THE EFFECT OF FOREIGN SKIN ON FEATHER PATTERN IN
THE COMMON FOWL (GALLUS DOMESTICUS).

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With 5 figures in the text.

Introduction.

One of the crucial methods of investigating the mode of development
of any particular tissue is to transfer that tissue from its normal site
to a new location in the same or some other animal. By this method,
especially as applied to the amphibia, a number of discoveries of funda-
mental importance have been made by SPEMANN, HARRISON and others.
The literature, particularly in reference to skin transplantation, is well
summarized by ERDMANN (1927). With birds and mammals the proce-
dure has been largely confined to the transplantation of internal organs,
especially the gonads, although several investigators including CARNOT
and DEFLANDRE (1896), LOEB (1897) and subsequently SCHOENE (1912)
have studied to some extent the reactions of transplanted mammalian
skin. The transplantation of feather producing skin of birds seems to
have been neglected until it was undertaken three years ago at Stanford
University. The omission is rather surprising since several laboratory
species, and especially the common fowl (Gallus) present many races
varying widely in size, color, pattern and other characteristics which
promise to afford good material for studying the interplay of develop-
mental factors.

Previous Findings.

Since this work is all recent, and some of the papers are still in
press, it may be permissable to summarize briefly the results thus far
obtained.

Methods. Various parts of the body have been tried as sites for
transplantation, but in most cases the lumbosacral region was selected
because of convenience and because it is here that sexual dimorphism
in the feathers is most clearly expressed. Nearly all transplants were
made while the chicks were only a few days old. The individuals to be
operated upon were etherized, after which their backs were thoroughly
drenched with alcohol and a large piece of skin, even as much as ten square centimeters in area, was removed with scissors and forceps. The pieces thus removed were fitted to the corresponding bare areas on prospective hosts and sewed in place with silk thread. The chicks were then resuscitated, dried, and returned to the brooder, after which they required no unusual attention.

**General Results.** This simple technique has proved successful in the majority of cases, but in all specimens studied histologically, there is an early invasion of lymphocytes which in some instances is so great as to destroy the follicles and, at times, all of the foreign tissue. Many cases, however, show no serious reaction of this sort, or become secondarily adjusted so that the grafts ultimately appear entirely normal with no visible line of demarcation between the grafted skin and that of the host, except such as is indicated by a difference in the type of feathers produced in the two areas.

In successful specimens, the transplanted skin shows the same type of response to gonadectomy, to thyroid feeding, and to the stimulus for moulting (not previously reported) as does the normal skin of the host. Sensory innervation of the graft is fully established as shown by histological examination and experimental tests. The intrinsic muscles which are derived from the donor also become innervated and are brought under voluntary control of the host.

**Effect of Transplantation on Secondary Sexual Characteristics.** When neither the donor nor the host belongs to a breed in which the cock is hen-feathered, the secondary sexual characteristics of the graft correspond to those of the host. That is to say, skin from a male grafted on a female produces feathers of the female type and conversely, female skin on a male produces feathers of the male type. The results obtained from skin transplantation thus tend to confirm the view that normal sexual differences in plumage of the fowl are due to endocrine factors. On the other hand, in a limited number of cases in which hen-feathered and incompletely cock-feathered strains were involved, feathers on the graft followed the character of the donor rather than that of the host. This result leads to the tentative assumption (not in accord with previous views) that hen-feathering and incomplete cock-feathering in the male may be due to a difference in responsiveness of the feather follicles and not necessarily to a difference in the grade of endocrine stimulation.