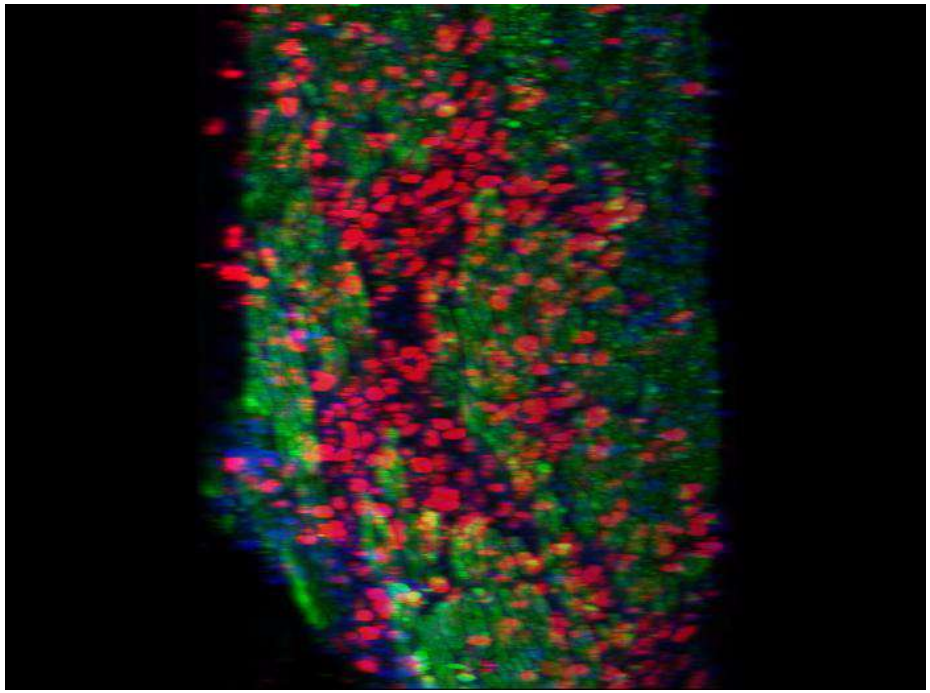
Newcastle University
Institute of Genetic Medicine
CardioVascular Research Centre



