medical and surgical work, barrier-nursing in a side-room is ineffective. The barrier-nursing included the use of gowns, but patients were attended by any member of the staff on duty, as was done in the investigation of spread of staphylococci in a surgical ward at St. Bartholomew's Hospital by Shooter *et al.* (1958). These workers, however, found barrier-nursing effective.

The initial determination of the carrier rate provides evidence of the density of infection among patients and medical, nursing, and lay staff, and may indicate the lines along which preventive measures should be directed. Subsequent swabbing identifies carriers to be treated with neomycin. It will identify persistent carriers, on whom detailed skin swabs may show widespread carriage and an accompanying danger of dispersal. Our findings are in agreement with those of Hare and Ridley (1958) in suggesting that the perineum in both sexes is a potent source of staphylococci.

Once neomycin treatment has been instituted the density of nasal carriage, or its absence, does not indicate the likelihood of infected lesions occurring. The tedious procedure of weekly nasal swabbing throughout a hospital is therefore of practical value only if the carriers so identified can be isolated. Owing to shortage of nurses and wards and the pressure of emergency work, even during a period in which all routine admissions were stopped, it was impossible to provide sufficient isolation beds to do this. We feel that in so widespread an epidemic no measure short of an isolation policy of this magnitude is likely to do more than reduce the incidence of infected lesions.

In the first six months of 1958 it became clear that there was an increasing depot of infection of tetracycline-resistant strains, including phage type 80, in the population of the area. Some of this had been derived from the epidemic in the Hitchin Hospitals, some from other hospitals, and 17 cases had no determinable contact with hospital infection.

Although the majority of infections with strains of phage type 80 that we have seen had been mild, a few severe cases, including one of peritonitis after laparotomy and one of septicaemia with a carbuncle in a nurse, show that this is not always so. Most of the minor lesions have been primary skin infections such as boils, small spots, and carbuncles. The strain was first identified by Rountree and Freeman (1955), when it was isolated from skin lesions, and it appears to have an unusually great tendency to colonize normal or abnormal skin. In old and debilitated people this strain may produce severe bedsores and infect the lungs, being partly or wholly responsible for a terminal bronchopneumonia. Clinically, the strain appears both more virulent and more invasive than other group I or group III strains, but experimental evidence of this increased virulence is lacking (Elek and Conen, 1957).

Widespread infection of a hospital with this strain leads to increased risks to patients admitted for any reason whatsoever and results in an increase of septic lesions among nurses. Attempts to eliminate the infection from the hospital have failed and cases of cross-infection continue to appear. It is felt that no measure short of reduction of emergency work as well as routine admissions would provide enough isolation beds to remove carriers as well as patients with lesions, and that, with foci of infection in the population of the area, elimination of the infection is not a practicable proposition.

Summary

A hospital epidemic of cross-infection due to *Staphylococcus pyogenes* phage type 80 is described.

Attempts at wholesale elimination of the infection were undertaken and failed.

Inability to isolate carriers as well as patients and staff with infected lesions appeared to be a major factor in the failure to eliminate phage type 80 strains.

High initial carrier rates among patients and staff improved after treatment, but there continued to be some persistent nasal and skin carriers in spite of treatment.

Foci of infection of phage type 80 and other tetracycline-resistant strains are increasing in the population in general practice, and it has proved necessary to provide isolation facilities for these cases identified before admission.

We are indebted to Dr. R. E. O. Williams and Dr. Patricia Jevons for determining the phage types and to them and Dr. R. A. Shooter for much advice. We thank the medical staff, the matron and nursing staff, and the hospital secretary, Mr. B. D. M. Smith, for wholehearted co-operation in our attempts at controlling this infection, and in their forbearance in the disruption of hospital life involved.

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FLUOXYMESTERONE

A NEW ORAL ANDROGEN

BY

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Male hypogonadism, be it primary, or secondary to hypopituitarism, requires androgen therapy, and treatment has become possible as the result of the synthesis of testosterone from cholesterol (Ruzicka and Wettstein, 1935; Butenandt and Hanisch, 1935). Initially, intramuscular injections of free testosterone three to seven times a week were employed. Subsequently, derivatives have been synthesized in an endeavour to produce more potent androgenic activity and a longer duration of action. Testosterone propionate in oily solution required to be injected intramuscularly only two to three times a week; crystalline suspensions were developed for injection every one to two months; and solid implants of testosterone or the propionate required insertion every three to four months (Miescher, Wettstein, and Tschopp, 1936; Deanesly and Parkes, 1937; Foss, 1937; Biskind, Escamilla, and Lissner, 1941). The disadvantage of these preparations is that they are largely inactive when taken by mouth, owing to their destruction by the liver.

