

# Therapie des akuten Herzinfarktes mit Stammzellen

## 1. Doppelstunde ESF II WS2016

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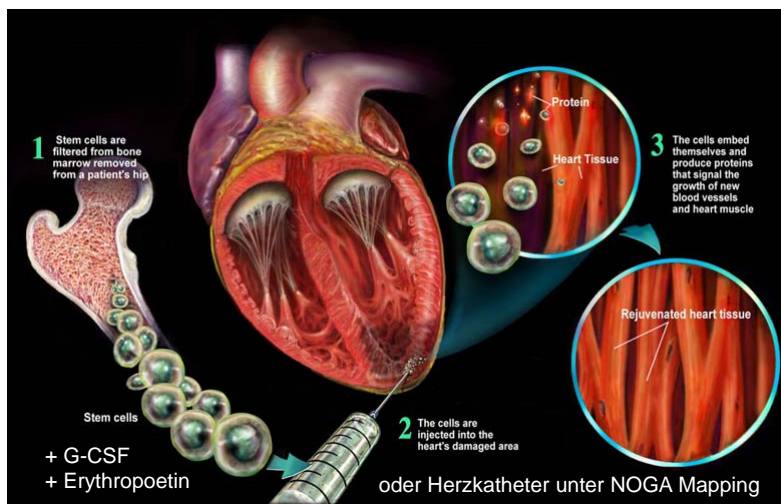
## Mending broken hearts

Stem cell therapy of acute myocardial infarction (AMI)

- Embryonic stem cells ESCs → too risky because of tumor formation, ethical issues allogenic
- Induced pluripotent cells iPSC → too risky because of tumor formation
- Induced cardiomyocytes iCMCs → one pre-clinical study; too early for evaluation
- Cardiac stem cells CSCs → not available in sufficiently large quantities allogenic
- Induced cardiac stem cells iCSCs → -"
- Adipose tissue-derived mesenchymal stem cells ADSCs → seems not to differentiate properly but may provide growth factors
- Bone marrow stem cells BMSCs / HSCs → safe, but are they suitable for cardiac therapy?

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„How stem cell therapy works“:



<http://adultstemcells.web.unc.edu/files/2013/12/heart.jpg>

Meta-analysis of stem cell therapy after AMI

International Journal of Cardiology 177 (2014) 764–770

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: [www.elsevier.com/locate/ijcard](http://www.elsevier.com/locate/ijcard)

Review

Effectiveness and safety of selected **bone marrow stem cells** on left ventricular function in **patients** with acute myocardial infarction: A meta-analysis of randomized controlled trials

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Circulation Research

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INTEGRATIVE PHYSIOLOGY

Cardiac Stem Cell Treatment in Myocardial Infarction  
A Systematic Review and Meta-Analysis of Preclinical Studies

Peter Paul Zeebsoot, Anna Maria Dorostkar Vagh, Sanne Johanna Jansen of Lorkaers, Gerardus P.J. van Hout, Gillian L. Currie, Emily S. Serna, Hendrik Grimmels, Jan Willem Buijssema, Maria-Jose Doumaers, Malcolm R. Macleod, Pieter A. Dorrevants, Steven A.J. Chamonek and Jeroen P.B. Snijder

<http://dx.doi.org/10.1161/CIRCRESAHA.115.307676>  
Published: April 15, 2016

### Bone marrow cell therapy of myocardial infarction in humans

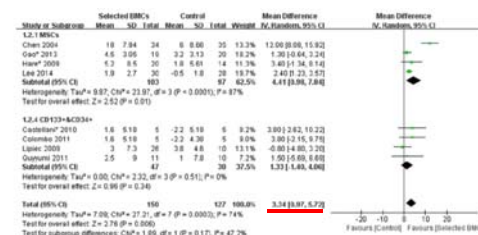
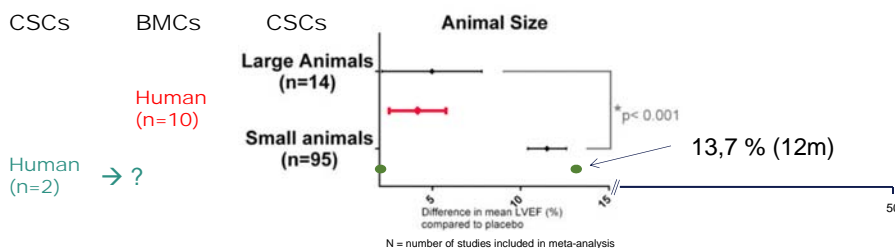


Fig. 6 Forest plot of mean difference (MD) with 95% confidence interval (CI) in left ventricular ejection fraction (LVEF) comparing different cell types in the included trials. Subgroups were divided into (A) BMSCs and (B) CD133+ combined with CD133-.

### Cardiac stem cell therapy of myocardial infarction in animals



### Literatur zur AMI-BMSCs und CSC Therapie

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## Conclusion

- LVEF is normally between 55 and 70% and life-threatening if below 35 to 40%.
- Acute myocardial infarction (AMI) causes a LVEF well below 35%.
  
- Clinical studies with different bone marrow-derived cell populations resulted in ~ + 3.3% LVEF
- Animal experiments with different populations of cardiac stem cells
- resulted in ~ + 4.7% LVEF (+12% in small animals)

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## Take home message:

- Currently CSCs are not superior to BMCs in large animals (and humans).
- Both cell types cannot increase the quality of life after acute myocardial infarction.
  
- → Alternative strategies should be evaluated
  
- → Guidelines for Stem Cell Research and Clinical Translation der ISSCR

<http://www.isscr.org/home/about-us/news-press-releases/2016/2016/05/12/isscr-releases-updated-guidelines-for-stem-cell-research-and-clinical-translation>

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## Alternative strategies to „cell therapy“

Activation of endogenous cardiac stem cells with

- Growth factors e.g. SDF-1 $\alpha$ /CXCR4 or HGF/C-Met
- Peptides and „very small gene“ products
- Micro RNAs e.g. miR206/499 via exosomes
- Drugs e.g. Cardiogenol

... which influence regulatory processes in CSCs.

Major requirement to study regulatory processes in cardiac stem cells:

A phenotypical stable cardiac stem cell line.

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Nachtrag zur Einführung



[Karl Sigmund](#)

Springer Fachmedien Wiesbaden,

12.03.2015 - 357 Seiten

ISBN 9783658085346

Der Wiener Kreis ist aus dem Geistesleben des 20. Jahrhunderts nicht wegzudenken. Anknüpfend an Russell und Einstein versucht ein Team von Mathematikern, Naturwissenschaftlern und Philosophen die Grundlagen einer wissenschaftlichen Weltanschauung zu legen, im scharfen Gegenwind der reaktionären Politik der Zwischenkriegsjahre. Anschaulich, einfach und einprägsam stellt Karl Sigmund eine der spannendsten Episoden der radikalen Moderne dar - einer Episode, die vom Nationalsozialismus zerstört wurde, aber im angelsächsischen Exil reiche Früchte trug. Viele der damals angerissenen Fragen haben heute noch ihre Auswirkungen: Es führt eine Linie von der symbolischen Logik Carnaps und Gödels zur Informatik, und die wissenschaftliche Weltanschauung ist so selbstverständlich geworden, dass wir sie kaum mehr wahrnehmen. Ein Buch für alle an der Kulturgeschichte des 20. Jahrhunderts Interessierten, das naturwissenschaftlich und geisteswissenschaftlich orientierte Leserinnen und Leser in gleichem Maß anspricht.