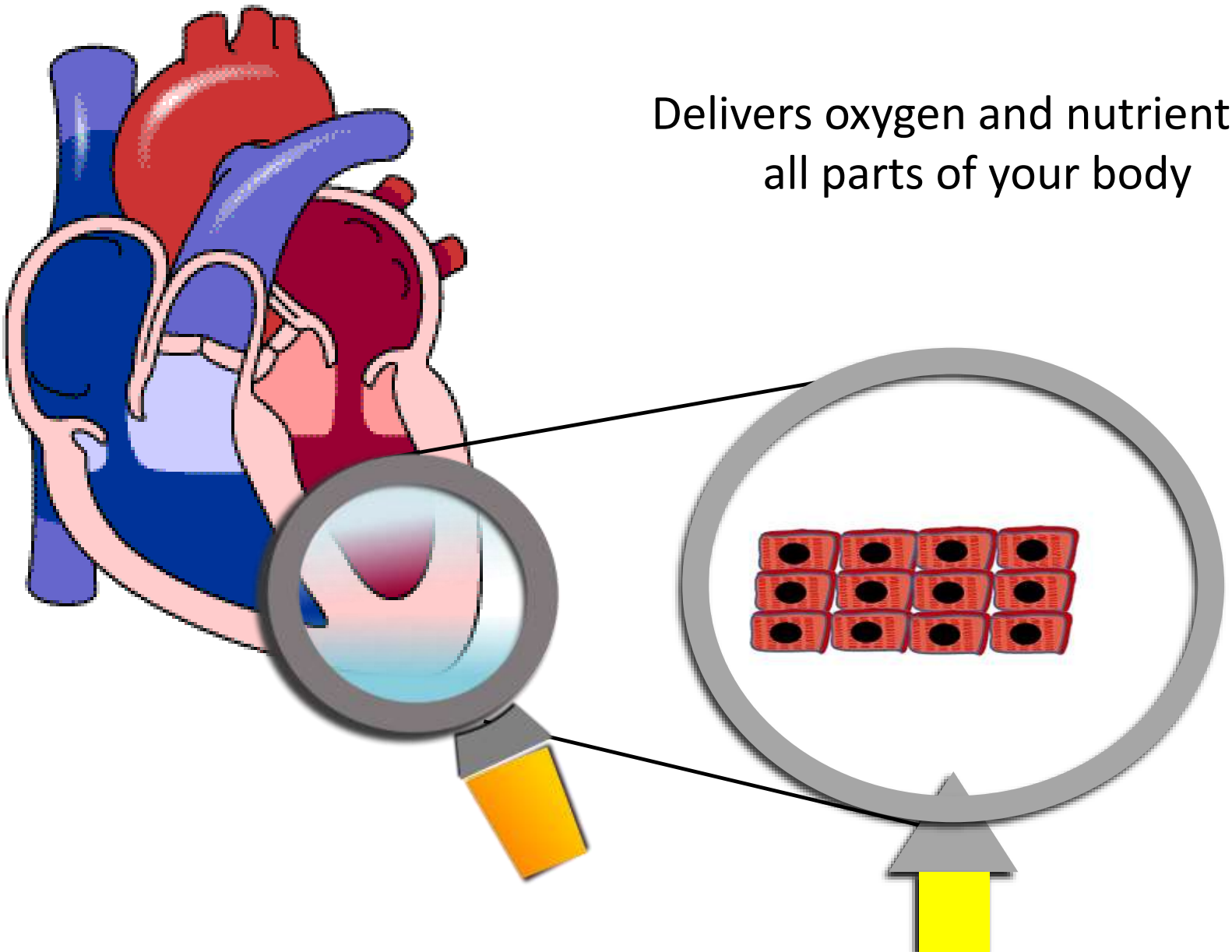
Heart Regeneration and Ageing

Dr Gavin Richardson

British Heart Foundation
MENDING BROKEN HEARTS

The Newcastle upon Tyne Hospitals NHS
NHS Foundation Trust

The Heart



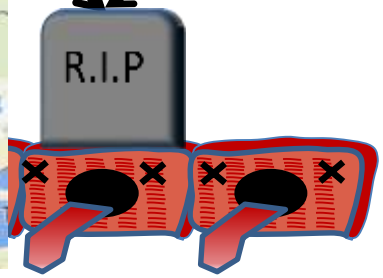
Delivers oxygen and nutrients to all parts of your body