An advance in treatment followed the production of methyltestosterone, which, when given orally, was shown to be active in castrated rats (Miescher and Tschopp, 1938), and later its potency was confirmed in man. Taken in this way, only about one-third is destroyed by the liver, but this is sufficient to make oral therapy expensive. When administered sublingually, methyltestosterone is partially absorbed through the buccal mucosa directly into the systemic circulation, hepatic inactivation thereby being avoided. Both oral and sublingual methyltestosterone produce satisfactory results for maintenance therapy, although the latter method is time-consuming for the patient, as the tablets take up to half an hour to dissolve (Foss, 1939a; McCullagh, 1940; Kearns, 1941; Tager and Shelton, 1941; Byron and Katzen, 1941; Spence, 1940, 1942).

An androgen which is more potent weight for weight than methyltestosterone, and which would be effective as an oral tablet, would therefore be of considerable value. Fluoxymesterone ("ultadren"; 9 α -fluoro-11 β -hydroxy-17-methyltestosterone) is one of a group of fluorine-substituted derivatives of methyltestosterone which have recently been synthesized and shown to have androgenic and anabolic properties in castrated rats (Herr and Heyl, 1953; Lyster, Lund, and Stafford, 1956; Herr, Hogg, and Levin, 1956). Fluoxymesterone was found to be the most potent of these fluorine derivatives when administered to animals.

The purpose of this paper is to describe the results of the oral treatment of eunuchism and male hypogonadism with fluoxymesterone, and to compare them with methyltestosterone.

Methods and Results

The therapeutic effects of androgens have been summarized previously (Foss, 1939b; Spence, 1940; Escamilla and Lisser, 1941), and consist of subjective and objective manifestations.

Subjective Manifestations.—These are the first to appear, occurring within 48–72 hours of the beginning of therapy, and are the first to be lost if androgens are discontinued. They consist of a feeling of general well-being, increased power of endurance, a greater feeling of self-confidence and optimism, together with more initiative. There is an increase in sexual desire and potency, and erections increase in strength and frequency, while there are a greater number of nocturnal emissions.

Objective Manifestations.—These are delayed in appearing after the institution of hormone therapy and are correspondingly slow to disappear on discontinuing treatment. Two to five months after the start of treatment there is deepening of the voice, the penis grows in length and girth, and the scrotum becomes more pendulous and its skin corrugated. Growth of hair in the axilla, on the chest, and in the pubic region is slow

in appearing, whilst beard growth is the last to be stimulated. The body weight increases and the configuration becomes masculine.

The 10 patients in this trial had previously received maximal androgenic replacement. In nine this consisted of daily sublingual methyltestosterone in doses of 20–40 mg. daily. The remaining patient (Case 2) had testosterone implants, 4 × 100 mg. four-monthly. It was not justifiable to withhold previous treatment to allow signs of androgen deprivation to occur, before starting fluoxymesterone. Subjective manifestations were therefore used as the criteria of adequacy of dosage of the latter drug.

At the start of the trial the patients were questioned regarding their psychiatric state and their sexual behaviour, and were examined fully. Fluoxymesterone was administered as 1-mg. scored tablets, initially in low dosage and subsequently increased if necessary. The patients were seen at monthly intervals, examined, and questioned concerning their general and psychological state and their sexual desire or drive, the strength and number of erections, the occurrence of ejaculations, and the frequency of nocturnal emissions. The objective signs of androgenic stimulation were observed on each attendance, and at the end of the trial, to assess whether the previously produced secondary sexual manifestations had been maintained. The patients were weighed, their blood pressures were recorded, and any evidence of fluid retention and oedema was carefully sought.

It has previously been shown that the estimation of androgen excretion products in the urine is of little value in confirming the clinical improvement produced by testosterone therapy (Biskind *et al.*, 1941); consequently such determinations were not performed in this trial.

The results are summarized in Table I. It will be seen that in all patients, apart from Case 7 (in which there is a marked psychogenic element), fluoxymesterone is a fully active androgen. It is able to maintain the improvement produced by previous androgen treatment. After two to six months' (average four months') therapy, there was no objective evidence of androgen deficiency. The dosage varied from two to four mg. a day, with an average of 2.5 mg. a day.

