pends upon the Na^+ concentration in plasma. Limited analytical results from the literature indicate that dentine, while still a hydrated tricalcium phosphate, differs significantly from bone in having a possibly higher Mg^{+2} and lower $(CO_3)^{-2}$ content. Its average formula approaches

$$[Ca_{8.36}Mg_{0.45}Na_{0.16}][(PO_4)_{5.34}(CO_3)_{0.88}](H_2O)_{2.0}$$

Enamel on the other hand is a more basic compound and a representative sample of human enamel has the formula

$$[Ca_{9.48}Mg_{0.18}Na_{0.11}][(PO_4)_{5.67}(CO_3)_{0.45}](OH)_{1.54}(H_2O)_{0.46}$$

which approaches that of a carbonate hydroxyapatite.

Possible variation in the basicity and composition of the inorganic compound of bone with type, species, age and pathological condition, although the subject of many studies in the past, can only be ascertained by further extensive analyses in which the errors of past work are avoided and in which the minor but not unimportant sodium and magnesium are determined. In general, evidence now available would seem to indicate that bone contains a hydrated tricalcium phosphate type of compound instead of hydroxyapatite as widely accepted and that sodium and carbonate are essential constituents of this compound.

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OCCURRENCE OF AVIDIN IN THE OVIDUCT AND SECRETIONS OF THE GENITAL TRACT OF SEVERAL SPECIES

AVIDIN, the anti-biotin factor which produces egg-white injury, has hitherto been known to exist only in the white of the hen's egg.[1] The site of origin and physiological significance of this potent biological substance have remained obscure. The white of the hen's egg represents a secretion from the mucosal lining of the oviduct.[2] Since the translucent jelly-like secretion found adherent to frogs' eggs is the direct homologue of the white of the bird's egg, it was deemed advisable to determine whether avidin might be present in this secretory product of the frog oviduct as well as in the oviduct itself. In addition, the oviduct of the hen and the eggs of several other species of birds were also assayed for avidin.

The materials to be tested were obtained in the fresh state, spread on glass plates and dried in a current of warm air at 37° C. The dried preparations were then pulverized and assayed for avidin by the yeast-growth method of Eakin *et al.*[3]

It was found that avidin exists in readily demonstrable quantities in the oviduct of both the hen and wood frog (Table I). It is noteworthy that the egg-jelly from two different species of frogs also contains very considerable anti-biotin potency. The presence of avidin in the egg-white of all the species of fowl tested should also be noted.

TABLE I

AVIDIN CONTENT OF BIRD AND AMPHIBIAN TISSUES AND SECRETIONS

Species	Material assayed	Units* of avidin per gm. dried weight
Hen (New Hampshire)	Egg white	11.5
	Oviduct	2.3
	Intestine	0.0
Wood frog (R. sylvatica)	Egg jelly	1.7
	Oviduct	0.75
	Intestine	0.0
Pickerel frog (R. palustris)	Egg jelly	1.5
Turkey	Egg white	16.2
Duck	" "	7.1
Goose	" "	8.0

* A unit of avidin is that amount required to completely neutralize the yeast growth supported by one microgram of free crystalline biotin.

Dried intestine of the hen and of the frog was employed as a control tissue and was found to contain no demonstrable activity.

The relatively low titres found in the oviduct of the hen and of the frog may be accounted for by the fact that the muscularis and stroma of these organs contribute a considerable proportion of inert material to the assay.

These data suggest that avidin is a secretory product of the oviduct of birds and amphibia and therefore may play an important role in embryonic development and in the physiology of the genital tract.

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HEREDITARY TRANSMISSION OF INDUCED TETRAPLOIDY AND COMPATIBILITY IN FERTILIZATION

THE writers have reported[1] that the change to a tetraploid condition (4n = 28 chromosomes) induced by colchicine in the branches of self-incompatible diploid (2n = 14 chromosomes) plants of *Petunia axillaris* (Lam.) B. S. P. was accompanied by a change to self-compatibility in fertilization and seed formation. It may now be reported that further investigations show that the condition of self-com-

[1] P. Gyorgy, *Annual Review of Biochemistry*, xi: 337, 1942.

[2] B. Patten, "Embryology of the Chick." P. Blakiston's Son and Co., Inc., Philadelphia. 1929.

