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How two-tone cats get their patches comes to light in cell study

Scientists have discovered how the distinctive piebald patches seen in black and white cats and some horses are formed in the womb.

Their insights could shed light on medical conditions that occur early in development, such as holes in the heart, which are caused by cells not moving to the right place as an embryo develops.

Researchers who set out to learn how pigment cells behave in mice found that they move and multiply randomly during early development rather than follow instructions.

Their findings contradict the existing theory that piebald patterns form on animals' coats because pigment cells move too slowly to reach all parts of the embryo before it is fully formed.

The study, by mathematicians and geneticists, shows that there is no complicated cell-to-cell communication to send the cells in a particular direction.

The same mathematical model could now be used to follow other types of cell during early development. Researchers at the Universities of Bath and Edinburgh, who carried out the study, say it could help them better understand conditions linked to early cell positioning.

Dr Richard Mort, from the University of Edinburgh's Medical Research Council Human Genetics Unit said: "We already know cells move through the developing skin to create pigment. We have discovered that they move and multiply at random which is not what was expected. Using a mathematical model we were then able to show that this simple process could explain piebald patterns."

Dr Christian Yates a Mathematical Biologist from the University of Bath, added: "Piebald patterns can be caused by a faulty version of a gene called kit. What we have found is counter intuitive. Previously it was thought that the defective kit gene slowed cells down but instead we've shown that it actually reduces the rate at which they multiply. There are too few pigment cells to populate the whole of the skin and so the animal gets a white belly. In addition to kit, there are many other genes that can create piebald patterns, the mathematical model can explain piebald patterns regardless of the genes involved."

Ranked among the top universities in the world

The research, published in *Nature Communications*, was funded by the Medical Research Council, Medical Research Scotland, the Engineering and Physical Sciences Research Council and the National Centre for Replacement, Refinement and Reductions of Animals in Research.

For more information please contact Hazel Lambert, Press and PR Office, tel 0131 650 6357, 07464 493 020; Email hazel.lambert@ed.ac.uk.

To speak to Dr Christian Yates please contact Vicky Just in the University of Bath Press Office on +44 (0)1225 386 883 or +44 (0)7966 341 357.

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