The Function of p53 in Intestinal Epithelium Wound Healing

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The intestines are a crucial part of the digestive system, aiding in digestion and nutrient absorption. They feature a columnar barrier of intestinal epithelial cells, called the intestinal epithelium, that is responsible for absorbing nutrients and defending against antigens. The barrier possesses unique regenerative processes that renew its lining every 3-5 days, whilst maintaining almost identical cell structure and cell type ratio. The intestinal epithelium is studied for its role in stem cell nodes and monolayer development regarding cell signaling and intestinal epithelial wound healing. The tumor suppressor gene, P53, has been linked with leader cell behavior during cell migration in MDCK monolayer development. Through study, we observed the function of p53 during intestinal epithelium wound healing, with the GiLA1 organoid line and p53-mNeonGreen and H2B/iRFP protein trackers. A live-cell imaging movie encapsulated the development of the organoid monolayer and was further analyzed through automated cell tracking. Immunofluorescent staining for Ki67 was used to compare the protein expressions within various cell types. We observed three transient and unique p53-positive cell types during wound healing. One of these types displayed a canonical p53 response, suggesting a different role for the other subtypes. We identified p53WAR (Wound Associated Repair) cells as essential leaders of collective cell migration during wound healing. We further discovered localized p53 in Ki67 high cells originating from the stem cell nodes. Lastly, most Wound Associated Epithelial (WAE) cells were p53-negative, but showed a transient increase in p53 after wound closure, suggesting a role for p53 in re-differentiation.

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