Why research h
and a

Heart attack

Increase
er r

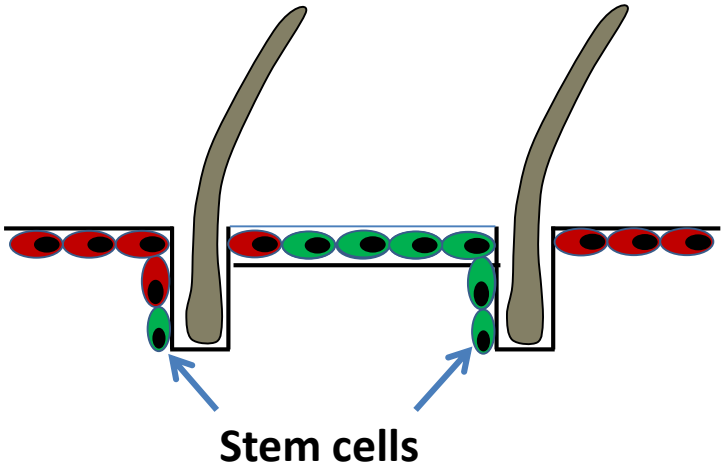
42 million beats every year

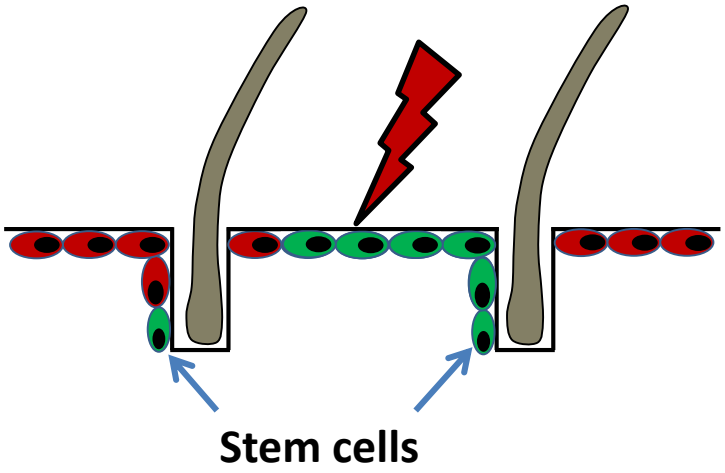


Regeneration in other organs

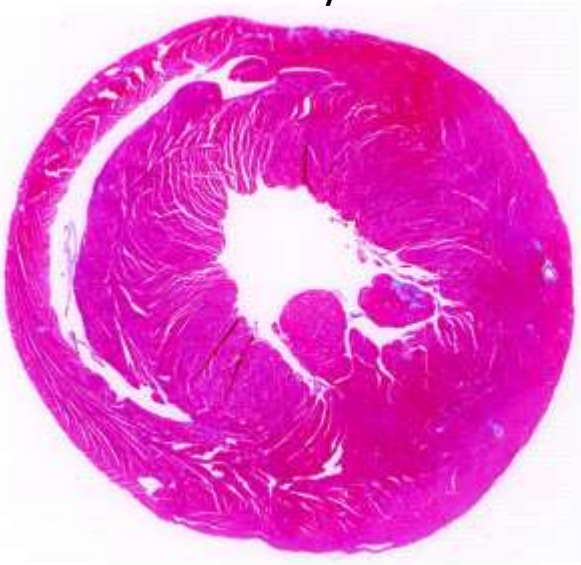
Normal ageing

Skin injury

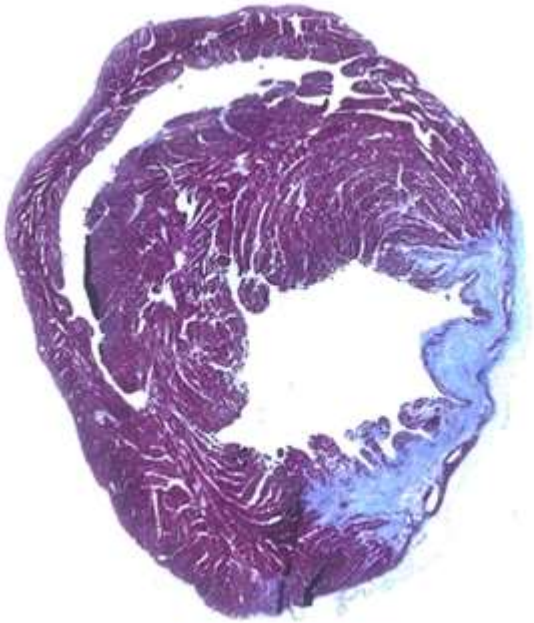




Healthy

