

Researchers discover laminin which can convert stem cells into retinal-like cells

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Growing the stem cells on a protein called laminin, which is typically present in the structural matrix outside of cells, the researchers observed the formation of cell colonies arranged as four concentric zones. Each of these zones exhibited characteristics specific to a particular anatomical component of the eye. By varying the type of laminin used, the researchers were also able to obtain cells with different mobilities, densities and tendencies to interact. For each version or isoform of laminin, the resultant cells differentiated in vitro matched those found in various parts of the eyes of embryonic mice where the same laminin isoform predominated.

“We found that the different laminin isoforms affected whether and how fast the cells migrated outwards from the point at which the colony was originally seeded and the density at which the cells in the colony were packed,” said Hayashi. “These different behaviors were related to the kinds of cells that the stem cells turned into, showing that we could specifically produce an ocular cell type just by choosing the appropriate type of laminin for the targeted cells.”

The researchers further investigated the molecular mechanisms behind these different behaviors. They found that the laminin isoform that gave rise to colonies with four concentric rings caused the contraction of extracellular structural scaffolds that tether cells together, producing higher-density colony centers. This in turn led to the inactivation of a protein called YAP, which in turn promoted the differentiation of pluripotent stem cells into retinal-like cells in the colony centers. “Now that we can use different laminins to program stem cells to become particular cells found in different parts of the eye, we can harvest and apply them in treatments for a range of ocular diseases,” said Professor Kohji Nishida of Osaka University, who is a co-author of the study. “This could be an extremely useful tool in the field of ophthalmology.”

The study is published in the journal Cell Reports.