P048 Stimulatory and inhibitors signals contribute to the placement of the cleavage furrow in sea urchin eggs

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Two mechanisms have been proposed to explain cleavage plane determination: a polar relaxation model where an inhibitory signal from the spindle poles restricts the furrow to the region where microtubule density is lowest; and an equatorial stimulation model proposing that microtubule overlap between the two spindle poles delivers a stimulatory signal to the cortex. To understand cleavage plane determination in large embryonic cells, we manipulated cellular geometry and spindle bipolarity to reveal whether one or both of these mechanisms were defining the cleavage plane in echinoderm eggs. Cells with monopolar spindles, generated using derivatives of both monastrol and S-trityl-l-cysteine, underwent random cell surface contractions resembling unorganized furrows following anaphase onset. To restrict the area of cell surface influenced by the spindle, egg geometry was altered by shaping it into a cylindrical morphology. Cells manipulated in this manner displayed psuedofurrow contractility at the polar regions, whereas a furrow formed adjacent to the monaster. Cylindrical monopolar Hexylene glycol treated cells stabilize microtubules and suppress polar contractions, but appeared to enhance furrowing adjacent to the monopolar spindle. These experiments suggest that the cleavage plane is determined by a combination of both stimulatory and inhibitory stimuli imparted by the mitotic apparatus to the cortical cytoskeleton.