[3] R. E. Eakin, E. E. Snell and R. J. Williams, *Jour. Biol. Chem.*, 140: 535, 1941.

[1] A. B. Stout and Clyde Chandler, SCIENCE, 94: 118, 1941.

patibility was transmitted to all seedlings thus far obtained from the selfed flowers of tetraploid branches and also that there was compatibility for all cross-relations among each series of these seedlings.

A total of 212 plants were grown from seeds obtained by controlled self-pollinations of eight flowers on tetraploid branches. The seedlings obtained from each capsule were pedigreed and numbered in a series. Three series were from different capsules of the same plant. Each of the other five series was from a different plant.

All seedlings of selfed tetraploid branches were tetraploid. All had the several characters which differentiated the tetraploid branches from diploid plants and branches. The corollas of the flowers, the anthers and the stigmas were definitely larger. There was appreciable increase in size for a maximum of about 50 per cent. of the pollen grains of a plant and these had four germ pores instead of three, which is the typical condition for diploid plants of this species. For the tetraploid plants whose pollen was examined the abortion of pollen ranged from 15 per cent. to 50 per cent. The chromosome numbers for 45 of the seedlings were determined; all were tetraploid. Thus all seedlings obtained from tetraploid flowers were tetraploid, which indicates that in the self-fertilizations of the tetraploid flowers only pollen and egg cells that were diploid had functioned in seed production.

All the tetraploid seedlings were self-compatible. Each of these plants was tested by controlled self-pollinations. Every one was highly self-compatible to its own pollen. Only one seedling produced small capsules to self-pollination, the largest of which had 65 seeds. Except for this plant there was no evidence of a partial selective incompatibility that results in reduced seeding.

The tetraploid seedlings of a series were cross-compatible in all intra-cross-relations. For one series of 44 siblings all possible cross-pollinations between 20 plants were made and six of these plants were used both as pollen and as seed testers with the other 24 members of the series. Similar tests were made for each of the other seven series of plants to a total of approximately 2,000 cross-combinations. In each and every one of these cross-relations large capsules well filled with seed were obtained.

Of back-cross-relations only those of tetraploid seedlings x diploid parent were cross-incompatible. Both diploid and tetraploid branches of each of several of the original plants which were treated with colchicine were propagated as clones and used in various cross-pollinations with their own tetraploid seedlings.

(1) A parent tetraploid clone as a seed parent with any of its tetraploid seedlings as a pollen parent was cross-compatible for every one of the 54 combinations that were tested.

(2) A parent diploid clone as a seed parent with any of its tetraploid seedlings as a pollen parent was cross-compatible for every one of the 130 combinations tested.

(3) Of the 142 cross-combinations tested for tetraploid seedlings x a parent tetraploid clone, every one was highly compatible.

(4) Tetraploid seedlings were tested as seed parents in 213 different combinations with the parent diploid as a pollen parent and in every case there was complete incompatibility.

Studies in pollen-tube behavior were made which revealed that:

(1) in all combinations which involve the pollen of tetraploid flowers the more advanced pollen tubes grew rapidly and reached the ovary within 48 hours after pollination.

(2) in self-pollination of self-incompatible diploid plants the pollen germinated but the more advanced tubes grew so slowly that at the end of six days none were observed more than three-fifths of the distance from stigma to ovary.

(3) in the cross-pollinations with tetraploids the pollen grains of a parent diploid germinated and grew at approximately the same rate as when used in self-pollination.

The results reported above were fully definite and conclusive for the material studied. The condition of induced tetraploidy eliminated the self-incompatibility that operated in the diploid somatic parent. This condition was transmitted to all the tetraploid recombinations of genetic factors which were obtained in each of the seed progenies. Also among the members of each progeny there was complete cross-compatibility for at least some one of the classes of pollen that segregated from the tetraploid complex. In back-cross relations the only incompatibility that continued was when the haploid pollen of a self-incompatible parent was used to pollinate a pistil of the tetraploid offspring. In the diploid plants of *Petunia axillaris* there is genetic control[2] in the relations of fertilization which effects self- and cross-incompatibilities. But when these genetic factors were duplicated in tetraploid branches and in their seed progenies there was no longer expression in respect to seed production of either self-incompatibility or intra-sib cross-incompatibility.

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[2] A. B. Stout, *The Botanical Review*, 4: 275–369, 1938.