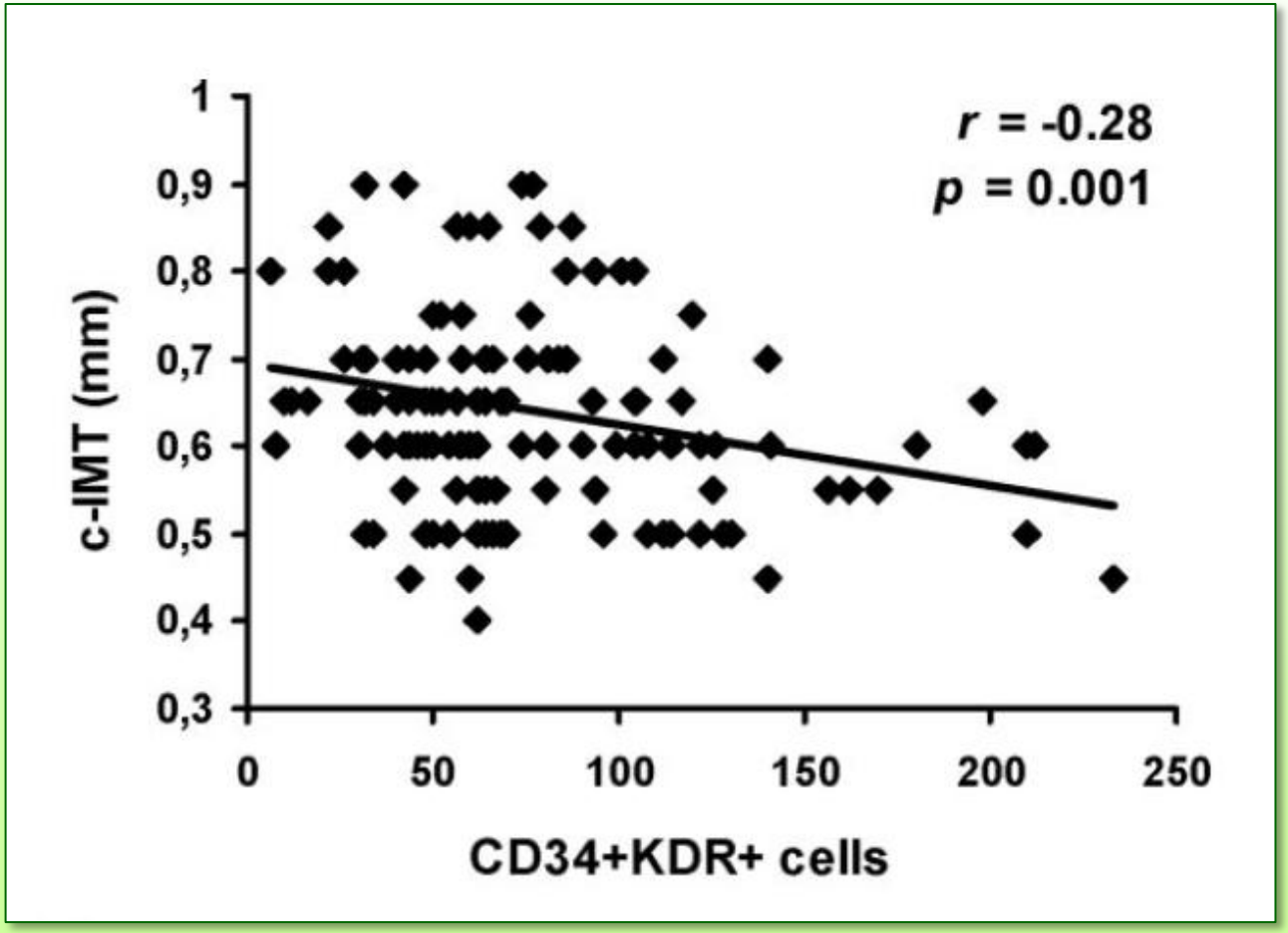


Fig. 1. Determinants of circulating CD34+ endothelial progenitor cell (EPC) numbers. CD34+ EPC decreased in early stages of chronic kidney disease (CKD) and decreased further during disease progression (*A* and *B*).

