Important Findings in the field of Embryology with potential applications in cancer

The laboratory of Developmental Biology and Nanobiotechnology at the Department of Biological Sciences of the University of Cyprus has recently published important findings in the field of embryology in the prestigious journal Development. The research team composed of the PhD candidate Nicoletta Petridou and the posdoctoral associate Dr. Panayiota Stylianou under the supervision of Assistant Professor Paris Skourides designed and generated a highly effective dominant negative inhibitor of the Focal Adhesion Kinase (FAK). The dominant negative named FF is unique in its ability to block several aspects of FAK function \textit{in vivo} and \textit{in vitro} in a variety of cell types and tissues. FF allowed the team to explore the role of FAK during vertebrate embryonic development probing its involvement in numerous developmental processes. Specifically the team showed that FAK is necessary for gastrulation, a critical period for embryonic development during which through massive movements of cells and tissues the embryo establishes its three dimensional architecture. Loss or deregulation of FAK’s activity was shown to lead to severe morphological defects and death of the embryo. Importantly by targeting FF to specific tissues the researchers were able to answer important questions with regards to the mechanobiology of gastrulation, showing that defects in one tissue affect movements of a different tissue located relatively far from the first through mechanical linkage and force transmission. Another notable aspect of this work are the potential applications of the dominant negative in other areas of biological research. FAK has been implicated in a variety of cancers and its role in cancer progression and metastasis is well documented. For this reason several FAK inhibitors have been developed or are under development. Emerging data from early-phase clinical trials with such inhibitors are promising with indications of clinical efficacy. FF has shown to be more effective and to block a wider range of FAK’s functions compared to existing protein and small molecule inhibitors. For this reason the
research team is currently investigating the possibility that FF could used as an anti cancer agent.

Mesodermal cells during gastrulation. FF expressing cells (green) are at the front at time zero but fail to migrate and are overtaken by control cells (red) after two hours (t1).