Because it is known that homeosis and transdetermination strongly depend on altered proliferation dynamics, experiments to alter proliferation and to study the consequent effects on these phenomena may be useful. In the present study the homeotic mutant ld-opht was used, which produces wing outgrowths in the eyes.1,2 Late 2nd-instar eye discs of this strain were bathed for 30 min in 9 - 100 µg/ml colchicine solutions made up in Ringer (control discs were bathed in Ringer only), then transplanted into larvae of the same age. Higher concentrations proved to be toxic. At the lower concentrations used (17 - 9 µg/ml) 124 (61%) of the transplanted discs were recovered (controls: 52%), 93% of which had undergone complete differentiation (controls: 97%) with an average incidence of all normal eye-antennal disc derivatives of 80% (controls: 82%).

At a concentration of 17 µg/ml fewer facets, but sometimes more bristles (often arranged in a confusing, crowded pattern) were formed. The occiput region often was much more extensively developed than in untreated implants and strikingly approached that of the normal fly, both in spatial relationships and in number of occipital bristles. This suggests that in these implants colchicine induced the process of growing-out which normally occurs in situ but fails to take place in untreated implants (cf. ref. 2). Interestingly, the long period between transplantation and pupation both in the treated and untreated discs often led to a partial or complete reduplication of the antenna and palps. The distal segments of the antenna always reduplicated first. Many antennal segments and palps were strongly enlarged and apparently trapped in the process of splitting-up (cf. ref. 3).

Homoeotic wing outgrowths were encountered in 10 (34%) of the implants treated with 17 µg/ml, in 25 (35%) of those treated with 11 µg/ml, and in 10 (67%) of those treated with 9 µg/ml. In the controls the penetrance was 33% (out of 72 implants). Therefore, a strong increase of penetrance was only observed at the lowest concentration tested; the X² for the difference was 5.68 (significant at the one-sided 2.50% level). The expressivity of the wing-like outgrowths is markedly increased by the colchicine treatment, but here also most strongly at 9 µg/ml, the surface of the outgrowths being 2.1 times as large as in the controls; this difference is significant (p=1.80, Wilcoxon test). At a concentration of 11 µg/ml the outgrowths were 1.9 times as large (p=2.74). At 9 µg/ml the total amount of wing tissue produced was more than 4 1/4 times as much as that produced in the controls; at 11 µg/ml twice; at 17 µg/ml 1 1/2 times as much. Colchicine given in the food in low concentrations during the larval period also significantly increased the expressivity of the wing-like outgrowths. We may therefore conclude that treatment with lower colchicine concentrations increases the production of homoeotic wing tissue in the eye of ld-opht, which is direct evidence for my earlier view1 that the homoeotic effect is a consequence of changed proliferation dynamics.

Colchicine, which is best known for its ability to arrest mitosis, may thus, under certain circumstances, exert mitosis-enhancing effects, as found by many other authors (see ref. 4 and 5 for further literature). It seems to be capable of enhancing prophase progression and the cells' entrance into metaphase if they are in a state of "high mitotic tendency" (Lüscher), as is the case in proliferating imaginal discs. It is interesting that proliferation-enhancing effects could also be suggested for other colchicine experiments on imaginal discs. Treatment of genital discs often produced many more spermathecae than normally.6 Tobler7 adduced several arguments (particularly a markedly increased transdetermination frequency) for a stimulation of proliferation in treated foreleg discs; he assumed a similar effect in the experiments of Vogt8 on aristapedia eye-antennal discs.


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In 1958, Fahmy (DIS 34:49) reported a chemically induced mutant with roughened, glazed, bright red but "patchy" eyes, which, because of their remarkable resemblance to overripe strawberries, he named strawberry (swb), and which he localized at 1-2.2 (between w and N). An X-ray induced allele, swb62b, was obtained from Amherst. P.T. Ives (personal communication) informed