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Experimental control of polarity in corymorpha palma.

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Corymorpha palma is a large, unbranched tubularian hydroid abundant on the Southern California coast. Many different lines of evidence show that in this form, as in others, the physiological axis is primarily represented by a quantitative differential, a gradient, in metabolic activity and associated conditions in the protoplasm. From the most active or 'high' end of this gradient the apical structure, the hydranth, develops and from lower levels the stem and base.

The forms resulting from the reconstitution of isolated pieces of the stem of Corymorpha differ with length of piece, level of body, physiological age and condition of animal, etc., and also with differences in various external conditions. The forms produced fall into three chief groups: (1) uniaxiate, a single individual or an apical part, which may develop from either distal or proximal end of the piece, or under certain conditions, from the side; (2) biaxiate, with an apical end developing from each cut surface and other parts in order from each apical end, as far as the length of the piece permits; (3) intermediate forms, biaxiate as regards the apical ends, but with one or more proximal or basal regions developing from the side of the stem between the two apical regions. In lots of similar pieces from similar stems the frequency of uniaxiate and intermediate forms is much higher in pieces allowed to lie undisturbed on the bottom of the container than in pieces supported above the bottom on loose absorbent cotton. The frequency of uniaxiate and intermediate forms is higher in pieces undisturbed on the bottom than in pieces moved about and turned over every few hours. Pieces above a certain length lying on the bottom and subjected to the action of depressing agents, *e. g.*, alcohol, LiCl, chloretone, ethyl urethane, give a higher frequency of uniaxiate and intermediate forms and in such forms a higher frequency of large proximal parts and multiple basal ends, than pieces in well aerated water.

The factors concerned in determining new polarities in such

pieces are: first, the proximal cut surface which establishes a region of high metabolism and a new gradient opposite in direction to the original in biaxiate forms; second, the differential exposure of the ends or regions of pieces lying on the bottom. All the evidence indicates that this differential exposure is not a matter of contact and lack of contact with a solid surface, but rather of the more rapid respiration possible on the free surface than on that in contact. After a certain period of such differential exposure the free surface becomes the high end of a gradient and develops into an apical end, while the surface in contact becomes the low end and develops into a proximal body level or a basal end. In the presence of depressing agents the development of basal parts from the region in contact is further favored by the decreased motor activity in consequence of which a particular region remains more continuously in contact, and by the differential inhibiting action of the agent, which also favors the increase in size and number of basal parts.

The following table gives in percentages some of the data obtained:

	Length of pieces	No. of pieces	Conditions	Uniaxiate and intermediate	Biaxiate	Dead
I	1/5 naked region	100	On cotton	24	73	3
		100	On bottom	72	20	8
II	1/10 naked region	50	Moved and turned	60	36	4
		50	Undisturbed	96	4	
III	1/4 naked region	20	Control in sea water	35	65	
		20	Alcohol 2% 48 hrs.	75	25	
IV	1/2 naked region	20	Control in sea water	25	75	
		20	LiCl m/20 24 hrs.	65	25	10
V	1/5 naked region	40	Control in sea water	47.5	52.5	
		20	Chloretone 1/5000 24 hrs.	85		15
		20	Ethyl urethane m/250 24 hrs.	80	10	10