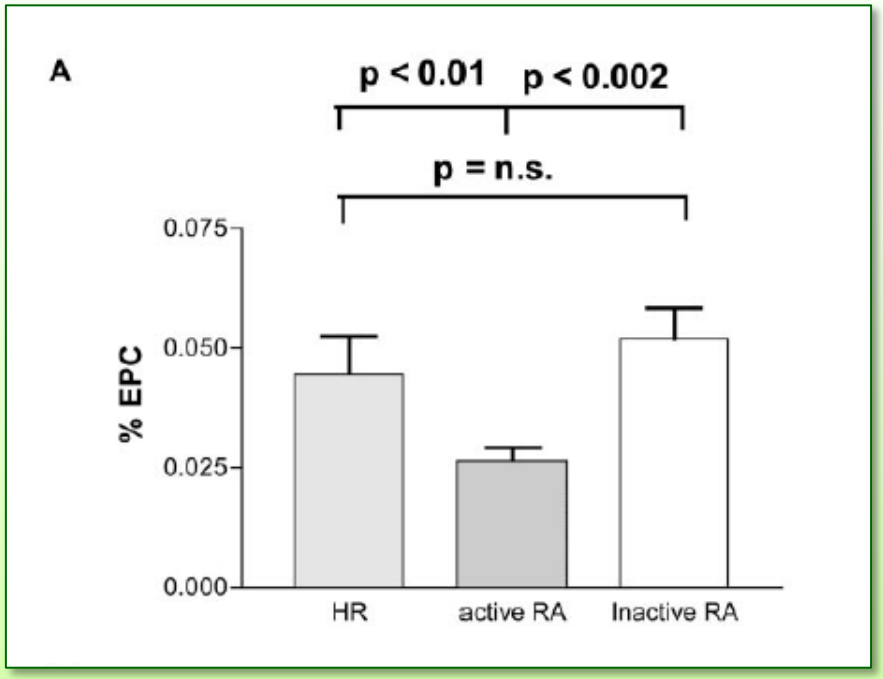
AJP-Renal Physiol. 2009; 296: F1314–F1322

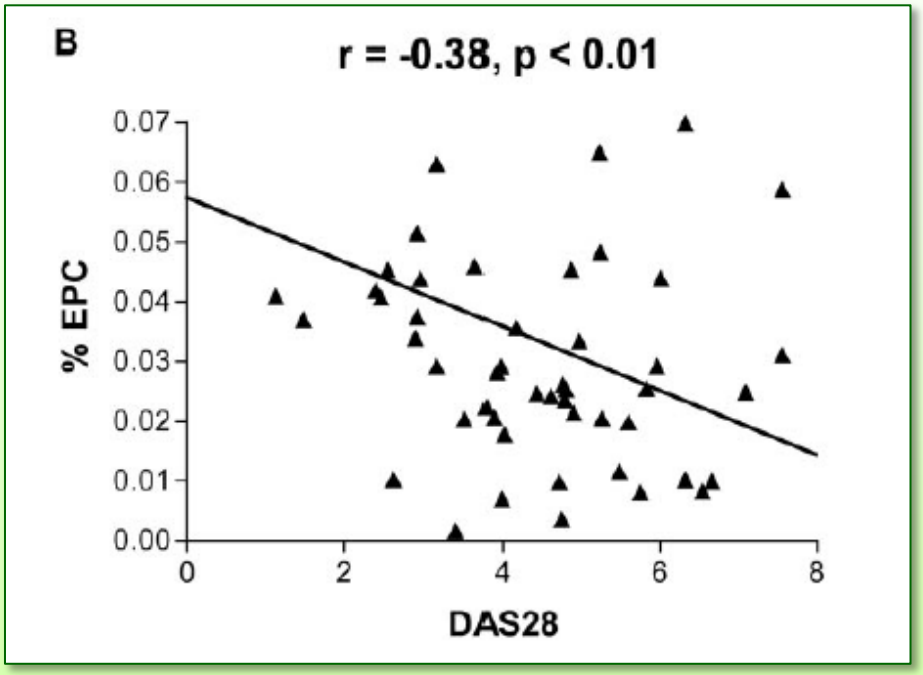
Atherosclerosis



Stroke. 2006; 37:2277-2282.

