Supplementary figure legends:

Fig.S1 Relationship between expression levels of RUNX2, TWIST1 or RUNX2+TWIST1 CHE/NCHE and patients' DFS. Fig.S1A- S1B shows that neither RUNX2 nor TWIST1 could predict the prognosis of breast cancer (P=0.606 and 0.091, respectively) and Fig.S1C shows that RUNX2+TWIST1 CHE were significantly correlated with poor DFS (*P*=0.005).

Fig.S2 Representative images of alizarin red S staining and the average calcification content of the mice's primary tumor in co-culture, NC and co-culture+LDN group. Fig. S2A to Fig. S2 C show the three group cells stained with alizarin red S. Fig. S2D shows the bar plot comparison of average calcification content (AOD) of the mice tumor in three group, respectively.

Fig.S3 Representative staining images of CD163, BMP-2, RUNX2 and TWIST1 in of primary tumor in mice. Fig.S3A-3C shows representative staining images of BMP-2 of mice's primary tumor in co-culture, NC and co-culture+LDN group, respectively. Fig.S3D-3F shows representative BMP-2 staining images of mice's primary tumor in the three groups. Fig.S3G-3I shows representative RUNX2 staining images of mice's primary tumor in the three groups. Fig.S3J-3L shows representative TWIST1 staining images of mice's primary tumor in the three groups.

Fig.S4 Full-length gels of Fig.2B