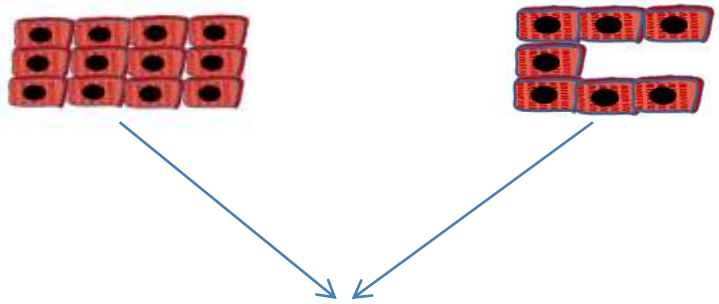


Heart Attack



n in the heart

Ageing

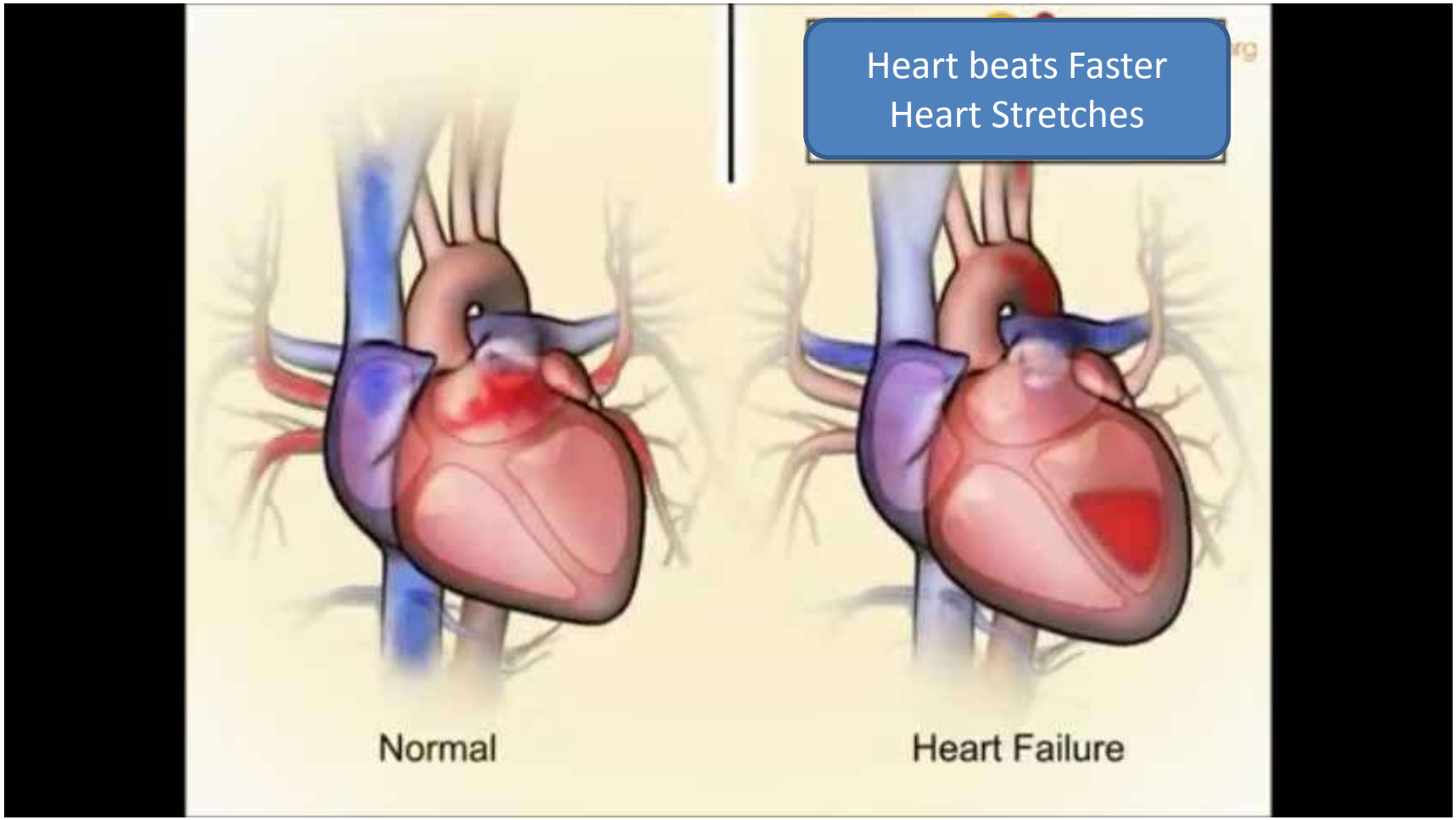


Same cells

No replacement of lost cells

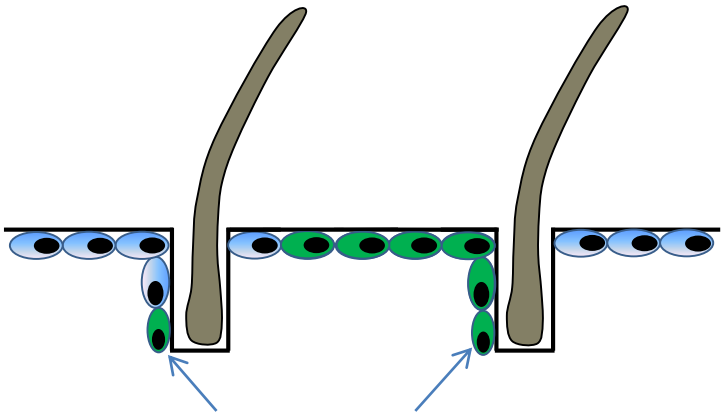
ce

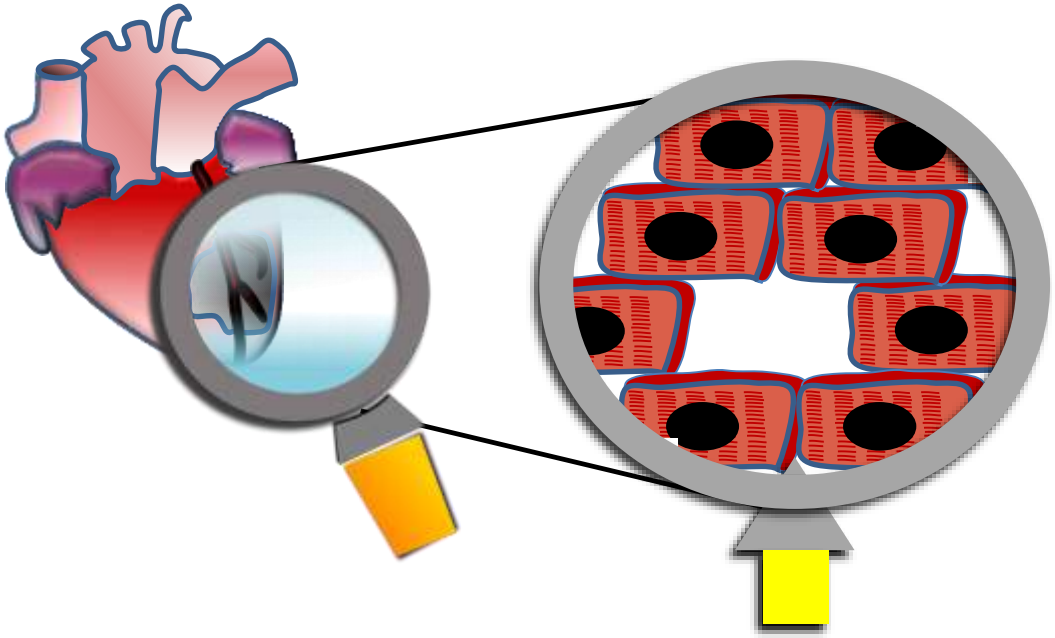
Heart failure



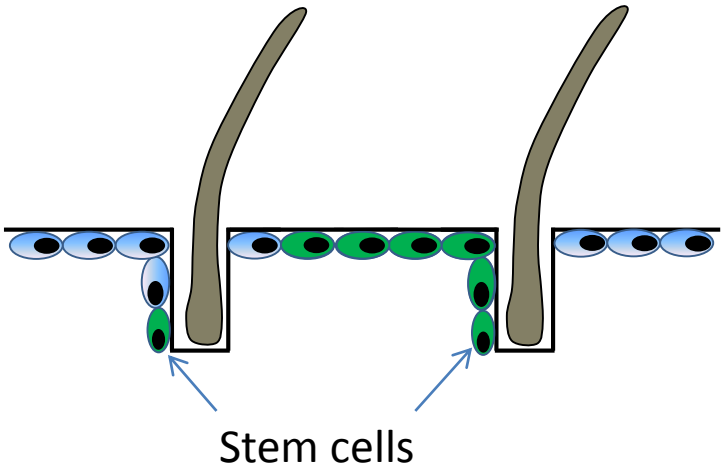
How do you mend a broken heart?