Arthritis

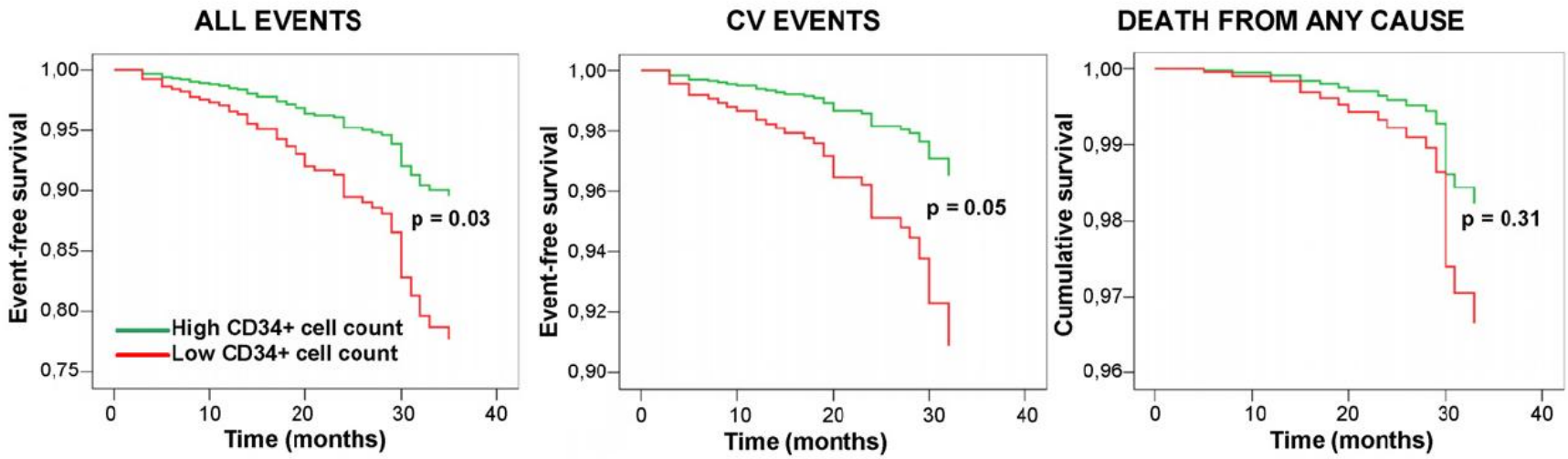




EPCs were significantly decreased in RA patients suffering from active disease (DAS > 3.2) compared with those from HRs.

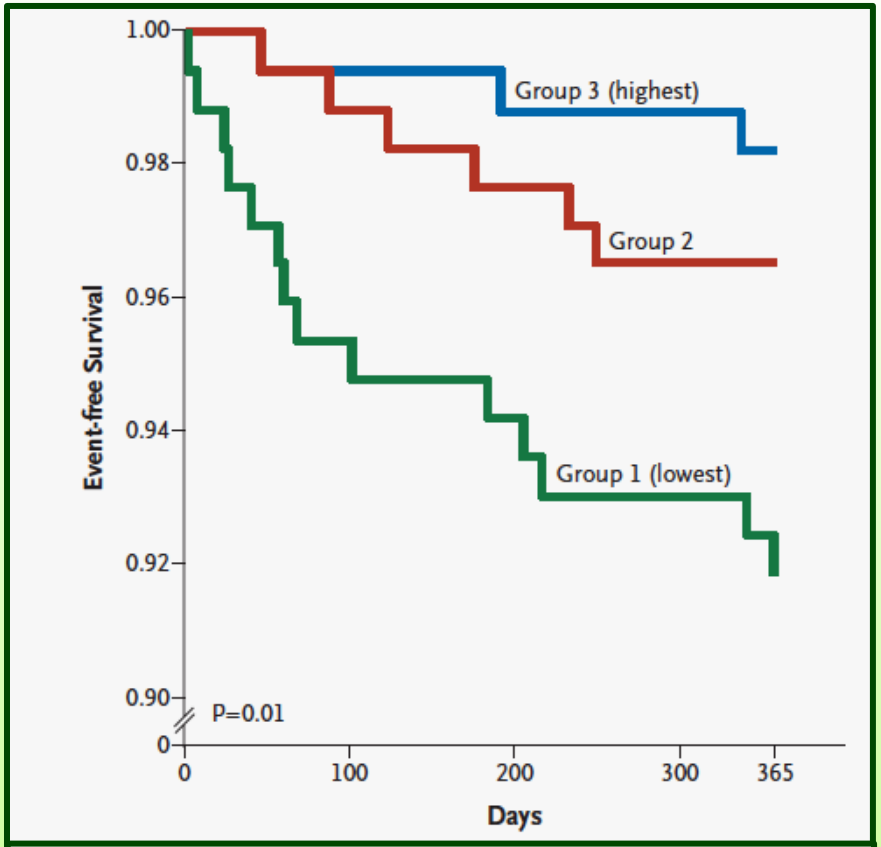
Circulation. 2005;111:204-211

Metabolic syndrome



Atherosclerosis 207 (2009) 213–219

Cardiovascular risks



No. at Risk					
Group 1	168	160	158	156	77
Group 2	172	170	168	166	83
Group 3	167	166	165	165	82
Total	507	496	491	487	242

The level of CD34+ cells is one of the best predictors of cardiovascular health; the higher the number of circulating CD34+ cells, the greater the cardiovascular health.

New England Journal of Medicine, September 8, 2005

Conclusion

1. Deficiency in daily stem cell-based tissue repair could be an underlying cause of many degenerative diseases.
2. Endogenous stem cell mobilization could have a wide application in the prevention and treatment of diseases, as well as recovery from surgery.
3. The number of circulating stem cells could be a marker for overall health/morbidity.

THANK YOU