Case Reports

Ten patients were selected for the trial. Nine had primary hypogonadism (two were eunuchs, the remainder being eunuchoids) and one had pituitary infantilism.

Case 1.—First attended 2½ years previously, when aged 37. His development was normal. Married for 13 years; one daughter aged 12 years. Five years previously had mumps and orchitis. Since then gradual loss of potency, erections feeble, and coitus only once every three to four weeks. Examination showed a male body configuration. Penis and scrotum normal. Right testis half normal size, left testis normal size. Axillary, pubic, and facial hair normal. Diagnosis—eunuchoidism. Previous treatment: sublingual methyltestosterone 30 mg. a day. Result: libido increased, erections strong and frequent, coitus three or four times a week.

Case 2.—First attended 6 years previously, aged 24. Attack of mumps at 10 years but no history of orchitis at that time. He has never developed sexually. Slight gynecomastia and female body configuration. Penis infantile; scrotum small and smooth; testes size of lentils. Pubic hair sparse and female pattern, no hair on the face; facial appearance that of a boy of 12. Voice unbroken. Shy young man, libido slight, no girl friends, erections infrequent, no nocturnal emissions. Diagnosis—eunuchoidism. Previous treatment:

initial testosterone propionate intramuscularly, 50 mg. three times a week, and later testosterone implants; sublingual methyltestosterone unsatisfactory; maintained on testosterone implants 4×100 mg. every four months. Result: penis and scrotum enlarged to adult proportions; axillary and facial hair normal (shaves once a day); pubic hair increased (female distribution); general well-being improved; erections frequent, three or four times a week, nocturnal emissions once a month; still no interest in girls.

Case 3.—First attended 8 years previously, when aged 24, with lack of sexual development. At 3 months had operation for bilateral inguinal hernia. Failed to mature at puberty and voice did not break. At age of 18 started on small doses of androgens. Feminine type of body configuration. Penis normal size, scrotum small, testes absent. Axillary and pubic hair sparse. No hair on trunk or face (does not shave). Voice high-pitched. Shy, with little interest in sex; erections infrequent, no nocturnal emissions. Diagnosis—eunuchism. Previous treatment: sublingual methyltestosterone, 20 mg. a day. Result: increased hair growth, shaves three or four times a week. Erections frequent, five or six a day, nocturnal emissions once a week.

Case 4.—First seen 7 years previously, aged 20, complaining of poor sexual development. Female body configuration. No axillary hair; sparse pubic hair; facial hair absent (does not shave). Penis minute, scrotum small and smooth, testes absent. Voice unbroken. Shy and diffident; erections weak and very infrequent, once a month; no nocturnal emissions. Diagnosis—eunuchoidism. Treatment: initially intramuscular testosterone propionate, 50 mg. three times a week, and later testosterone implants, 4×100 mg. every four months. Maintained on sublingual methyltestosterone 30 mg. daily. Result: increased hair growth; axillary hair normal, pubic hair abundant (female pattern); shaves three times a week; penis normal size; increased feeling of self-confidence; has got married; erections strong, intercourse twice a week with ejaculation.

Case 5.—First attended one year previously, aged 30. Referred with infertility. Married $3\frac{1}{2}$ years. Axillary hair sparse, pubic hair scanty and of female distribution. Penis and scrotum normal, testes small $\frac{1}{2}$ by $\frac{1}{4}$ in. (2 by 0.6 cm.). Voice broken. Intercourse satisfactory, once a month. Diagnosis—eunuchoidism. Previous treatment: sublingual methyltestosterone, 30 mg. a day. Result: sexual desire increased, potency improved, intercourse twice a week, erections strong.

Case 6.—First attended 9 years previously, aged 25, complaining of sterility. At age 12 years? mumps with swelling of testes. Body configuration male, with genu

valgum. Penis small, scrotum small and smooth, testes size of lentils. Axillary hair normal, pubic hair present (female pattern), no hair on face or chest (never shaved). Voice normal. Married; potency poor; erections infrequent, with no ejaculations. Diagnosis—eunuchoidism. Treated initially with testosterone propionate intramuscularly 30 mg. twice a week; later testosterone implants 4×100 mg. every four months; finally maintained on methyltestosterone sublingually 30 mg. a day. Result of treatment: increase in hair, shaves daily; intercourse satisfactory once a week, erections normal.

