

Gastrulation and Body Axes Formation: A Molecular Concept and Its Clinical Correlates

ABSTRACT

During the third week of human pregnancy, an embryo transforms from two germinal disc layers of hypoblast and epiblast to three germinal layers of endoderm, mesoderm and ectoderm. Gastrulation is a complex process that includes cellular mobility, morphogenesis and cell signalling, as well as chemical morphogenic gradients, transcription factors and differential gene expression. During gastrulation, many signalling channels coordinate individual cell actions in precise time and location. These channels control cell proliferation, shape, fate and migration to the correct sites. Subsequently, the anteroposterior (AP), dorsoventral (DV) and left-right (LR) body axes are formed before and during gastrulation via these signalling regulation signals. Hence, the anomalies in gastrulation caused by insults to certain molecular pathways manifest as a wide range of body axes-related disorders. This article outlines the formation of body axes during gastrulation and the anomalies as well as the clinical implications.