

STEM CELLS IN THE ADULT HUMAN BRAIN - GOOD NEWS FOR ME?⁽¹⁾

1. INTRODUCTION

i) What are Stem Cells?

After fertilisation of mammalian egg cells, a small cluster is produced of embryonic “stem cells” which have, at that time, no predetermined function. As foetal development progresses, these “uncommitted” stem cells become committed to specialised work in supplying the specific needs of various organs and tissues, including blood forming elements and brain cells.

ii) History of Stem Cell Research

Over 30 years ago, similar “uncommitted and untrained” bone marrow cells were discovered in animals (and subsequently in adult humans) which had the potential of forming blood components including red and white corpuscles, blood clotting and immune factors and any other haemopoietic function required.

By the 1970’s similar “haemopoietic” stem cells were being cultured and harvested for bone marrow transplantation into patients suffering from potentially fatal conditions such as leukaemia (which can now be treated and subsequently cured.)

iii) Neuropoiesis in the Adult Human Brain

The enthusiasm generated by successful bone marrow transplantation and the rapid technological advances made in the science of haematology, are now being applied to the unexpected finding (in 1994) of an analogous stem cell system in animals and later (in 1999) in adult humans. Embryonic cell remnants, like discarded bricks from a building site, are found to be still active in nooks and crannies of the brain (eg. adjacent to the Hippocampus) functioning, as they have since the dawn of creation, to perform minor repairs to brain injuries.

CONCLUSION (Definitely good news for ME and all chronic neurological conditions!)

2. STEM CELLS FOR ALL SEASONS⁽²⁾

- Resources and Clinical Issues : -

i) Criteria for the Use of Stem Cells

They must be capable of self renewal and of producing the same or different progeny. It is desirable that they should be free from ageing and able to remain active during the lifetime of the host.

I ii) Candidate Stem Cells:

a) Embryonic Germ Cells

These cells, derived from the earliest cell division of the embryo (Blastocyst stage) appear to be the most useful as they potentially fulfil above criteria. However, the natural supply is limited as they may not self renew in vivo. They may also be subject to ageing and will need considerable cultural manipulation. There is however, a ready supply of surplus cells (currently being destroyed) from standard in vitro fertilisation (for infertility) and from other sources which do not offend religious beliefs.

b) Somatic Stem Cells from Human Adults

These are derived at a later stage in development and are therefore less capable of differentiation but which can be found in many sites including the liver, spleen, and bone marrow. Culture can be enhanced by attention to their natural biochemical and environmental requirements.

c) Stem Cell Plasticity

The phenomenal interest in stem cell biology over recent years has turned it into the most exciting field of science in 2002 and it has been shown that haemopoietic and neural cells can differentiate into a wide variety of different cells lines – to say nothing of those which can supply material for liver, lung, brain supporting tissue, (glial cells), cartilage, bone, adipose tissue, skin and muscle fibres including heart muscle. In fact, there is almost no chronic illness or disease arising from ageing which, potentially, cannot benefit.

Clinical Problems

Although many of these procedures are already well established in the treatment (and cure!) of leukaemia and other haematological malignancies, we still need research into : -

- (i) methods of culture using Cytokines and stimulatory growth factors,
- (ii) readily available sources of stem cells (eg. umbilical cord blood),
- (iii) suitable preparatory regimes for patients before a transplant,
- (iv) the use of grafting techniques to prevent rejection.

CONCLUSION

During the week ending April 27th 2002, we were able to listed to two actors speaking on TV and radio about their recovery or hope of recovery, from formerly fatal illnesses. The first (an English actor) recalled his recent recovery from leukaemia and current return to a busy life on stage and film, while the second (a Canadian) called himself a “lucky man” to be still working full time in his chosen career despite having recently “come out” with a diagnosis of Parkinsons disease for the past 5 years.

Their confidence will be well founded if we can convince our present Health Service Managers to support serious research into prevention (by the work described above) of a wide range of chronic neurological and other illnesses still shamefully neglected and deteriorating ^(3.)

GOOD NEWS FOR US ALL!!

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