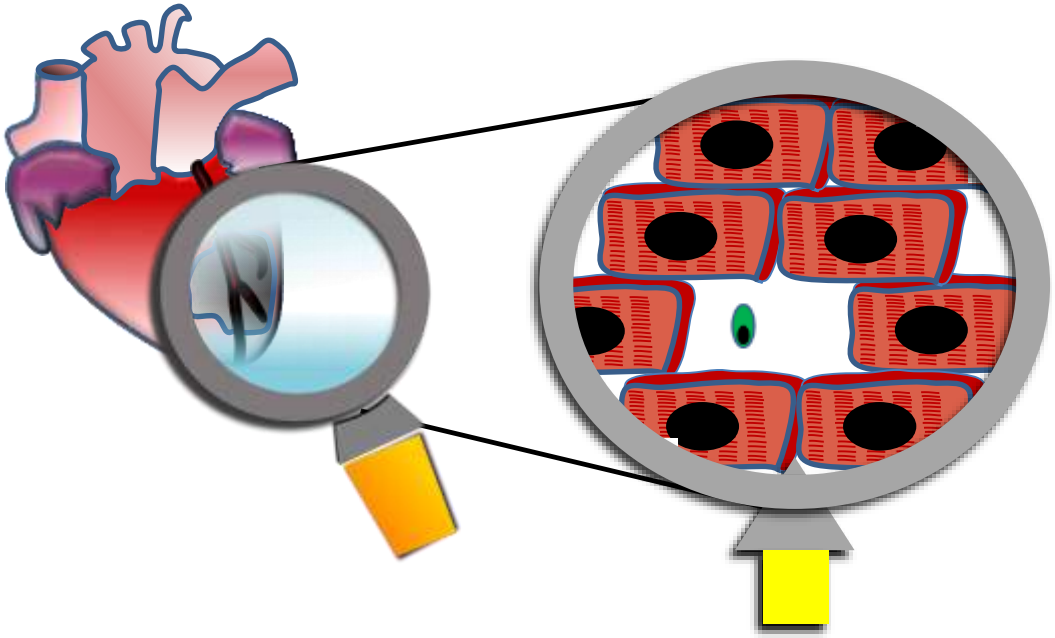
Stem cell transplant





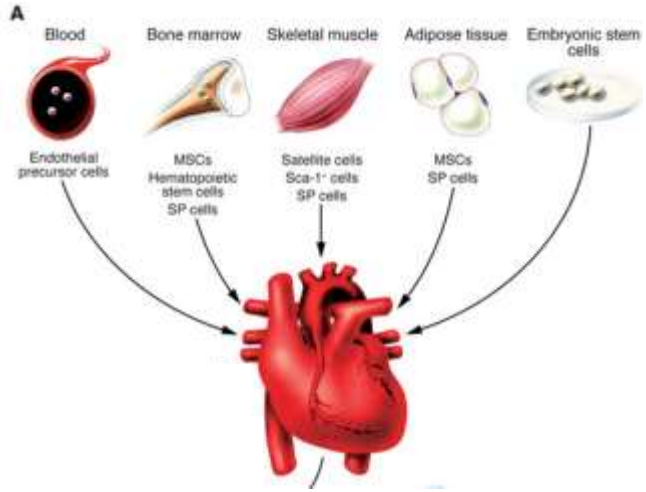
Stem cell transplant





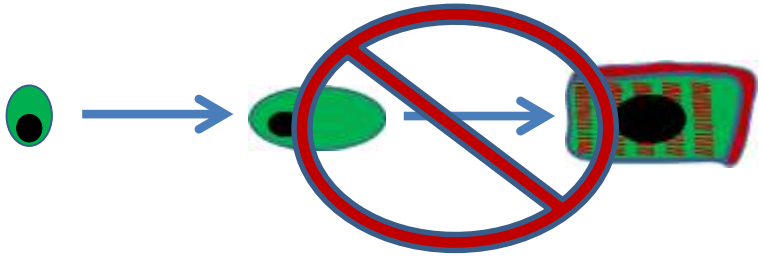
Stem cell transplants work

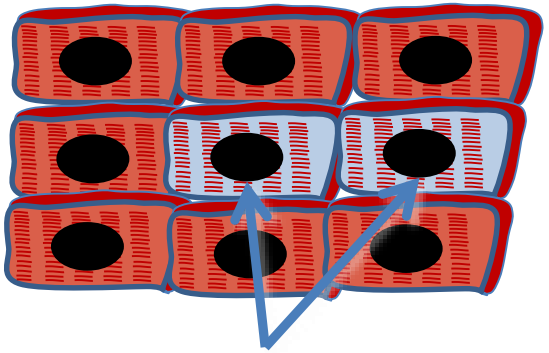
Different types of stem cells



- Better pumping function
- Increased health in patients

Don`t work as we expected





New muscle cells
Not from transplanted cells

Can the heart regenerate after all?

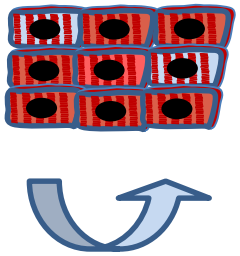
INSTITUTE OF Genetic Medicine

British Heart Foundation

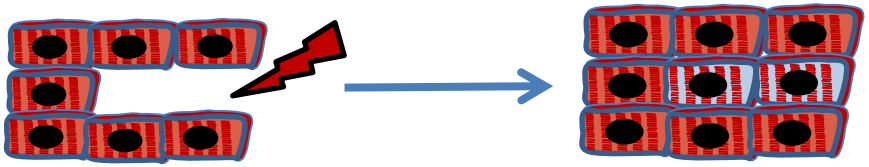
MENDING BROKEN HEARTS

Our questions

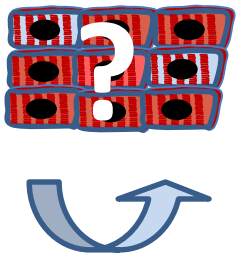
1. Can the heart replace muscle cells?



2. Does the heart make more muscle cells in order to heal itself after injury?



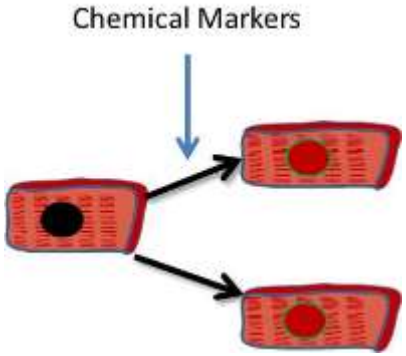
3. What happens to this ability as we age



Can the heart make new muscle cells? Does the heart attempt to heal itself?

