

Mottling expression is curious, and so is blotching – what is responsible?

--Coe, E

Mottling and blotching in the aleurone tissue display patterns inconsistent with random on/off switching of pigmentation during cell division. Microscopic images of the “cobblestones” of the tissue showing mottling and blotching are in MaizeGDB:

http://images.maizegdb.org/db_images/Variation/coe9209-1413/05.jpg

http://images.maizegdb.org/db_images/Variation/coe9209-1413/03.jpg

http://images.maizegdb.org/db_images/Variation/cd7101-3161-0702/52.jpg

Some cells show pigmentation, some not. The groupings of colored cells in mottling and blotching contrast dramatically with cellular morphogenesis of the aleurone tissue, which occurs by systematic cell divisions in alternating planes (Coe, E. The aleurone tissue of maize as a genetic tool. Pp.447-459 in Walden, DB (ed). 1978. Maize Breeding and Genetics. Wiley & Sons, NY). Specifically, when *R1-st* mutates to colored during development the morphogenetic progression is revealed by the contiguous clusters of cells in binary series, from alternating planes of division: “squares to bricks to squares to bricks” -- i.e., when *R1-st* mutates just before the last division, a cluster of 2 is formed; if in the preceding division, a cluster of 4 in 2x2; 8 in 2x4; 16 in 4x4, and 32 in 4x8:

http://images.maizegdb.org/db_images/Variation/coe9209-1413/06.jpg

http://images.maizegdb.org/db_images/Variation/coe9209-1413/04.jpg

What is the pattern in mottling? The three images of mottling cited first above are unlike *R1-st* patterns, and patterns are difficult to discern. More instructive are the expressions in highly paramutant *R1-iv* or *R1-v* (four or five times paramutagenized), where pigmented cells are greatly reduced in frequency. I am unaware of photographs, but there are typically as few as 10-20 colored cells in a whole aleurone tissue. Surprisingly, the colored cells occur not in single, scattered, independently pigmented cells, but in irregular, very localized clusters -- i.e., neither a Poisson distribution nor a morphogenetic switching to “on”, but something in between. Despite the fact that the clusters are not contiguous, neighboring cells tend to be pigmented (Coe, E and Mouli, C. 1971. Mottling in maize through chance determination of an unfixed clonal state. *Genetics* **68**:s12). In standard, highly mottled aleurone tissue the patterns are also not contiguous but are suggestive of clustering, consonant with the irregular clustering in highly paramutant *R1*.

Does mottling expression reflect constancy/inconstancy of epigenetic changes in cell lineages, or perhaps of signal propagation and decay, or perhaps of the distribution of RNA or protein moieties during cell divisions?