

Graphene oxide to help reconnect human nerve cells...

Nerves and their connections are the wiring in our bodies that connect brain to muscles. When this goes wrong we can end up paralysed and permanently incapacitated. So when I heard that a team in South Korea found that graphene oxide could help nerves reconnect I thought you might like to know too...

The global context

According to the World Health Organisation every year, around the world, between 250,000 and 500,000 people suffer a spinal cord injury. While there is a lot of research for treating brain/spinal cord injuries there is no cure.

The problem

Human nerve cells join to one another with long fibres called axons and connections called synapses. Ideally scientists would like to grow connected nerve cells so they can be used in transplant operations. Nerve cells can be grown in the lab but these connections grow out in uncontrolled, random directions. Repairing nerve damage means making axons grow in the direction needed and this isn't what the nerve cells do in the lab.

The solution

The South Korean scientists have found a way to make the nerve cells grow in any pattern they want. They reported their work a few weeks ago in a paper titled "Magnetic Force-Driven Graphene Patterns to Direct Synaptogenesis of Human Neuronal Cells"

Scientists know that graphene oxide nanoplatelets are not only compatible with human tissue but can form a scaffold over

which human cells will grow. Graphene oxide can be printed on surfaces using lithography. The problem is that when repairing axons the printed structures need to be modified to make sure that the start and end points align with the nerve cells requiring repair.

The team made graphene oxide nanoplatelets with magnetic particles attached using a compound called (3-Aminopropyl) triethoxysilane (APTES).

The APTES can be thought of as glue that sticks the magnetic iron to the graphene oxide. This means the graphene oxide nanoplatelets can be steered using magnets to bridge the gap between two human nerve cells.

When in place the cells grow over the graphene oxide using it as a guide and accurately aligning the lab grown transplant cells to the ends of the damaged nerve fibres.

Summary

This is not a cure. This is lab work that shows graphene oxide can be used to manipulate the way nerve cells grow. It seems to me this is a big step forward giving researchers a method to tailor grown transplant cells to repair damaged connections in a human body.

This work should also be able to recreate damaged areas, at least in two dimensions so that the repair operation can be rehearsed before the actual operation is done.

And by now dear reader, you will be ahead of me. If this can be done in two dimensions then it should be possible to manipulate the graphene oxide guides in three dimensions and form the basis for a future 3D printing of nerve fibres using CT scans to provide the model of the structures required.

All this is yet to come, however I hope you will agree that this work lays the foundations for repairing brain damage and

spinal cord injuries that will give hope to millions of people in the future.