healthy

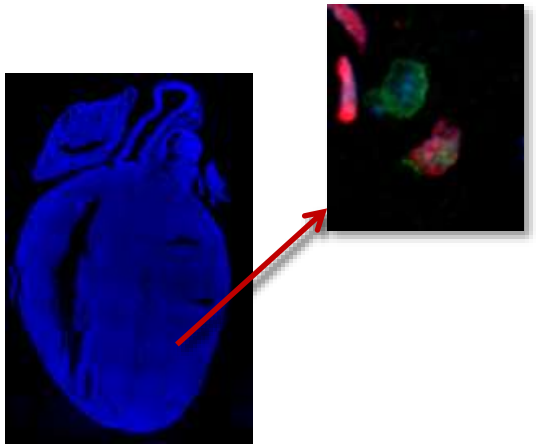
Heart failure



Red = New Cells

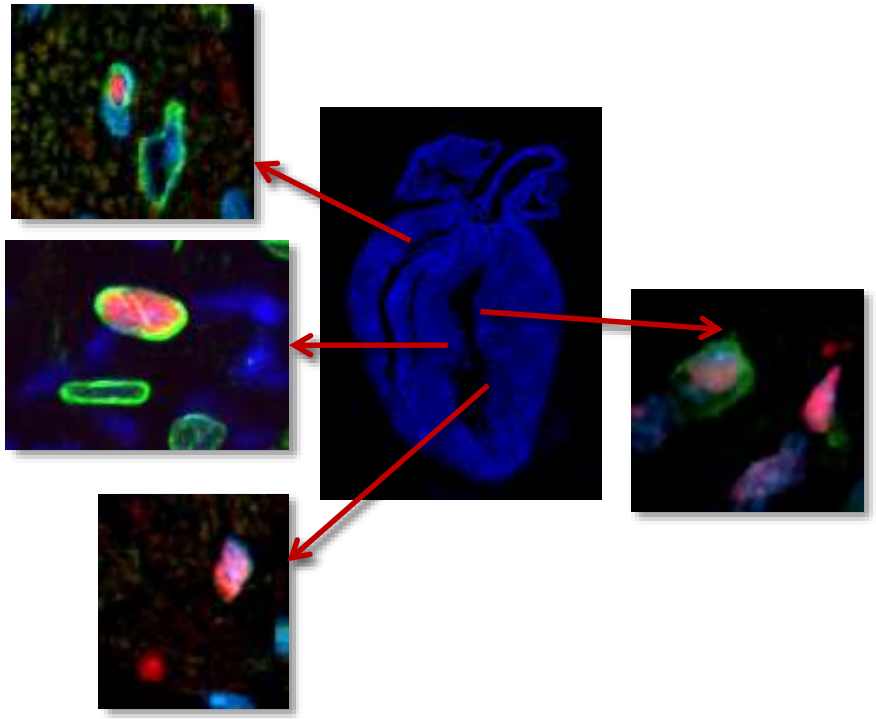
Green = Muscle cells

Healthy heart



The healthy heart makes new muscle cells

Heart failure

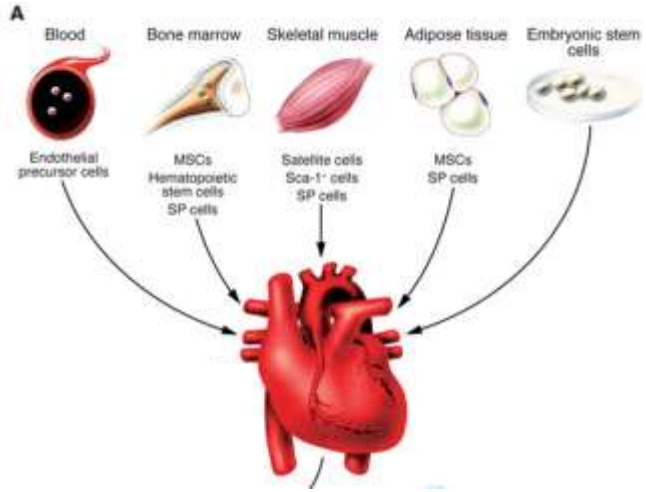


In hearts with heart failure the heart increases the
rate of new muscle cells generation

The heart can make new cells
And attempts to heal itself

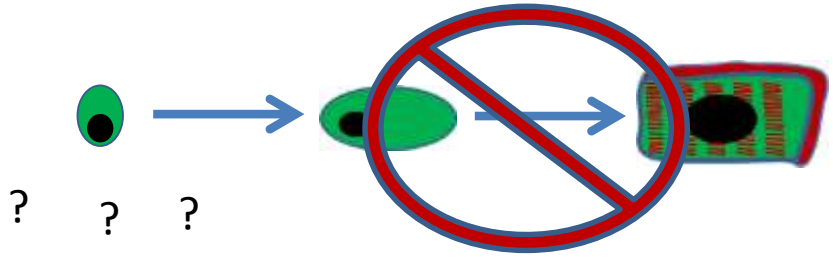
So how do stem cell Transplants work?

Different types of stem cells



- Better pumping function
- Increased health in patients

Doesn't work as we expected



So how do stem cell Transplants work?

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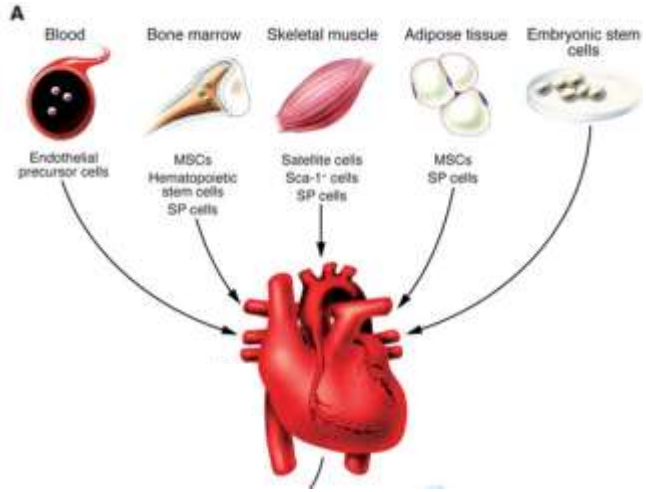

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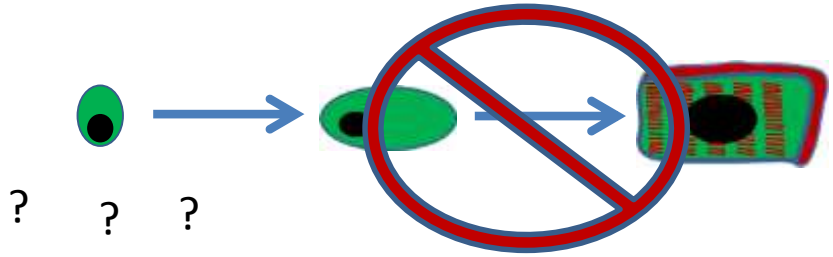

