

PATTERN SENSITIVITY TO BOUNDARY AND INITIAL CONDITIONS IN TURING-TYPE REACTION-DIFFUSION MODELS OF MORPHOGENESIS. P. Arcuri and J.D. Murray, Centre for Math Biology, Math Institute, 24-29 St. Giles, Oxford OX1 3LB, England.

Turing-type reaction diffusion mechanisms with zero flux boundary conditions have been criticized, with some justification, because of the sensitivity of the spatial patterns to changes in the initial conditions, model parameters and domain geometry and size. Here other types of boundary conditions of comparable biological justification are examined. A simple analysis is used to indicate the dominant solution characteristics as functions of parameters which incorporate domain size, diffusion coefficients, and the overall rate of the reactions. Numerical simulations show that boundary conditions which are non-homogeneous with respect to the kinetic steady state give rise to spatial patterns which are much less sensitive than those obtained with zero flux conditions, indicating that criticisms of morphogen reaction diffusion models should perhaps be tempered.

VARIATIONS IN PATTERN OF REGENERATION FROM DIFFERENT PROXIMO-DISTAL LEVELS OF LIMBS IN YOUNG FROG TADPOLES TREATED WITH RETINOL PALMITATE. I.A. Niazi and K.K. Sharma. Department of Zoology, University of Rajasthan, Jaipur 302004, India.

Rana breviceps tadpoles were immersed in 15 IU/ml retinol palmitate suspension for up to 72 h after amputation through thigh, shank and ankle segments which were at different developmental stages. Three regenerate types resulted: Normal (N) similar to controls containing only distal parts; whole limbs (WL) consisting of parts proximal to amputation level also; and undifferentiated blastemas (B). Respective percentages of N, WL and B types from the three amputation levels after 24-72 h treatments varied significantly. They were: 24 h - thigh: 32, 53, 15; shank: 5, 95, 0; ankle: 97, 3, 0. 48 h - thigh: 7, 77, 16; shank: 0, 40, 60; ankle: 2, 78, 25. 72 h immersion stopped regeneration of N, reduced that of WL to about 30% and increased that of B type to about 70% at all levels. Effect of a specific retinol palmitate treatment appeared related to developmental state of the limb at amputation level.

POSITIONAL SIGNALLING AND POSITIONAL VALUES IN A HYDROID ARE DRAMATICALLY ALTERED BY TPA, RETINOIDS AND BY ENDOGENOUS SUBSTANCES. W.A. Müller. Zool. Inst., University. D-6900 Heidelberg, Germany.

In hydroids a high positional value implies a high potential to form head structures, positional values below a critical level merely allow stolon formation.

The tumor promotor TPA causes an increase of the positional value as indicated by the regeneration of multiple heads at all positions of the hydranth. On the other hand, a substance derived from cultures of primary polyps causes a decrease of the positional value: Even heads transform eventually into stolons.

A hydra-derived inhibitor I (isolated by Berking) stops the increase as well as a decrease of the positional value.

Retinoids alter the range of positional signalling. The length of the hydranths is reduced for the benefit of stolon elongation. The distances between periodic structures such as tentacles or hydranth buds are reduced and more such structures are specified per unit length. Species: Hydractinia echinata.

PATTERN FORMATION IN DICTYOSTELIUM AS ANALYZED BY CELL TYPE SPECIFIC MONOCLONAL ANTIBODIES. I. Takeuchi, T. Noce and M. Tasaka. Department of Botany, Faculty of Science, Kyoto University, Kyoto 606, Japan.

Prestalk and prespore differentiation during the development of D. discoideum was examined by the use of specific monoclonal antibodies [M. Tasaka, T. Noce and I. Takeuchi, Proc. Natl. Acad. Sci. USA, 80, 5340(1983)]. Prior to cell aggregation, a prestalk and stalk specific antigen appears in the majority of cells, but there is a considerable variation among the cells in the antigen content. After the cells aggregate, certain cells begin to synthesize prespore antigens and become prespore cells. It was found that during this process, cells containing less prestalk antigen are converted to prespore cells while those containing more remain prestalk cells. This indicates that the prestalk antigen content of preaggregation cells reflects the tendency of the cells toward prestalk/prespore differentiation within cell aggregates. We have further evidence that this tendency is correlated with the nutritional conditions of the cells.