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The cellular mechanisms underlying mammary tissue plasticity during lactation.

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The mammary tissue is characterized by its capacity to adapt in response to a wide variety of changing conditions. This capacity of adaptation refers to the mammary tissue plasticity. In dairy ruminants, lactation is challenged by modifications that can either be induced on purpose such as modifications of management practices, or involuntary when adverse environmental constraints arise. These modifications can elicit both immediate changes in milk yield and composition and carryover effects that persist after the end of the challenge. This review focuses on the current knowledge concerning the cellular mechanisms underlying mammary tissue plasticity. One of the main cellular mechanisms contributing to mammary tissue plasticity is the changes in the activity and number of mammary epithelial cells in the tissue. The later results from changes in the rates of cell proliferation and death, as well as changes in mammary epithelial cell exfoliation. It also relies on the number of resident adult mammary stem cells and their progenitors, which can regenerate the pools of mammary cells. Epigenetic changes may stand for an additional mechanism. Several challenges including the milking frequency, the level of feed supply and hormonal manipulations have been shown to modulate milk yield together with changes in mammary cell activity, turnover and exfoliation. Changes in DNA methylation have been observed together with reductions in milk yield during once daily milking and during mastitis in dairy cows, and may affect cell activity sustainably. In contrast to what has been assumed for a long time, no carryover effect on milk yield were observed during challenges induced by the level of feed supply in dairy cows and milking frequency in dairy goats, even if the number of mammary cells was reduced. In addition, the mammary tissue plasticity have been shown to be influenced by the parity, the stage of lactation, the health status and genetic factors. In conclusion, the cellular mechanisms underlying mammary tissue plasticity are diverse and the mammary tissue can either shows elastic properties (with no permanent deformation) or not in response to environmental changes.