Genetic selection

Are you born an astronaut? Read our background information and decide for yourself

The mapping of the human genome is one of the greatest achievements in our scientific history. Now, many people are discussing ways in which we can benefit from having this information.

One of the first biologists to sequence the human genome – Craig Venter – has advocated the use of genetic selection in space exploration. What if you could look into someone’s genetic sequence and pick astronauts who have genes for strong bones? The effects of bone-density loss in microgravity could be minimised. Equally, if someone’s genetic analysis shows that their DNA repairs itself very quickly, that could help armour them against space radiation (and minimise cancer risk).

Is it ethical to select someone for a job based on their genetic information? Would it only apply to astronauts, or would it set a dangerous precedent for other professions too? Currently it is illegal in the US to pick someone for a job based on their genetic information. There is no similar law in the UK.

Would genetic selection be a step towards genetic modification of an astronaut? We can already modify foods to last longer, taste better and give astronauts more of the nutrients they need. We could also modify the bacteria in the gut to keep astronauts healthier in space – is that okay? Why not go a step further and actively alter the genome of the astronaut candidates most mentally suited to space exploration so that they are physically versatile too? Where would you say the line is? Why?

Looking way into the future, could we select or modify cyanobacteria to absorb Mars’s thin atmosphere of carbon dioxide and pump out oxygen so that we can eventually live there ourselves?

Astronaut requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum height</td>
<td>1.9 m</td>
</tr>
<tr>
<td>Minimum height</td>
<td>1.57 m</td>
</tr>
<tr>
<td>Visual acuity</td>
<td>6:6</td>
</tr>
<tr>
<td>Sitting blood pressure</td>
<td>140/90</td>
</tr>
</tbody>
</table>

ABOUT THIS RESOURCE

This resource first appeared in ‘Big Picture: Space Biology’ in June 2015. Published by the Wellcome Trust, a charity registered in England and Wales, no. 210183.
bigpictureeducation.com
PROS

- The dangerous effects of human spaceflight are likely to be minimised by genetically selecting those best suited to those conditions.
- Achievements in space would likely be faster as we wouldn’t have to spend time working out to solve problems like bone-density loss.

CONS

- Is it ethical to screen or tamper with someone’s genetic sequence for the purposes of what is, in effect, just a job?
- We might miss out on the spin-off technology that comes from trying to solve these problems in space rather than genetically.

REFERENCES

NASA: Astronaut requirements
San Diego Union-Tribune: Craig Venter to NASA: Think about engineering your astronauts