Case 7.—First attended 7 years previously, aged 38, complaining of lack of development and impotence. In childhood only one testis descended. At puberty no sexual development, although the voice broke slightly. At the age of 36 married, but intercourse unsatisfactory and infrequent. Body configuration male. Penis minute, scrotum small and smooth. Right testis impalpable, left testis size of a lentil. Axillary hair sparse, pubic and facial hair scanty, shaves infrequently; voice high-pitched. Sexual desire poor, intercourse infrequent, erections weak. Diagnosis—eunuchoidism. Previous treatment: injections of testosterone propionate, 50 mg. three times a week, followed later by testosterone implants 4×100 mg. every three months; finally maintained on sublingual methyltestosterone 40 mg. a day. Result of treatment: voice broke; axillary, pubic, and facial hair increased, shaves daily; penis enlarged to adult size, sexual desire increased, erections strong, intercourse satisfactory, once or twice a week, with ejaculation.

Case 8.—First attended 8 years previously, aged 27, complaining of lack of development. Attack of mumps orchitis at 12 years. Body configuration male. Penis small, scrotum normal, testes 1.5 by 1 cm. Axillary hair scanty, pubic hair scanty and of feminine distribution, no hair on face, never shaves. Voice broken. Shy and diffident; unmarried but interested in women. Erections infrequent, no nocturnal emissions. Diagnosis—eunuchoidism. Treated initially with testosterone propionate, 50 mg. intramuscularly twice a week, and later with testosterone implants, 4×100 mg. every four months. Finally maintained on methyltestosterone sublingually, 20 mg. a day. Result of treatment: increased growth of hair; growth in size of penis; felt better; married, and intercourse frequent (three times a week) and satisfactory, erections strong.

Case 9.—First attended in 1958, aged 32. Right orchidectomy for tuberculous epididymitis in 1947; one year later left orchidectomy for tuberculosis of other testis. Body configuration, normal male appearance. Penis normal adult

TABLE I.—Summary of Results

Case	Age	Diagnosis	Previous Maintenance Treatment	Fluoxymesterone Dosage (mg.) Compared with Prior Treatment (Subjective* [Assessment])								Dosage of Fluoxymesterone for Maintenance	Therapeutic Ratio of Fluoxymesterone: Methyltestosterone	Months of Therapy	Weight				Blood Pressure	
															Initial		End of Treatment		Initial	Highest Recorded
				1	1½	2	2½	3	4	5	st. lb.				kg.	st. lb.	kg.			
1	39	Eunuchoid	M.T. 30 mg./day	—	—	+					2 mg.	1: 15	2	10.9	67.6	10.10	68	120/80	125/80	
2	30	"	T.P. implants 4 × 100 mg. 4/12	—	—	—	+			3 "	—	4	10.9	67.6	10.10	68	115/70	115/70		
3	32	Eunuch	M.T. 20 mg./day	—	—	+				2 "	1: 10	5	9 4½	59.2	9 7	60.3	120/80	120/85		
4	27	Eunuchoid	M.T. 30 mg./day	—	—	—		—	+	4 "	1: 7.5	5	10 11	68.5	10 13	69.4	115/70	115/70		
5	31	"	M.T. 30 mg./day	—	—	—	+			3 "	1: 10	2½	10 10½	68.2	10 5	65.8	120/75	120/75		
6	34	"	M.T. 30 mg./day	—	—	—	+			2½ "	1: 12	6	14 4	90.7	14 4	90.7	120/80	120/80		
7	45	"	M.T. 40 mg./day	—	—	—	—		—	2½ "	1: 12	2½	12 1	76.6	12 3	77.6	125/80	130/80		
8	35	"	M.T. 20 mg./day	—	—	+				2 "	1: 10	6	15 3	96.6	15 2	96.1	130/80	140/80		
9	32	Eunuch	M.T. 25 mg./day	—	+					2 "	1: 12.5	3	15 0	95.3	15 1	95.7	125/80	130/80		
10	21	Pituitary infantilism	"	—	—	+				2 "	1: 12.5	4	9 6	59.9	9 8	60.8	120/80	120/80		

* Note: — = Not so effective. + = As effective or more effective. M.T. = Methyl testosterone. T.P. = Testosterone propionate. There was no change in objective symptoms and signs in any patient and oedema was not present.

size, scrotum empty. Axillary and facial hair normal (shaves daily); pubic hair abundant, female pattern. Sexual desire waning; intercourse once a week, erections weak. Diagnosis—eunuchism. Treatment: sublingual methyltestosterone, 25 mg. a day, and this maintained his normal sexual potency.

