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Waves of ratcheting cancer cells in growing tumor tissue layer TAESEOK YANG, TAE KWON, HYUN KIM, KYOUNG LEE, Korea Univ, CENTER FOR CELL DYNAMICS TEAM — Over many years researchers have shown that the mechanical forces generated by, and acting on, tissues influence the way they grow, develop and migrate. As for cancer research goes, understanding the role of these forces may even be as influential as deciphering the relevant genetic and molecular basis. Often the key issues in the field of cancer mechanics are to understand the interplay of mechanics and chemistry. In this study, we discuss very intriguing population density waves observed in slowly proliferating of tumor cell layers. The temporal periods are around 4 hr and their wavelength is in the order of 1 mm. Tumor cell layer, which is initially plated in a small disk area, expands as a band of tumor cells is "ratcheting" in concert in radially outward direction. By adding Cytochalasin D and Latrunculin B, an inhibitor of actin polymerization, or Mytomycin, a chemotherapeutic agent, we could halt and modulate the wave activities reversibly. The observed waves are visually quite similar to those of chemotaxing dictyostelium discodium amoeba population, which are driven by nonlinear chemical reaction-diffusion waves of cAMP. So far, we have not been able to show any relevant chemo-attractants inducing the collective behavior of these tumor cells. Researchers have been investigating how forces from both within and outside developing cancer cells interact in intricate feedback loops. This work reports the example of periodic density waves of tumor cells with an explanation purely based on nonlinear mechanics.

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