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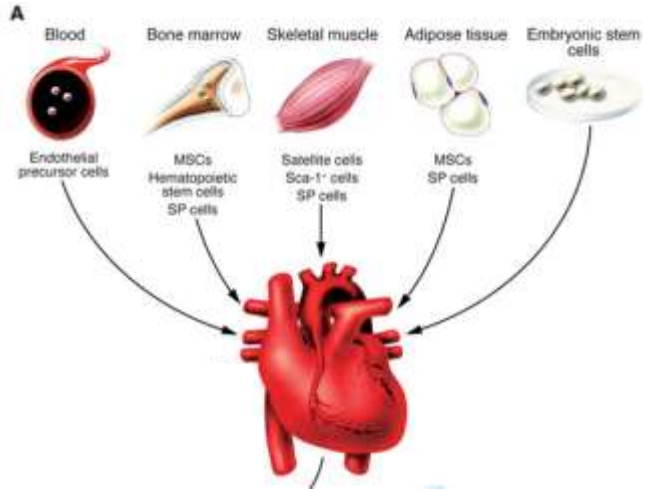

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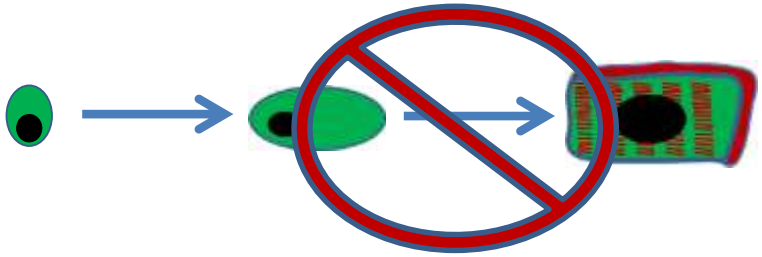
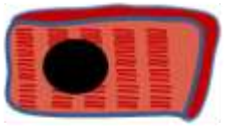


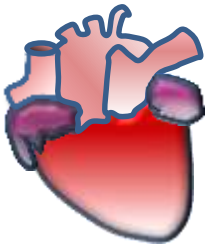
If the heart can make new muscle cells why does it get old?

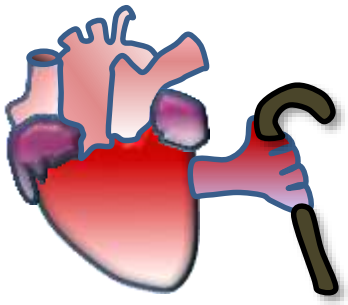


If we can keep making new heart muscle cells then why does the heart not work as well when we are older?

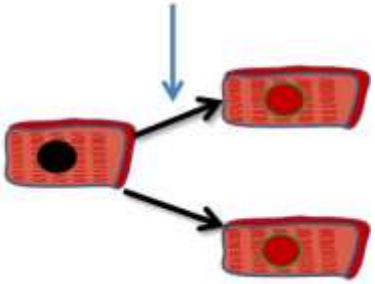
What happens to regeneration as we age?