Case 10.—First attended 4 years previously, aged 17, with the complaint of dwarfism. Normal birth and early development. Severe head injury at age 4 years (? fractured base of skull). Delayed growth noted at 12 years. Height at age 17, 60 in. (152 cm.), symphysis to ground 31 in. (78.7 cm.), symphysis to vertex 29 in. (73.6 cm.); span 61 in. (155 cm.). Weight 96 lb. (43.5 kg.). Penis infantile, scrotum small and smooth, testes the size of peas, right testis retractile. No facial or body hair. Voice unbroken. Physical examination otherwise normal. X-ray film of pituitary fossa normal; urinary 17-ketosteroids, 1 mg./24 hours. B.M.R. —22%. Diagnosis—pituitary infantilism. Treated with chorionic gonadotrophin, 100 units intramuscularly twice a week, and tab. thyroid. B.P., 1 gr. (65 mg.) daily, and later with testosterone propionate intramuscularly, 50 mg. twice a week, and then testosterone implants, 4 × 100 mg. every four months; finally maintained on sublingual methyltestosterone, 25 mg. a day. Result of treatment: total height 67½ in. (172 cm.), symphysis to ground 36½ in. (92.7 cm.), symphysis to vertex 31½ in. (79.3 cm.), span 69½ in. (176.5 cm.), weight 135 lb. (61.2 kg.); increase in body and facial hair, shaves twice a week; penis normal size, testes the size of marbles; nocturnal emissions once a week.

Discussion

For the initiation of the treatment of hypogonadism much larger doses of androgens are necessary than for maintenance; for this initial treatment intramuscular testosterone propionate has been preferred, implants being difficult to control adequately and oral therapy requiring large dosage. For maintenance treatment, however, sublingual or oral therapy is the most convenient.

In this trial the potency of fluoxymesterone was assessed on a subjective basis, and a measure was obtained by comparing the dosage with that of previously administered sublingual methyltestosterone. Fluoxymesterone is seen to have a much greater potency, being 7.5 to 15 times (average 11.25) as active (weight for weight). These figures correspond with those found in castrated male rats (Lyster *et al.*, 1956).

The disadvantage of previous oral androgen therapy has been the high dosage necessary. Although the dosage of testosterone for maintenance therapy in hypogonadism is variable from patient to patient, average requirements have been determined. Testosterone propionate intramuscularly is required in doses of 40–50 mg. a week, equalling 6–7 mg. a day (Foss, 1937, 1939b; Spence, 1940); testosterone implants, 300–500 mg. every three to four months, equalling 3–5 mg. a day (Spence, 1940; Biskind *et al.*, 1941). Sublingual methyltestosterone is very much less potent weight for weight than parenteral therapy; average maintenance dosage varies from 10 to 30 mg. a day (Foss, 1939a; Escamilla and Lissner, 1941; Byron and Katzen, 1941; Tager and Shelton, 1941; Spence, 1942; Escamilla and Gordan, 1950). Gordan (1956) found that the maintenance dose of fluoxymesterone was 1.5–2 mg. a day. In this series the daily requirement varied from 2 to 4 mg., with an average of 2.5 mg. a day.

It is apparent from Table II that on a weight-for-weight basis oral fluoxymesterone is the most potent androgen so far investigated.

TABLE II.—*Comparison of Maintenance Requirement of Androgens in Hypogonadism*

	Dose	
	Period	Daily
Testosterone propionate (oily solutions) by intramuscular injection. (Various authors)	40–50 mg./wk	6–7 mg.
Testosterone by implantation. (Various authors)	300–500 mg./3–4 mths	3–5 ..
Sublingual or oral methyltestosterone. (Various authors)		10–30 ..
Sublingual methyltestosterone. (Present series)		20–40 ..
Oral fluoxymesterone		2–4 (av. 2.5) mg.

The tablets of fluoxymesterone were normally swallowed; in two patients it was administered sublingually, but in neither case did this increase its potency.

Fluoxymesterone was employed for periods of two to six months—sufficient time to see whether subjective signs of androgen deficiency developed. None were detected.

Only one previously untreated eunuchoid (not tabulated) has been seen in the endocrine clinic since this trial was started. He has received doses of 6 mg. of fluoxymesterone daily. Subjective improvement had already occurred after three weeks, but it is too early to assess how successful oral fluoxymesterone will be in initiating treatment.

Lyster *et al.* (1956) showed that, in castrated rats, fluoxymesterone had potent anabolic, in addition to androgenic, activity. In the present series the anabolic action was not disproportionately greater than the androgenic, no patient gaining more than 5 lb. (2.27 kg.), the average weight gain being 1 lb. (0.45 kg.).

