LETTERS TO THE EDITORS

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Responses of Seedlings to Animal Embryonal Extracts

STIMULATION of growth of animal tissues by embryonal extracts of animals is a well-established fact since its discovery by Carnot[1]. The influence of extracts of plant embryos on the growth of higher plants is still a subject of controversy.

Hungarian workers have extracted from the hearts of embryos a substance which, they claim, stimulates the growth of the myoblasts of the heart by accelerating the rhythm of cell proliferation, both mitotic and amitotic[2]. The substance is called 'Corhormone' and has found application in human therapeutics. This action is claimed to be specific: the embryonal extract alone, after the 'hormone' has been isolated, has no such effects.

I have tried to ascertain the effects of both 'Corhormone' itself and the embryonal extract ('M.Gy.23') containing no 'hormone' (both kindly given by the Hungarian Pharmaceutical Products Co.) on seedlings of radish, *Raphanus sativus* var. *Saxa*.

Thirty-eight seeds in each series were germinated in Petri dishes, lined with filter paper, in a 1 : 20 solution of 'Corhormone' or in the embryonal extract of the same concentration. Nutrient solution was added on the fourth day of the experiment, and the treatment with 'Corhormone' and the embryonal extract was repeated on the second and seventh day of the experiment. Tap water was used as control. The accompanying table shows some of the results obtained.

Treatment	Height (mm.)	Coeffi-cient of area of leaves	Weight of aerial parts per plant (mgm.)	Weight of stems per mm. length (mgm.)	Length of roots (mm.)	Weight of roots per plant (mgm.)	Weight of roots per mm. length (mgm.)
'Corhormone'	58	143	99	1·19	111	24	0·22
Embryo extract	49	154	76	1·65	94	38	0·39
Control	43	79	57	1·23	82	23	0·28

Increases in the size of the leaves were brought about by both 'Corhormone' and the embryonal extract.

There was also a gain in the weight of the aerial parts in the treated plants, but the difference in favour of 'Corhormone' is almost as marked when compared with the embryonal extract as between this last and the controls. This is due to the hypertrophy and increased succulence of the leaves of the plants treated with 'Corhormone': for as can be seen when the weights per mm. length of the stems of the two series of treated plants are compared, it was the stems of the plants treated with 'extract' which were hypertrophied. Similar remarks hold for the thickening of the roots.

Luxuriant growth and an increased number of root-hairs and of secondary roots on the plants treated with 'Corhormone' were also observed, as compared with both the plants treated with 'extract' and the controls.

Preliminary cytological examination of the leaves of the plants treated with 'Corhormone' showed islands of large stomata among others of the size of the controls, thus indicating myxoploid tissue. The stomata of 'extract'-treated plants were of normal size.

These observations suggest *inter alia*:

1. Confirmation that the transverse reactions of plants and their sequels, such as we have described as the 'alarm signals' or syndromes of phytocarcinomata and polyploidy[3], are in a great measure independent of the chemical constitution of the substance administered[4], similar results having been obtained by carcinogenic and polyploidizing agents of widely different chemical structure[5–6].

2. That, in spite of certain similarities between the effects of 'Corhormone' and the embryonal extract, other effects on plants seem to justify a certain specificity of action of 'Corhormone', as claimed for its effects in the animal organism.

3. The sensitiveness of the seedlings in giving different responses to the two substances is a new argument in favour of the use of plants as pharmacological test-objects, as advocated by Macht and Krantz[7] for another heart-active substance (in digitalis assay).

It is not yet known whether 'Corhormone' is to be considered as a true hormone or rather as a nutrient like the trephones[8]. The final interpretation of these observations must depend upon further work.

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[3] Havas, L., *Bull. Acad. Roy. Belg.*, 333 (1942).
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[6] Havas, L., and Gal, E., *Nature*, **141**, 284 (1938).
[7] Macht and Krantz, *J. Amer. Pharm. Assoc.*, **16**, 210 (1927).
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Number of Tentacles in *Hydra vulgaris* as a Genetic Character

THE number of tentacles in *Hydra vulgaris* Pallas varies from three to nine. The frequency distribution in 869 individuals is

Number of tentacles	3	4	5	6	7	8	9
Number of hydra	1	2	61	646	132	24	3

From this, though any definite conclusion is risky, it is difficult to see that the number of tentacles in *Hydra* is the result of any single environmental factor as size or age. A normal curve of number of tentacles will be in general the distribution under environmental variations.

The number of tentacles in the adult and that in the buds, however, do not always correspond. A *Hydra* with 6 tentacles may carry buds with 4, 5, 6, 7 or 8 tentacles. The relationship between the number of tentacles in the adult and that in the buds is shown in the accompanying table:

Number of tentacles in the adult	Number of tentacles in the buds *1st bud*	*2nd bud*	*3rd bud*	Number of cases
9	7	7	9	1
9	8			1
9	7	8		1
9	7			2
8	8	6		1
8	7	7		1
8	7			2
8	6			5
8	6	6		2
7	8			1
7	7			4
7	7	7	5	1
7	7	8		1
7	7	6		3
7	6			21
7	6	6		9
7	6	5		1
6	8			2
6	7	7	5	1
6	7			11
6	7	6		4
6	6	7		12
6	6	6		39
6	6			90
6	6	5		4
6	5			5
6	4			2
5	6	7		2
5	6	6		5
5	6			2
5	6	5		1
5	5			1
5	4			1

From the above table, two points can be seen: (1) That the number of tentacles in the buds is never more than the number of tentacles in the adult plus 2, and is never less than the number of tentacles in the adult minus 2; or in other words, if the number of tentacles in the adult is a, the number of tentacles in the buds lies within the range of $a + 2$ and $a - 2$; (2) That the number of tentacles in buds of the adults which carry more than 6 tentacles tends to be less than the number in the adults, and the number of tentacles in buds of the adults which carry less than 6 tentacles tends to be more than the number in the adults. For example, if a *Hydra* has 8 tentacles, its buds tend to have less than 8 tentacles, or if a *Hydra* has 5 tentacles its buds tend to have more than 5 tentacles. This is according to the law of filial regression.

The filial generations of the *Hydra* by budding have been individually recorded. Though the results at present have not yet reached the stage for analysis, there are a few cases worth mentioning. There are two *Hydra* with 6 tentacles, and one *Hydra* with 7 tentacles which have all bred true for three generations. Although these cases might simply represent coincidences among a vast number of cases, it is also possible that they are really pure lines which breed true. Should the latter assumption be true, which can be confirmed with further breeding, then there is promise for future research in the crossing of these pure lines.

The arrangement of the tentacles around the hypostome is always in radial symmetry whatever the number. The determination of the number of the tentacles in the buds is always very early in the life-history, and is independent of either the size of the adult or the size of the bud itself. A small bud may have as many as 8 or 9 tentacles while a large one may have only 4 or 5 tentacles. Though this fact does not necessarily prove that the number of tentacles in *Hydra* is a genetic character, it is difficult to explain on the hypothesis of environmental variations why the number of tentacles does not correspond with the size of the buds.

We do not wish to discuss at this time the mode of inheritance in the number of tentacles. But one thing seems to be clear: the mode of inheritance in budding will be different from the mode of inheritance in sexual generations. Some new hypothesis may be necessary to explain why the number of tentacles in the adult does not correspond with the number of tentacles in the buds.

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