Ageing

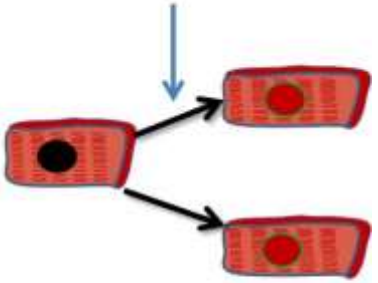




Chemical Markers



Chemical Markers

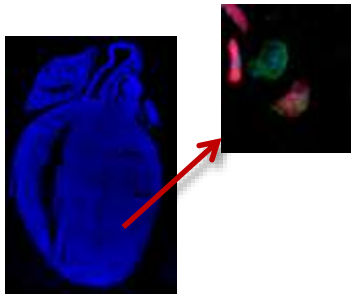


Red = New Cells
Green = Muscle cells

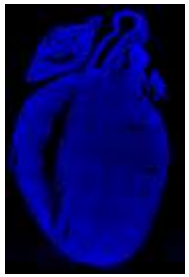
Red = New Cells
Green = Muscle cells

The ability to make new muscle cells decreases with age

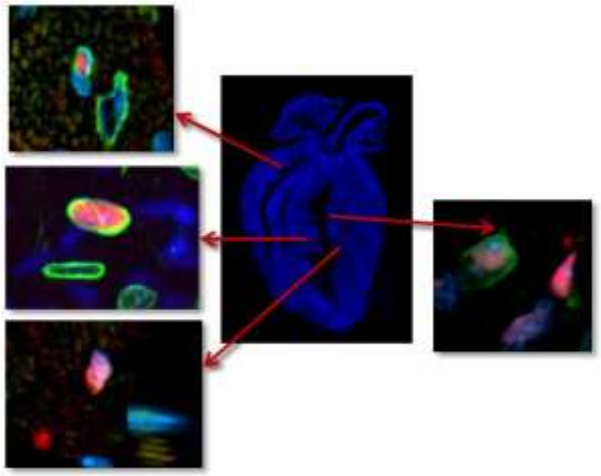
Young heathy



Old healthy



Young heart failure

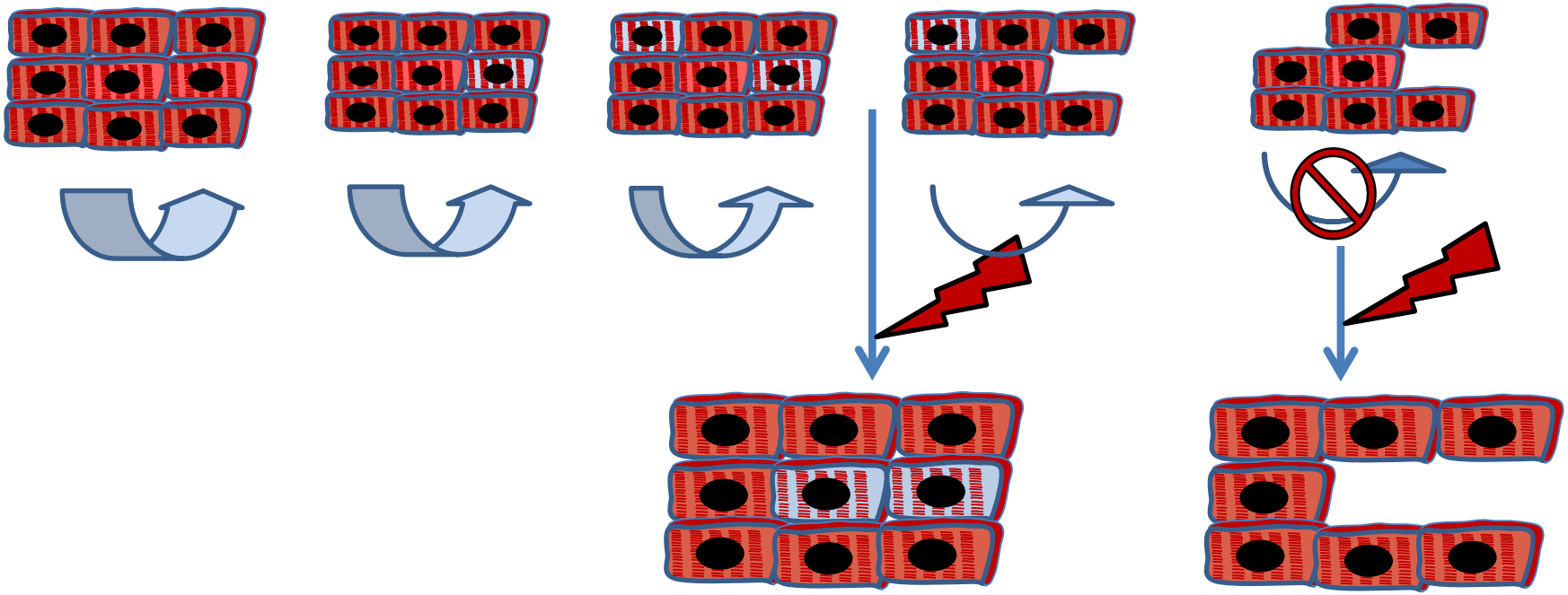


Old heart failure

Regeneration and ageing
The bad news





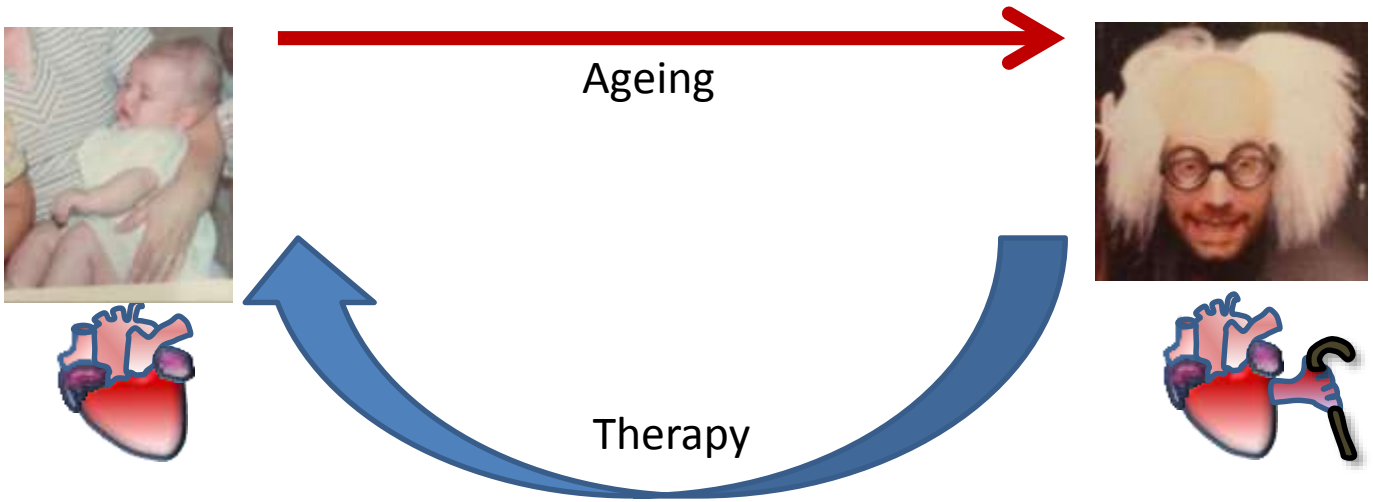


Regeneration and ageing
The good news

- The heart can make new muscle cells
  - Attempts to heal itself
  - This isn`t enough to heal the heart

- This can be increased by chemicals produced by stem cells

- We have an understanding of why the heart ages



INSTITUTE OF Genetic Medicine

Thank you for your Time and for listening

British Heart Foundation MENDING BROKEN HEARTS

The Newcastle upon Tyne Hospitals NHS
NHS Foundation Trust