Androgens have salt-retaining properties, as has been demonstrated in animals and confirmed in man when treated with large doses (Thorn and Harrop, 1937; Kenyon, 1938; Kenyon, Sandiford, Bryan, Knowlton, and Koch, 1938). It might have been anticipated that fluoxymesterone, being a hydroxy-substituted steroid and having a fluorine atom attached to ring 3, would show this property in an exaggerated manner. However, in no case was there any clinical evidence of oedema, and if any gain in weight was due to water retention this only amounted to an average of 1 lb. (0.45 kg.).

Summary

Fluoxymesterone (ultandren) was administered to 10 patients with eunuchism and hypogonadism, in nine of whom it was found to be an effective oral androgen for maintenance therapy. The potency was 7.5 to 15 times (average 11.25) greater than that of sublingual methyltestosterone. The maintenance dosage varied from 2 to 4 mg. (average 2.5 mg.) a day. Comparison with the average daily doses of the other androgenic preparations used in clinical practice shows it to be the most potent yet investigated. There were no undesirable side-effects; no patient gained weight excessively. No fluid retention was detected. Fluoxymesterone is fully active when taken orally, there being no necessity for sublingual application.

I thank Dr. A. W. Spence for suggesting this trial and for allowing me to conduct it in the endocrine clinic at St. Bartholomew's Hospital. I also thank Dr. C. D.

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EFFECT OF PENICILLIN THERAPY ON OCCURRENCE OF SECOND ATTACKS IN SCARLET FEVER

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Scarlet fever has been regarded as a good example of an infection which bestows a fairly permanent immunity, so that before the use of antibiotics second attacks of the disease were uncommon. Thuresson (1942), for example, over an observation period of five and a half years, recorded secondary attacks in 1.5–2.1%, while Ström (1954) gave rates of 0.7–1.2% over a period of nine and a half years. Such figures, it should be noted, refer to "late secondary attacks" in which the second illness occurred at least three months after the first infection. It is probably wise to separate these late recurrences from "early secondary attacks," not only because it may take some time for full immunity to develop but, perhaps more important, because many of the early recurrences may result from secondary infection in hospital or at home by a different type of streptococcus before immunity can be effectively acquired.

During the past ten years penicillin has become the standard method of treatment for scarlet fever, with obvious and immediate efficacy. One interesting aspect, however, has been the apparent weakened immunity, with a consequential frequency of secondary attacks. We have therefore studied this problem by analysing the admissions to our unit. The investigation is solely

concerned with the incidence of secondary attacks in patients whose first attack was treated with penicillin, and especially in the incidence of late recurrences, since these seem most likely to reflect the antitoxic immunity bestowed by the antibiotic-treated disease.

Material

Our material comprises 7,837 cases of primary scarlet fever admitted to Aurora Hospital (formerly the Hospital for Contagious Diseases, Helsinki) in the 10-year period 1947–56, all of which were treated with penicillin (Fig. 1).

In Finland the physician is obliged by law to notify every case of scarlet fever to the health authorities. In Helsinki such cases are treated either at Aurora Hospital or at the patient's home, under the supervision of the health authorities. During recent years an increasing proportion of cases have been treated at home, so that, although in 1951 only 19% were not admitted to hospital, by 1956 the proportion had increased to 59%. For this reason, and because of the exclusion of a small number of patients without antibiotics or with antibiotics other than penicillin, the present series represents only 60% of the new cases of scarlet fever in Helsinki notified to the health authorities during the period as a whole.

The statistics of second attacks are collected from the beginning of 1947 to the end of 1957—that is, a period of one year longer than that in which the series of primary cases was observed. The mean observation time is thus six and a half years. Secondary attacks treated in hospital were easily abstracted. The physicians' obligation to notify the health authorities of the cases treated at home made it possible to obtain records of those patients who contracted scarlet fever again and were treated at home. The annual distribution of scarlet fever cases treated with penicillin and the number of second attacks are shown in Fig. 1 and Table I.

Results

During the period of observation, 501 (6.4%) patients suffered a second attack of scarlet fever; of these cases, 108 (1.4%) were early second attacks and 393 (5%) were late second attacks. All but 84 of these second attacks were treated in hospital.

FIG. 1.—New scarlet fever patients treated with penicillin in Aurora Hospital in 1947–56 and the early (black column) and late (white column) second attacks observed in them yearly.